

# Modicon M218 Logic Controller Hardware Guide

06/2019



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

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

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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.

### 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.





## At a Glance

### Document Scope

The purpose of this document is to:

- show you how to install and operate your controller
- show you how to connect the controller to a programming device equipped with EcoStruxure Machine Expert software
- help you understand how to interface the controller with I/O modules, HMI and other devices
- help you become familiar with the controller features.

**NOTE:** Read and understand this document and all related documents (*see page 9*) before installing, operating or maintaining your controller.

Users should read through the entire document to understand all its features.

### Validity Note

This document has been updated with the release of EcoStruxure™ Machine Expert V1.1.

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

The characteristics that are presented in the present document 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 document and online information, use the online information as your reference.

### Related Documents

| Title of Documentation                          | Reference Number                                                           |
|-------------------------------------------------|----------------------------------------------------------------------------|
| Modicon M218 Logic Controller Programming Guide | EIO0000003614 (eng)<br>EIO0000003615 (chs)                                 |
| TM2...N I/O Expansion Module Hardware Guide     | EIO0000003786 (eng)<br>EIO0000003787 (chs)                                 |
| Modicon TM2 Digital I/O Module Hardware Guide   | <a href="#">EIO0000000028</a> (eng)<br><a href="#">EIO0000000033</a> (chs) |
| Modicon TM2 Analog I/O Module Hardware Guide    | <a href="#">EIO0000000034</a> (eng)<br><a href="#">EIO0000000039</a> (chs) |
| Modicon TM3 Digital I/O Module Hardware Guide   | <a href="#">EIO0000003125</a> (eng)<br><a href="#">EIO0000003130</a> (chs) |
| Modicon TM3 Analog I/O Module Hardware Guide    | <a href="#">EIO0000003131</a> (eng)<br><a href="#">EIO0000003136</a> (chs) |
| Modicon M218 Logic Controller Instruction Sheet | S1A63573                                                                   |

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

## 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.**

## 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.**

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# Chapter 1

## Basics of the TM218 System

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### Overview

This chapter provides general information about the TM218 system architecture and its components.

### What Is in This Chapter?

This chapter contains the following topics:

| Topic                                                | Page |
|------------------------------------------------------|------|
| M218 System Architecture                             | 12   |
| M218 System Expansion Architecture                   | 14   |
| Expansion Modules and Maximum Hardware Configuration | 16   |
| TM2...N Modules General Description                  | 17   |
| TM2 Digital I/O Modules General Description          | 18   |
| TM2 Analog I/O Modules General Description           | 19   |
| TM3 Digital Modules General Description              | 20   |
| TM3 Analog Modules General Description               | 23   |
| TM3RDM••R Expansion Modules                          | 26   |

## M218 System Architecture

### Introduction

The M218 system is a compact control system that offers an all-in-one solution with optimized configurations and an expandable architecture.

### Architecture Example

The following illustration provides an example of a Modicon M218 Logic Controller in a hardware environment:



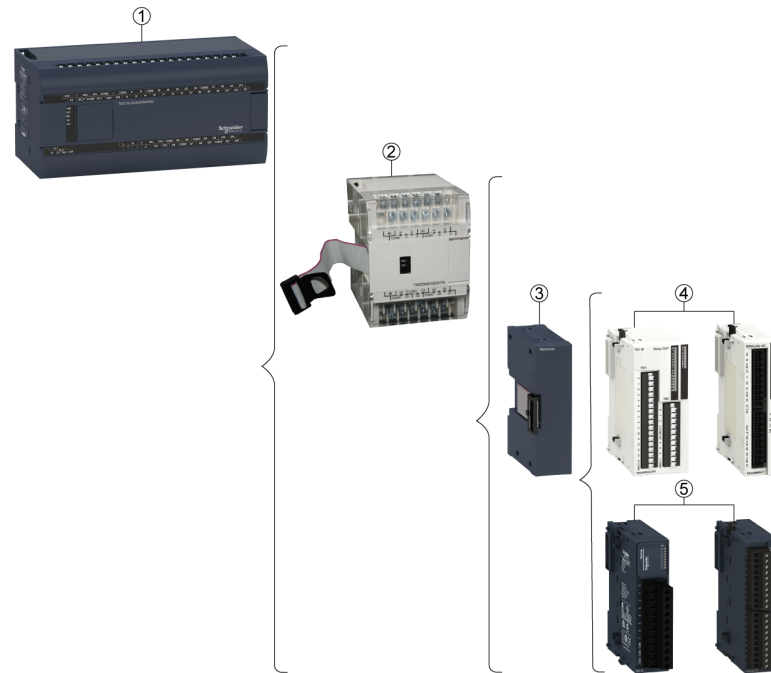
## M218 System Architecture

Optimized configurations and flexibility are provided by the association of:

- TM2...N I/O expansion modules ([see page 17](#))
- An accessory TM2DOCKN adaptor module ([see page 17](#)) to connect TM2 and TM3 I/O expansion modules
- TM2 digital I/O expansion modules ([see page 18](#))
- TM2 analog I/O expansion modules ([see page 19](#))
- TM3 digital I/O expansion modules ([see page 20](#))
- TM3 analog I/O expansion modules ([see page 23](#))
- TM3R mixed I/O expansion modules ([see page 26](#))

Application requirements determine the architecture of your M218 system.

The illustration below shows the components of the M218 system:



- 1 M218 controller
- 2 TM2...N expansion I/O module
- 3 TM2 adaptor module TM2DOCKN
- 4 TM2 digital or analog expansion module
- 5 TM3 digital or analog expansion modules

**NOTE:** With M218 controller, it is not required to place a TM2 module before a TM3 module. The position of modules TM2 and TM3 can be mixed after the TM2DOCKN adaptor module

## M218 System Expansion Architecture

### Overview

There are 2 ways to connect expansion modules to M218 controllers:

- Direct connection
- Connection with an adaptor module

Both connection types can be used simultaneously.

### Direct Connection of Expansion Modules

TM2...N expansion modules are connected directly to M218 controllers through a soft ribbon cable:



### Connection of Expansion Modules with an Adaptor Module

TM3 and/or TM2 system expansion modules can be connected with M218 controllers using the TM2DOCKN adaptor module.

The adaptor module is installed between the M218 controller and the TM3/TM2 expansion modules:



### Using Direct Connection and Connection with Adaptor Module Simultaneously

The two types of connections can be used with a single M218 controller to connect TM2...N and TM3/TM2 expansion modules simultaneously:



In this case, the connection sequence is the following (from left to right):

- Connect the TM2...N expansion module(s) directly to the M218 controller.
- Connect the adaptor module TM2DOCKN to the TM2...N expansion module.
- Connect the TM2 or TM3 expansion module(s) to the adaptor module.

## Expansion Modules and Maximum Hardware Configuration

### Overview

You can expand the number of I/Os of your M218 controller by adding I/O expansion modules.

The following types of electronic modules are supported:

- TM2...N I/O expansion modules ([see page 17](#))
- An accessory TM2DOCKN adaptor module ([see page 17](#)) to connect TM2 and TM3 I/O expansion modules
- TM2 digital I/O expansion modules ([see page 18](#))
- TM2 analog I/O expansion modules ([see page 19](#))
- TM3 digital I/O expansion modules ([see page 20](#))
- TM3 analog I/O expansion modules ([see page 23](#))
- TM3R mixed I/O expansion modules ([see page 26](#))

### Maximum Hardware Configuration

The following table shows the maximum number of expansion modules for each Modicon M218 Logic Controller:

| Controller                                                                                                      | Maximum Number of Expansion Modules |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------------|
| TM218LDA16DRN                                                                                                   | 4                                   |
| TM218LDA24DRN<br>TM218LDA24DRHN<br>TM218LDD24DUPHN<br>TM218LDAE24DRHN                                           | 4                                   |
| TM218LDA40DRN<br>TM218LDA40DRPHN<br>TM218LDD40DUPHNB<br>TM218LDAE40DRPHN<br>TM218LDA40DR2HN<br>TM218LDA40DR4PHN | 7                                   |
| TM218LDA60DRN                                                                                                   | 7                                   |

## TM2...N Modules General Description

### Introduction

The range of TM2...N expansion modules includes:

- TM2...N digital and analog
- TM2DOCKN adaptor module for TM2 or TM3 expansion modules

For further details, refer to TM2...N expansion modules (*see Modicon TM2...N Expansion Modules, Hardware Guide*).

### TM2...N Expansion Modules

The TM2...N expansion modules are connected directly with the controller by a soft ribbon cable.

| Reference    | Description                       |
|--------------|-----------------------------------|
| TM2DMM16DRTN | 8 regular inputs, 8 relay outputs |
| TM2AMI2HTN   | 2 analog inputs                   |
| TM2AMI4HTN   | 4 analog inputs                   |
| TM2AMO2HTN   | 2 analog outputs                  |

### TM2DOCKN Adaptor Module

The adaptor module allows you to connect the TM2 or TM3 expansion modules to your M218 controller:

| Reference | Description                                     |
|-----------|-------------------------------------------------|
| TM2DOCKN  | Adaptor module for TM2 or TM3 expansion modules |

If you need to mix TM3 expansion modules with TM2...N Analog I/O expansion modules on the same project, you must update the firmware of the TM2...N Analog I/O expansion modules. To update the firmware, refer to Changing the TM2...N Analog I/O Expansion Modules Firmware (*see Modicon TM2...N Expansion Modules, Programming Guide*). During all the firmware update procedure:

- The controller must be disconnected from the system and applications it effects.
- The PC, the controller and the I/O module must stay connected together.

## 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.**

## TM2 Digital I/O Modules General Description

### Introduction

The range of TM2 I/O modules includes

- Input modules,
- Output modules,
- Mixed input/output modules.

For further details, refer to TM2 Digital I/O Modules (*see Modicon TM2, Digital I/O Modules, Hardware Guide*).

The TM2 digital I/O modules are equipped with either a HE10 connector, a non removable spring terminal block or a removable screw terminal block. For modules fitted with HE10 type connector outputs, a group of products known as Telefast 2 are available that enable digital input/output modules to be quickly connected to sensors and actuators (Please refer to Telefast 2 catalog for more information).

### Module Features

The following table shows the digital I/O modules features, with corresponding channel type, voltage/current and terminal type:

| Reference module      | Channels | Channel type                 | Voltage/current                          | Terminal type                       |
|-----------------------|----------|------------------------------|------------------------------------------|-------------------------------------|
| <b>Input Modules</b>  |          |                              |                                          |                                     |
| TM2DAI8DT             | 8        | Inputs                       | 120 Vac<br>7.5 mA                        | Removable screw terminal block      |
| TM2DDI8DT             | 8        | Inputs                       | 24 Vdc<br>7 mA                           | Removable screw terminal block      |
| TM2DDI16DT            | 16       | Inputs                       | 24 Vdc<br>7 mA                           | Removable screw terminal block      |
| TM2DDI16DK            | 16       | Inputs                       | 24 Vdc<br>5 mA                           | HE10 Connector                      |
| TM2DDI32DK            | 32       | Inputs                       | 24 Vdc<br>5 mA                           | HE10 Connector                      |
| <b>Output Modules</b> |          |                              |                                          |                                     |
| TM2DRA8RT             | 8        | Outputs<br>Relay             | 30 Vdc/230 Vac<br>2 A max                | Removable screw terminal block      |
| TM2DRA16RT            | 16       | Outputs<br>Relay             | 30 Vdc/230 Vac<br>2 A max                | Removable screw terminal block      |
| TM2DDO8UT             | 8        | Outputs<br>Transistor sink   | 24 Vdc<br>0.3 A max per output           | Removable screw terminal block      |
| TM2DDO8TT             | 8        | Outputs<br>Transistor source | 24 Vdc<br>0.5 A max per output           | Removable screw terminal block      |
| TM2DDO16UK            | 16       | Outputs<br>Transistor sink   | 24 Vdc<br>0.1 A max per output           | HE10 Connector                      |
| TM2DDO16TK            | 16       | Outputs<br>Transistor source | 24 Vdc<br>0.4 A max per output           | HE10 Connector                      |
| TM2DDO32UK            | 32       | Outputs<br>Transistor sink   | 24 Vdc<br>0.1 A max per output           | HE10 Connector                      |
| TM2DDO32TK            | 32       | Outputs<br>Transistor source | 24 Vdc<br>0.4 A max per output           | HE10 Connector                      |
| <b>Mixed Modules</b>  |          |                              |                                          |                                     |
| TM2DMM8DRT            | 4<br>4   | Inputs<br>Outputs<br>Relay   | 24 Vdc/7 mA<br>30 Vdc/230 Vac<br>2 A max | Removable screw terminal block      |
| TM2DMM24DRF           | 16<br>8  | Inputs<br>Outputs<br>Relay   | 24 Vdc/7 mA<br>30 Vdc/230 Vac<br>2 A max | Non-removable spring terminal block |

## TM2 Analog I/O Modules General Description

### Introduction

The range of TM2 analog I/O modules includes:

- Input modules,
- Output modules,
- Mixed Input/Output modules.

For further details, refer to TM2 analog I/O expansion modules (*see Modicon TM2, Analog I/O Modules, Hardware Guide*).

The TM2 analog I/O modules are equipped with either screw terminal blocks or RJ11 connectors (only for TM2ARI8LRJ).

### Module Features

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

| Reference module      | Channels | Channel type      | Voltage/current                                     | Terminal Type            |
|-----------------------|----------|-------------------|-----------------------------------------------------|--------------------------|
| <b>Input Modules</b>  |          |                   |                                                     |                          |
| TM2AMI2HT             | 2        | High-level inputs | 0...10 Vdc<br>4...20 mA                             | Removable screw terminal |
| TM2AMI2LT             | 2        | Low-level inputs  | Thermocouple type J,K,T                             | Removable screw terminal |
| TM2AMI4LT             | 4        | Inputs            | 0...10 Vdc<br>0...20 mA<br>PT100/1000<br>Ni100/1000 | Removable screw terminal |
| TM2AMI8HT             | 8        | Inputs            | 0...20 mA<br>0...10 Vdc                             | Removable screw terminal |
| TM2ARI8HT             | 8        | Inputs            | NTC / PTC                                           | Removable screw terminal |
| TM2ARI8LRJ            | 8        | Inputs            | PT100/1000                                          | RJ11 connector           |
| TM2ARI8LT             | 8        | Inputs            | PT100/1000                                          | Removable screw terminal |
| <b>Output Modules</b> |          |                   |                                                     |                          |
| TM2AMO1HT             | 1        | Outputs           | 0...10 Vdc<br>4...20 mA                             | Removable screw terminal |
| TM2AVO2HT             | 2        | Outputs           | +/- 10 Vdc                                          | Removable screw terminal |
| <b>Mixed Modules</b>  |          |                   |                                                     |                          |
| TM2AMM3HT             | 2        | Inputs            | 0...10 Vdc 4...20 mA<br>0...10 Vdc 4...20 mA        | Removable screw terminal |
|                       | 1        | Outputs           |                                                     |                          |
| TM2AMM6HT             | 4        | Inputs            | 0...10 Vdc 4...20 mA<br>0...10 Vdc 4...20 mA        | Removable screw terminal |
|                       | 2        | Outputs           |                                                     |                          |
| TM2ALM3LT             | 2        | Low-level inputs  | Thermo J,K,T, PT100<br>0...10 Vdc 4...20 mA         | Removable screw terminal |
|                       | 1        | Outputs           |                                                     |                          |

## TM3 Digital Modules General Description

### Introduction

The range of TM3 digital I/O expansion modules includes:

- Input modules
- Output modules
- Mixed input/output modules

All TM3 digital I/O expansion modules are equipped with (depending on the reference):

- Removable screw terminal blocks
- Removable spring terminal blocks
- HE10 (MIL 20) connectors

For further details, refer to TM3 digital I/O expansion modules (*see Modicon TM3, Digital I/O Modules, Hardware Guide*).

For modules with HE10 (MIL 20) connectors, a group of products known as Telefast 2 (*see Modicon TM3, Digital I/O Modules, Hardware Guide*) are available that enable these modules to be quickly connected to sensors and actuators.

### 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<br>Current | Terminal Type / Pitch                            |
|-----------|----------|----------------|--------------------|--------------------------------------------------|
| TM3DI8A   | 8        | Regular inputs | 120 Vac<br>7.5 mA  | Removable screw<br>terminal block /<br>5.08 mm   |
| TM3DI8    | 8        | Regular inputs | 24 Vdc<br>7 mA     | Removable screw<br>terminal block /<br>5.08 mm   |
| TM3DI8G   | 8        | Regular inputs | 24 Vdc<br>7 mA     | Removable spring<br>terminal block /<br>5.08 mm  |
| TM3DI16   | 16       | Regular inputs | 24 Vdc<br>7 mA     | Removable screw<br>terminal blocks /<br>3.81 mm  |
| TM3DI16G  | 16       | Regular inputs | 24 Vdc<br>7 mA     | Removable spring<br>terminal blocks /<br>3.81 mm |
| TM3DI16K  | 16       | Regular inputs | 24 Vdc<br>5 mA     | HE10 (MIL 20)<br>connector                       |
| TM3DI32K  | 32       | Regular inputs | 24 Vdc<br>5 mA     | HE10 (MIL 20)<br>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<br>Current                                                             | Terminal Type / Pitch                            |
|-----------|----------|----------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------|
| TM3DQ8R   | 8        | Relay outputs                          | 24 Vdc / 240 Vac<br>7 A maximum per<br>common line / 2 A<br>maximum per output | Removable screw<br>terminal block /<br>5.08 mm   |
| TM3DQ8RG  | 8        | Relay outputs                          | 24 Vdc / 240 Vac<br>7 A maximum per<br>common line / 2 A<br>maximum per output | Removable spring<br>terminal block /<br>5.08 mm  |
| TM3DQ8T   | 8        | Regular transistor<br>outputs (source) | 24 Vdc<br>4 A maximum per<br>common line/0.5 A<br>maximum per output           | Removable screw<br>terminal block /<br>5.08 mm   |
| TM3DQ8TG  | 8        | Regular transistor<br>outputs (source) | 24 Vdc<br>4 A maximum per<br>common line/0.5 A<br>maximum per output           | Removable spring<br>terminal block /<br>5.08 mm  |
| TM3DQ8U   | 8        | Regular transistor<br>outputs (sink)   | 24 Vdc<br>4 A maximum per<br>common line/0.5 A<br>maximum per output           | Removable screw<br>terminal block /<br>5.08 mm   |
| TM3DQ8UG  | 8        | Regular transistor<br>outputs (sink)   | 24 Vdc<br>4 A maximum per<br>common line/0.5 A<br>maximum per output           | Removable spring<br>terminal block /<br>5.08 mm  |
| TM3DQ16R  | 16       | Relay outputs                          | 24 Vdc / 240 Vac<br>8 A maximum per<br>common line / 2 A<br>maximum per output | Removable screw<br>terminal blocks /<br>3.81 mm  |
| TM3DQ16RG | 16       | Relay outputs                          | 24 Vdc / 240 Vac<br>8 A maximum per<br>common line / 2 A<br>maximum per output | Removable spring<br>terminal blocks /<br>3.81 mm |
| TM3DQ16T  | 16       | Regular transistor<br>outputs (source) | 24 Vdc<br>8 A maximum per<br>common line / 0.5 A<br>maximum per output         | Removable screw<br>terminal blocks /<br>3.81 mm  |
| TM3DQ16TG | 16       | Regular transistor<br>outputs (source) | 24 Vdc<br>8 A maximum per<br>common line / 0.5 A<br>maximum per output         | Removable spring<br>terminal blocks /<br>3.81 mm |
| TM3DQ16U  | 16       | Regular transistor<br>outputs (sink)   | 24 Vdc<br>8 A maximum per<br>common line / 0.5 A<br>maximum per output         | Removable screw<br>terminal blocks /<br>3.81 mm  |
| TM3DQ16UG | 16       | Regular transistor<br>outputs (sink)   | 24 Vdc<br>8 A maximum per<br>common line / 0.5 A<br>maximum per output         | Removable spring<br>terminal blocks /<br>3.81 mm |
| TM3DQ16TK | 16       | Regular transistor<br>outputs (source) | 24 Vdc<br>2 A maximum per<br>common line / 0.1 A<br>maximum per output         | HE10 (MIL 20)<br>connector                       |
| TM3DQ16UK | 16       | Regular transistor<br>outputs (sink)   | 24 Vdc<br>2 A maximum per<br>common line / 0.1 A<br>maximum per output         | HE10 (MIL 20)<br>connector                       |

| Reference | Channels | Channel Type                        | Voltage<br>Current                                               | Terminal Type / Pitch    |
|-----------|----------|-------------------------------------|------------------------------------------------------------------|--------------------------|
| TM3DQ32TK | 32       | Regular transistor outputs (source) | 24 Vdc<br>2 A maximum per common line / 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 / 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<br>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 / 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 / 2 A maximum per output |                                            |
| 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 / 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 / 2 A maximum per output |                                            |

## TM3 Analog Modules General Description

### Introduction

The range of TM3 analog I/O expansion modules includes:

- Input modules
- Output modules
- Mixed input/output modules

All TM3 analog I/O expansion modules are equipped with (depending on the reference):

- Removable screw terminal blocks
- Removable spring terminal blocks

For further details, refer to TM3 analog I/O expansion modules (*see Modicon TM3, Analog I/O Modules, Hardware Guide*).

### 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 / 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 / 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 / 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 / 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<br>0...20 mA extended<br>4...20 mA extended | Removable screw terminal block / 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<br>0...20 mA extended<br>4...20 mA extended | Removable spring terminal blocks / 3.81 mm |
| 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 / 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 / 3.81 mm |
| TM3TI4D   | 16 bit, or<br>15 bit + sign | 4        | inputs       | Thermocouple                                                                                      | Removable screw terminal block / 3.81 mm   |

| Reference | Resolution                  | Channels | Channel Type | Mode                                | Terminal Type / Pitch                      |
|-----------|-----------------------------|----------|--------------|-------------------------------------|--------------------------------------------|
| TM3TI4DG  | 16 bit, or<br>15 bit + sign | 4        | inputs       | Thermocouple                        | Removable spring terminal blocks / 3.81 mm |
| TM3TI8T   | 16 bit, or<br>15 bit + sign | 8        | inputs       | Thermocouple<br>NTC/PTC<br>Ohmmeter | Removable screw terminal block / 3.81 mm   |
| TM3TI8TG  | 16 bit, or<br>15 bit + sign | 8        | inputs       | Thermocouple<br>NTC/PTC<br>Ohmmeter | Removable spring terminal blocks / 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 / 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 / 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 / 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 / 5.08 mm |

### TM3 Analog Mixed Input/Output Modules

This 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<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA                                             | Removable screw<br>terminal block /<br>3.81 mm  |
|           |                             | 2        | outputs      |                                                                                                   |                                                 |
| TM3AM6G   | 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<br>terminal block /<br>3.81 mm |
|           |                             | 2        | outputs      |                                                                                                   |                                                 |
| 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  |
|           | 12 bit, or<br>11 bit + sign | 1        | outputs      | 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 |
|           | 12 bit, or<br>11 bit + sign | 1        | outputs      | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA                                             |                                                 |

## TM3RDM••R Expansion Modules

### Introduction

The range of TM3RDM••R expansion modules includes Digital mixed input/output modules (*see page 205*).

### TM3RDM••R Digital Mixed Input/Output Modules

This following table shows the TM3RDM••R mixed I/O modules, with corresponding channel type, nominal voltage/current, and terminal type:

| Reference                         | Channels | Channel Type   | Voltage<br>Current                                                             | Terminal Type / Pitch                                         |
|-----------------------------------|----------|----------------|--------------------------------------------------------------------------------|---------------------------------------------------------------|
| TM3RDM16R ( <i>see page 207</i> ) | 8        | Regular inputs | 24 Vdc<br>5 mA                                                                 | Removable screw<br>terminal block /<br>3.81 mm (0.15 in.)     |
|                                   | 8        | Relay outputs  | 24 Vdc / 240 Vac<br>4 A maximum per<br>common line / 2 A<br>maximum per output |                                                               |
| TM3RDM32R ( <i>see page 214</i> ) | 16       | Regular inputs | 24 Vdc<br>5 mA                                                                 | Removable screw<br>terminal<br>blocks / 3.81 mm<br>(0.15 in.) |
|                                   | 16       | Relay outputs  | 24 Vdc / 240 Vac<br>4 A maximum per<br>common line / 2 A<br>maximum per output |                                                               |

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## Chapter 2

### TM218 System General Rules for Implementing

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#### Overview

This chapter describes the installation requirements, wiring rules and recommendations, and the environmental specifications of the controller.

#### What Is in This Chapter?

This chapter contains the following topics:

| Topic                            | Page |
|----------------------------------|------|
| Introduction                     | 28   |
| Installation Requirement         | 30   |
| Environmental Characteristics    | 32   |
| Wiring Rules and Recommendations | 34   |
| Grounding the TM218 System       | 38   |

## Introduction

### Before You Begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

#### WARNING

##### UNGUARDED MACHINERY CAN CAUSE SERIOUS INJURY

- Do not use this controller and related software on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

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

The M218 controller and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on the factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only the user can be aware of all the conditions and factors present during the setup, operation, and maintenance of the machine; therefore, only the user can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, the user should refer to the applicable local and national standards and regulations.

In some applications, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas where serious injury can occur. The M218 controller and related software products alone cannot protect an operator from injury. For this reason, this equipment cannot be substituted for or take the place of point-of-operation protection. Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

#### 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 and secured by a keyed or tooling locking mechanism.
- 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 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:** Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of this document, and are generally not included in any wiring diagrams, installation examples, application examples, programming examples, or other representations that may be included in this and other related documents.

## Start-Up and Test

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that the arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

### CAUTION

#### EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

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

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Verify that the completed system is free from all short-circuit and grounds, except those grounds installed according to local and national regulations. If high-potential voltage testing is necessary, follow recommendations in equipment documentation to help prevent accidental equipment damage or injury.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove ground from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

## Operation and Adjustments

There are hazards that can be encountered if this equipment is improperly operated or adjusted, regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components. It may be possible to mis-adjust this equipment and thereby producing unintended consequences. Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics or machine behavior. Restrict access to such adjustments only to qualified personnel familiar with the machinery used and the instructions of the equipment manufacturers for all of the electrical equipment employed. Use the instructions from the manufacturers as a guide for functional, electrical, or other like adjustments.

## Installation Requirement

### Before Starting

Read and understand this chapter before beginning the installation of your TM218 system.

### 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

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.**

### 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 and secured by a keyed or toolled locking mechanism.
- 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 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.**

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

Install and operate this equipment according to the environmental conditions described in this document, unless the equipment is otherwise designated as functional safety equipment and conforming to applicable regulations and standards.

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

## Environmental Characteristics

### Enclosure Requirements

TM218 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 TM218 system components meet European Community (CE) requirements for open equipment as defined by EN61131-2. 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 TM218 system. Use enclosures with a keyed locking mechanism to minimize unauthorized access.

### Environmental Characteristics

This equipment meets CE requirements as indicated in the table below. This equipment is intended for use in a Pollution Degree 2 industrial environment.

The table below gives the general environmental characteristics:

| Characteristic                                                                                                                                                              | Specification           |                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| This product is compliant with Europe RoHS recommendations and China RoHS regulations.<br> |                         |                                                                                                                                     |
| Standard compliance                                                                                                                                                         | IEC61131-2              |                                                                                                                                     |
| Ambient operating temperature                                                                                                                                               | Horizontal installation | 0...55 °C (32...131 °F)                                                                                                             |
| Storage temperature                                                                                                                                                         |                         | - 25...70 °C (- 13...158 °F)                                                                                                        |
| Relative humidity                                                                                                                                                           |                         | 5...95% (non-condensing)                                                                                                            |
| Degree of pollution                                                                                                                                                         | IEC60664                | 2                                                                                                                                   |
| Degree of protection                                                                                                                                                        | IEC61131-2              | IP20 with protective covers in place                                                                                                |
| Corrosion immunity                                                                                                                                                          |                         | No                                                                                                                                  |
| Operating altitude                                                                                                                                                          |                         | 0...2000 m (0...6,560 ft)                                                                                                           |
| Storage altitude                                                                                                                                                            |                         | 0...3000 m (0...9,843 ft)                                                                                                           |
| Vibration resistance                                                                                                                                                        | Mounted on a DIN rail   | 3.5 mm (0.138 in.) fixed amplitude from 5...8.4 Hz<br>9.8 m/s <sup>2</sup> (1 g <sub>n</sub> ) fixed acceleration from 8.4...150 Hz |
|                                                                                                                                                                             | Mounted on a panel      | 10 mm (0.394 in.) fixed amplitude from 5...8.6 Hz<br>29.4 m/s <sup>2</sup> (3 g <sub>n</sub> ) fixed acceleration from 8.6...150 Hz |
| Mechanical shock resistance                                                                                                                                                 | Mounted on a DIN rail   | 147 m/s <sup>2</sup> (15 g <sub>n</sub> ) for a duration of 11 ms                                                                   |
|                                                                                                                                                                             | Mounted on a panel      | 294 m/s <sup>2</sup> (30 g <sub>n</sub> ) for a duration of 11 ms                                                                   |
| Connection type                                                                                                                                                             |                         | Removable screw terminal block                                                                                                      |
| Connector insertion/removal cycles                                                                                                                                          |                         | 50                                                                                                                                  |
| Controller RTC Battery Type ( <i>see page 45</i> )                                                                                                                          |                         | Lithium thionyl chloride, TSX PLP1 (replaceable)                                                                                    |

## Electromagnetic Susceptibility

The TM218 system meets electromagnetic susceptibility specifications as indicated in the table below:

| Characteristic                                                         | Specification          | Range                                                                                                                                                                           |
|------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electrostatic discharge                                                | IEC/EN 61000-4-2       | 9 kV (air discharge)<br>7 kV (contact discharge)                                                                                                                                |
| Electromagnetic fields                                                 | IEC/EN 61000-4-3       | 10 V/m (80 MHz...3 GHz)                                                                                                                                                         |
| Fast transients burst                                                  | IEC/EN 61000-4-4       | Power lines: 4 kV<br>Relay Outputs: 2 kV<br>Inputs and Static Outputs (DC): 1.5 kV<br>Ethernet line: 1.5 kV<br>Com1 and Com2 line: 1.5 kV                                       |
| Surge immunity                                                         | IEC/EN 61000-4-5       | Power Supply: CM: 2.2kV /; DM: 1.1 kV<br>AC IO: CM: 2.2kV; DM: 1.1 kV<br>DC IO: CM: 1.1kV; DM: 0.5 kV<br>Shielded cable: 1.1 kV<br>CM = Common Drive<br>DM = Differential Drive |
| Immunity to conducted disturbances, induced by radio- frequency fields | IEC/EN 61000-4-6       | 3 V <sub>eff</sub> (0.15...80 MHz)                                                                                                                                              |
| Conducted emission                                                     | EN 55011 (IEC/CISPR11) | 150...500 kHz, quasi peak 79 dB $\mu$ V                                                                                                                                         |
|                                                                        |                        | 500 kHz...30 MHz, quasi peak 73 dB $\mu$ V                                                                                                                                      |
| Radiated emission                                                      | EN 55011 (IEC/CISPR11) | 30...230 MHz, 10 m@40 dB $\mu$ V/m quasi peak                                                                                                                                   |
|                                                                        |                        | 230 MHz...1 GHz, 10 m@47 dB $\mu$ V/m quasi peak                                                                                                                                |

## Wiring Rules and Recommendations

### Overview

This section describes the wiring guidelines and associated best practices to be respected when using the TM218 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 TM218 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 (highly recommended).
- Use twisted-pair, shielded cables for analog, and/or fast I/O.
- Use twisted-pair, shielded cables for networks, and field bus.

#### WARNING

##### UNINTENDED EQUIPMENT OPERATION

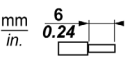
- Use shielded cables for all input, output and communication types specified above.
- Properly ground the cable shields as indicated in the related documentation.
- Route communications and I/O cables separately from power cables.

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

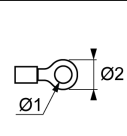
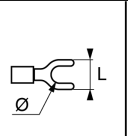
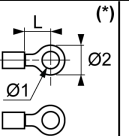
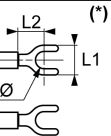
For more details, refer to Grounding Shielded Cables ([see page 38](#)).

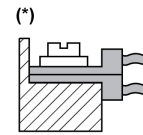
## Rules for Removable Screw Terminal Block

The following tables show the cable types and wire sizes for a removable screw terminal block (I/Os and Power Supply):

|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|  |  |  |  |  |  |  |
| mm<br>in.                                                                         | 6<br>0.24                                                                         |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| mm <sup>2</sup>                                                                   | 0.33...1.5                                                                        | 0.33...1.5                                                                        | 0.33...1                                                                          | 0.33...1.5                                                                        | 0.33...1                                                                          | 0.5...1.5                                                                         |
| AWG                                                                               | 22...14                                                                           | 22...14                                                                           | 22...16                                                                           | 22...14                                                                           | 22...16                                                                           | 20...14                                                                           |

|                                                                                   |                                                                                   |       |      |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------|------|
|  |  | N•m   | 0.5  |
| Ø 3,5 mm (0.14 in.)                                                               |                                                                                   | lb-in | 4.43 |

|     |  |        |  |        |  (*) |        |        |  (*) |        |        |
|-----|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|--------|---------------------------------------------------------------------------------------|--------|--------|----------------------------------------------------------------------------------------|--------|--------|
|     | Ø1                                                                                | Ø2     | Ø                                                                                 | L      | Ø1                                                                                    | Ø2     | L      | Ø                                                                                      | L1     | L2     |
| mm  | 3.2                                                                               | ≤ 6.2  | 3.2                                                                               | ≤ 6.2  | 3.2                                                                                   | ≤ 6.2  | ≥ 6.3  | 3.2                                                                                    | ≤ 6.2  | ≥ 6.3  |
| in. | 0.13                                                                              | ≤ 0.24 | 0.13                                                                              | ≤ 0.24 | 0.13                                                                                  | ≤ 0.24 | ≥ 0.25 | 0.13                                                                                   | ≤ 0.24 | ≥ 0.25 |



The use of copper conductors is highly recommended.

### ! DANGER

#### LOOSE WIRING CAUSES ELECTRIC SHOCK

- Be sure to 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 (4 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.**

### 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.

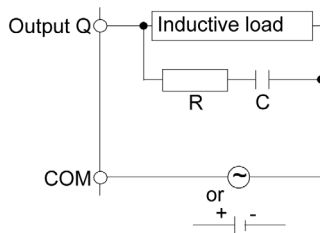
#### ⚠ WARNING

##### 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.

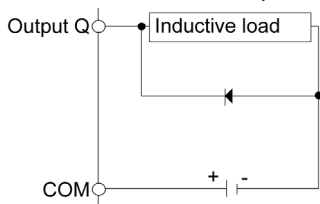
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

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



- C represents a value from 0.1 to 1  $\mu\text{F}$ .
- R represents a resistor of approximately the same resistance value as the load.

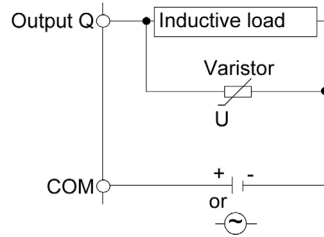
**Protective circuit B:** this protection circuit can be used for DC load power circuits.



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 of the varistor exceeds the peak load energy by 20% or more.

## Grounding the TM218 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) is connected to the conductive backplane by a heavy-duty wire, usually a braided copper cable with the maximum allowable cable section ([see page 35](#)).

### Functional Ground (FE) on the DIN Rail

The DIN Rail for your TM218 system is common with the functional ground (FE) plane and must be mounted on a conductive backplane.

#### WARNING

##### UNINTENDED EQUIPMENT OPERATION

Connect the DIN rail to the functional ground (FE) of your installation.

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

### Shielded Cable 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 M218 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 TM2 XMTGB Grounding Bar to provide a protective ground (PE).
- Use the TM2 XMTGB Grounding Bar 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 following cables must be connected to the protective ground (PE):

- Ethernet
- Modbus

#### **⚠ DANGER**

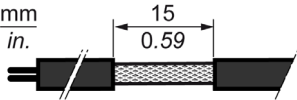
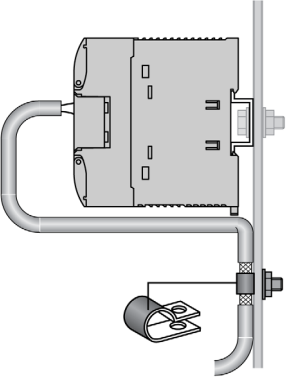
##### **ELECTRIC SHOCK**

Make sure that Modbus cables are securely connected to the protective ground (PE).

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

### Protective Ground (PE) Cable Shielding

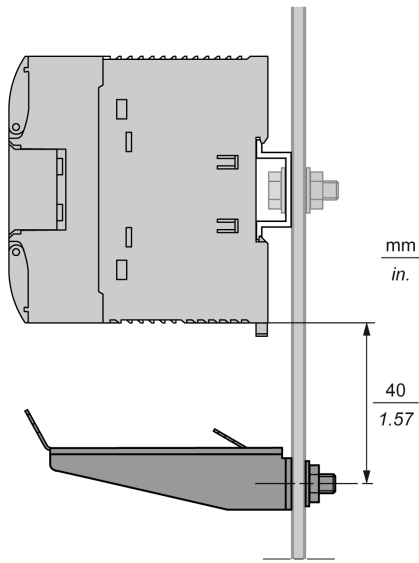
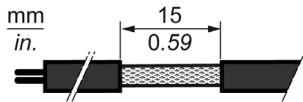
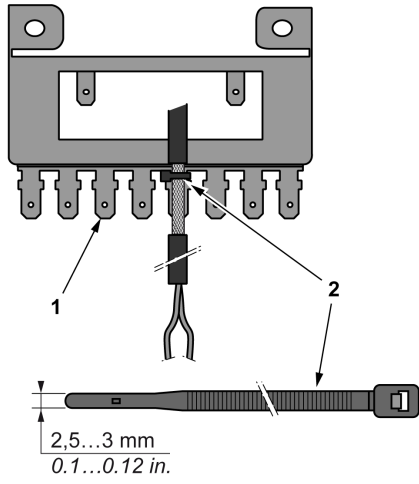
To ground the shield of a cable through a grounding clamp:

| 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 TM218 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 directly on the conductive backplane below the TM218 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 TM2 XMTGB Grounding Bar for Functional Ground (FE) connections.

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# Chapter 3

## M218 Description

---

### Overview

This chapter describes the Modicon M218 Logic Controller features.

### What Is in This Chapter?

This chapter contains the following sections:

| Section | Topic                          | Page |
|---------|--------------------------------|------|
| 3.1     | M218 Controller Features       | 42   |
| 3.2     | M218 Controller I/O Management | 47   |

## Section 3.1

### M218 Controller Features

---

#### What Is in This Section?

This section contains the following topics:

| Topic                                          | Page |
|------------------------------------------------|------|
| Modicon M218 Logic Controller Devices Overview | 43   |
| Real Time Clock (RTC)                          | 45   |

## Modicon M218 Logic Controller Devices Overview

### Overview

The Schneider Electric Modicon M218 Logic Controller has a variety of powerful features. This Controller can service a wide range of applications.

The software configuration and programming is accomplished with the EcoStruxure Machine Expert software, and is described in the EcoStruxure Machine Expert Programming Guide (*see EcoStruxure Machine Expert, Programming Guide*).

### Key Features

#### Programming languages

The Modicon M218 Logic Controller is supported and programmed with the EcoStruxure Machine Expert software, which supports the following IEC61131-3 programming languages:

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

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

#### Power Supply (*see page 69*)

The power supply of the Modicon M218 Logic Controller is either: 24 Vdc or 100...240 Vac, depending on the controller model.

#### Real Time Clock (*see page 45*)

The Modicon M218 Logic Controller includes a Real Time Clock (RTC) system (*see page 45*).

#### Run/Stop Switch (*see page 50*)

1 Run/Stop switch is integrated on each controller to toggle its state.

#### Memory

The table below describes the different types of memory:

| Memory type | Size     | Used                                                      |
|-------------|----------|-----------------------------------------------------------|
| RAM         | 1 Mbytes | To execute the application.                               |
| Flash       | 1 Mbytes | To save program and data in case of a power interruption. |

#### Embedded Input/Output

The following embedded I/O types are available, depending on the controller model (*see page 44*):

- Regular input
- Fast input (HSC)
- Regular output
- Fast output (PTO/PWM/FG)
- Analog input
- Analog output

#### Embedded Communication features

3 types of communication ports are available on the front panel, depending on the controller model (*see page 44*):

- Ethernet Port (for TM218LDAE24DRHN and TM218LDAE40DRPHN)
- USB Programming Port
- 2 Serial Link Port

For more details, refer to the chapter Integrated Communication Ports (*see page 221*).

## Modicon M218 Logic Controller Range

| Reference                                                                                                                                                                                                                                                                                                                                                                                                                               | Digital Input                                                  | Digital Output                                                           | Analog Input    | Analog Output       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------|-----------------|---------------------|
| TM218LDA16DRN<br>(see page 73)                                                                                                                                                                                                                                                                                                                                                                                                          | 7 regular inputs<br>and 2 fast inputs<br>(HSC) <sup>(1)</sup>  | 7 relay outputs                                                          | No              | No                  |
| TM218LDA24DRN<br>(see page 83)                                                                                                                                                                                                                                                                                                                                                                                                          | 12 regular inputs<br>and 2 fast inputs<br>(HSC) <sup>(1)</sup> | 10 relay outputs                                                         | No              | No                  |
| TM218LDA24DRHN<br>(see page 91)                                                                                                                                                                                                                                                                                                                                                                                                         | 10 regular inputs<br>and 4 fast inputs<br>(HSC) <sup>(2)</sup> | 10 relay outputs                                                         | No              | No                  |
| TM218LDD24DUPHN<br>(see page 101)                                                                                                                                                                                                                                                                                                                                                                                                       | 10 regular inputs<br>and 4 fast inputs<br>(HSC) <sup>(2)</sup> | 6 regular outputs<br>and 4 fast outputs<br>(PTO/PWM/FG) <sup>(3)</sup>   | No              | No                  |
| TM218LDAE24DRHN<br>(see page 113)                                                                                                                                                                                                                                                                                                                                                                                                       | 10 regular inputs<br>and 4 fast inputs<br>(HSC) <sup>(2)</sup> | 10 relay outputs                                                         | No              | No                  |
| TM218LDA40DRN<br>(see page 123)                                                                                                                                                                                                                                                                                                                                                                                                         | 22 regular inputs<br>and 2 fast inputs<br>(HSC) <sup>(1)</sup> | 16 relay outputs                                                         | No              | No                  |
| TM218LDA40DRPHN<br>(see page 131)                                                                                                                                                                                                                                                                                                                                                                                                       | 20 regular inputs<br>and 4 fast inputs<br>(HSC) <sup>(2)</sup> | 12 relay outputs<br>and 4 fast outputs<br>(PTO/PWM/FG) <sup>(3)</sup>    | No              | No                  |
| TM218LDD40DUPHNB<br>(see page 143)                                                                                                                                                                                                                                                                                                                                                                                                      | 20 regular inputs<br>and 4 fast inputs<br>(HSC) <sup>(2)</sup> | 12 regular outputs,<br>and 4 fast outputs<br>(PTO/PWM/FG) <sup>(3)</sup> | No              | No                  |
| TM218LDAE40DRPHN<br>(see page 155)                                                                                                                                                                                                                                                                                                                                                                                                      | 20 regular inputs<br>and 4 fast inputs<br>(HSC) <sup>(2)</sup> | 12 relay outputs<br>and 4 fast outputs<br>(PTO/PWM/FG) <sup>(3)</sup>    | No              | No                  |
| TM218LDA40DR2HN<br>(see page 167)                                                                                                                                                                                                                                                                                                                                                                                                       | 20 regular inputs<br>and 4 fast inputs<br>(HSC) <sup>(2)</sup> | 16 relay outputs                                                         | No              | 2 analog<br>outputs |
| TM218LDA40DR4PHN<br>(see page 179)                                                                                                                                                                                                                                                                                                                                                                                                      | 20 regular inputs<br>and 4 fast inputs<br>(HSC) <sup>(2)</sup> | 12 relay outputs<br>and 4 fast outputs<br>(PTO/PWM/FG) <sup>(3)</sup>    | 2 analog inputs | 2 analog<br>outputs |
| TM218LDA60DRN<br>(see page 195)                                                                                                                                                                                                                                                                                                                                                                                                         | 34 regular inputs<br>and 2 fast inputs<br>(HSC) <sup>(1)</sup> | 24 relay outputs                                                         | No              | No                  |
| <p>(1) The reduced fast inputs have a maximum frequency of 10 kHz. They can be used either as regular inputs or as reduced fast inputs for counting.</p> <p>(2) The fast inputs can be used either as regular inputs or as fast inputs for counting or event functions.</p> <p>(3) The fast outputs can be used either as regular outputs or as fast outputs for PTO, PWM, Frequency Generator functions, or reflex output for HSC.</p> |                                                                |                                                                          |                 |                     |

## Real Time Clock (RTC)

### Overview

The M218 controllers include 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 indicates if the battery is depleted or absent.

The table below 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) |

### RTC Battery

The controller has one RTC battery (to be ordered separately).

In the event of a power interruption, the backup battery retains the time for the controller.

The table below shows the characteristics of the RTC battery:

|                                    |                                                                                        |
|------------------------------------|----------------------------------------------------------------------------------------|
| <b>Use</b>                         | In the event of a transient power outage, the battery powers the RTC.                  |
| <b>Backup Time</b>                 | At least 1.5 years at 45 °C max (113 °F). At higher temperatures, the time is reduced. |
| <b>Battery Monitoring Features</b> | Yes                                                                                    |
| <b>Replaceable</b>                 | Yes                                                                                    |
| <b>Controller RTC Battery Type</b> | Lithium thionyl chloride type, TSX PLP1                                                |

## Installing and Replacing the RTC 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**

Follow all the instructions of the battery manufacturer.

- 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 RTC battery with identical type (Lithium thionyl chloride type, TSX PLP1), follow these steps:

| Step | Action                                                                                                                                                                                                         |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Power off your controller.                                                                                                                                                                                     |
| 2    | Slide out the battery holder of the controller: <div> </div>                                                                                                   |
| 3    | Remove the battery from the battery holder.                                                                                                                                                                    |
| 4    | Insert the new battery into the battery holder in accordance with the polarity markings on the battery.                                                                                                        |
| 5    | Replace the battery holder on the controller and verify that the latch clicks into place.                                                                                                                      |
| 6    | Power up your Modicon M218 Logic Controller.                                                                                                                                                                   |
| 7    | Set the internal clock. For further details on the internal clock, please refer to M218 RTC Library (see <i>Modicon M218 Logic Controller, System Functions and Variables, M218 PLCSystem Library Guide</i> ). |

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## Section 3.2

### M218 Controller I/O Management

---

#### What Is in This Section?

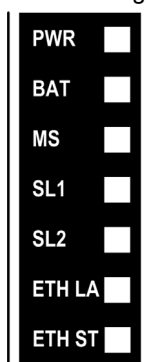
This section contains the following topics:

| Topic                          | Page |
|--------------------------------|------|
| System and I/O Diagnostic LEDs | 48   |
| Run/Stop Switch                | 50   |
| Input Management               | 51   |
| Output Management              | 53   |

## System and I/O Diagnostic LEDs

### System LED Display

The following illustration shows the system LEDs on the front panel display:



**NOTE:** Ethernet LEDs **ETH LA** and **ETH ST** are present only on the system LED display of the TM218LDAE24DRHN and TM218LDAE40DRPHN controllers.

### System LED Description

The table below describes the status of the system LEDs for the M218 controllers:

| Label  | Function type | Color     | Status                          | Description                                                   |                        |                       |
|--------|---------------|-----------|---------------------------------|---------------------------------------------------------------|------------------------|-----------------------|
|        |               |           |                                 | States <sup>1</sup>                                           | Prg port communication | Application execution |
| PWR    | Power         | Green     | On                              | Indicates that power is applied.                              |                        |                       |
|        |               |           | Off                             | Indicates that power is removed.                              |                        |                       |
| BAT    | Battery       | Red       | On                              | Indicates that the RTC battery needs to be replaced.          |                        |                       |
|        |               |           | Flashing                        | Indicates that the battery charge is low.                     |                        |                       |
| MS     | Main status   | Green/Red | Flashing green/Red              | BOOTING                                                       | NO                     | NO                    |
|        |               |           | Red flash                       | INVALID OS                                                    | Restricted             | NO                    |
|        |               |           | 1 green flash                   | No application                                                | Yes                    | NO                    |
|        |               |           | Green on                        | RUNNING                                                       | Yes                    | Yes                   |
|        |               |           | 3 green flashes                 | RUNNING with breakpoint                                       | Yes                    | Restricted            |
|        |               |           | Flashing green                  | STOPPED                                                       | Yes                    | NO                    |
|        |               |           | Rapid flashing red              | Event state HALT with detection of an application error       | Yes                    | NO                    |
|        |               |           | Red on                          | Internal error detected                                       | NO                     | NO                    |
|        |               |           | Off                             | Power removed                                                 | NO                     | NO                    |
|        |               |           | Green with 1 red flashing       | RUNNING with detection of an external error                   | Yes                    | Yes                   |
|        |               |           | Flashing green with 1 red flash | STOPPED with detection of an external error                   | Yes                    | NO                    |
| SL1    | Serial link 1 | -         | -                               | Indicates the status of Serial link 1 ( <i>see page 225</i> ) |                        |                       |
| SL2    | Serial link 2 | -         | -                               | Indicates the status of Serial link 2 ( <i>see page 227</i> ) |                        |                       |
| ETH LA | ETH activity  | -         | -                               | Indicates the status of Ethernet ( <i>see page 222</i> )      |                        |                       |
| ETH ST | ETH status    | -         | -                               |                                                               |                        |                       |

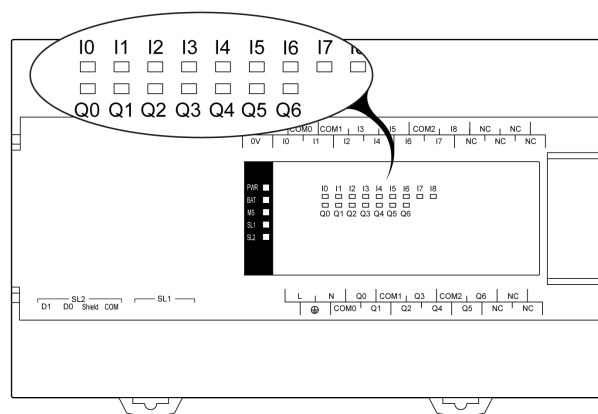
<sup>1</sup> For more information about the controller state description, refer to the programming guide (*see Modicon M218 Logic Controller, Programming Guide*).

## I/O LEDs

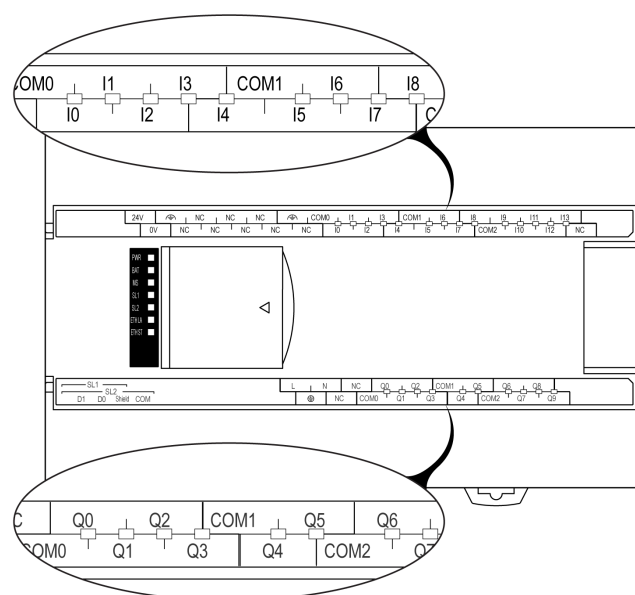
Depending on the M218 controller model, I/O LEDs are located:

- on the center of the controller's front panel, or
- within the I/O terminal block labels of the controller

The illustration below shows the front panel center location of the I/O status LEDs:



The illustration below shows the I/O terminal block label location of the I/O status LEDs:



## I/O LED Description

For each input and output, the LED displays the status of the I/O, not the frequency of the I/O signal:

| Function Type  | Color | Status | Description                                   |
|----------------|-------|--------|-----------------------------------------------|
| Digital input  | Green | On     | Indicates that the input state is active      |
|                |       | Off    | Indicates that the input state is not active  |
| Digital output | Green | On     | Indicates that the output state is active     |
|                |       | Off    | Indicates that the output state is not active |

**NOTE:** If the frequency of the digital output used as a PTO is less than 46 Hz, the corresponding output LED will be off.

## Run/Stop Switch

### Run/Stop Switch

The Modicon M218 Logic Controller can be operated externally by the following:

- a Hardware Run/Stop switch
- a Run/Stop operation by a dedicated input, defined in the software configuration
- a EcoStruxure Machine Expert Software command

The Modicon M218 Logic Controller has a Run/Stop hardware switch, which puts the controller state to the Run or Stop mode.

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

| Run/Stop input         | Switch on Run                                     | Switch on Stop |
|------------------------|---------------------------------------------------|----------------|
| Not configured         | Run (unless a stop command is issued by software) | Stop           |
| Configured and logic 1 | Run (unless a stop command is issued by software) | Stop           |
| Configured and logic 0 | Stop                                              | Stop           |

### 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.**

## Input Management

### Overview

The Modicon M218 Logic Controller features digital inputs, including 4 fast inputs, except the references below which have 2 fast inputs:

- TM218LDA16DRN
- TM218LDA24DRN
- TM218LDA40DRN
- TM218LDA60DRN

The following functions are configurable on standard and/or fast inputs:

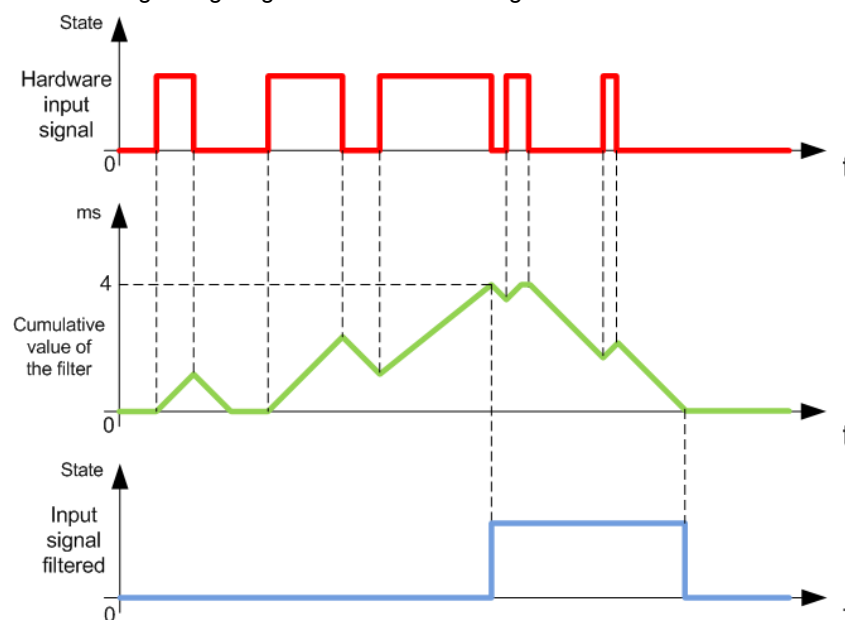
- Filters (depends on the function associated with the input).
- 4 fast inputs can be either latched or used for events (rising edge, falling edge, or both) and thus be linked to an external task.
- Any input can be used for the RUN/STOP function.
- Some of the inputs can be used by HSC, PTO, PWM, and FG functions.

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

### Integrator Filter Principle

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

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

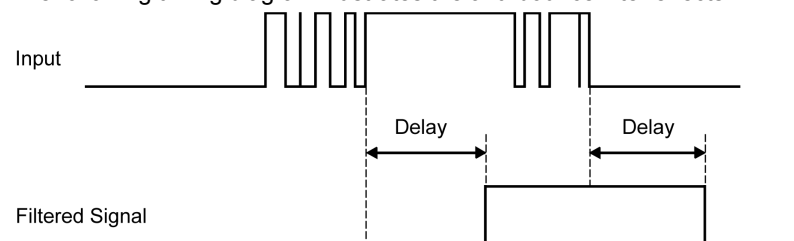


**NOTE:** The value selected for the filters time parameter specifies the cumulative time in ms that must elapse before the input can be 1.

### 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 sudden changes of input levels caused by noise. The bounce filter is only available on the fast inputs.

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



## Bounce Filter Availability

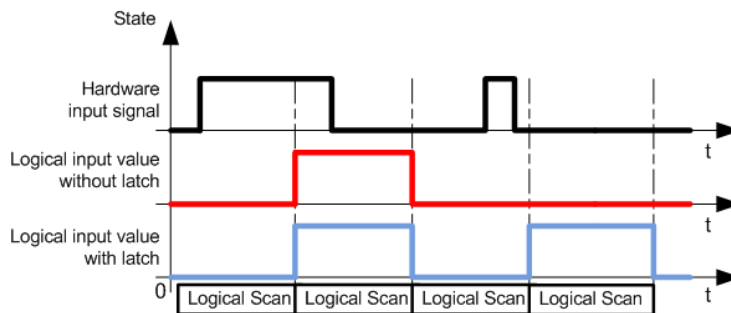
The bounce filter can be used on a fast input when:

- Using a latch or event
- No HSC is enabled

## Latching

Latching is a function that can be assigned to the Modicon M218 Logic Controller fast inputs. This function is used to memorize (or latch) any pulse with a duration that is less than the Modicon M218 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 with the I/O configuration display in EcoStruxure Machine Expert.

The following timing diagram illustrates the latching effects:



## Event

An input configured for Event can be associated with an External Task (see *Modicon M218 Logic Controller, Programming Guide*).

## RUN/STOP

The RUN/STOP function is used to start or stop a program using an input:

- When the configured RUN/STOP input is at logic 0, the controller is put into a STOP state and any outside command to enter the RUN state is ignored.
- A rising edge (passing from 0 to 1) of the RUN/STOP input provokes automatically a start-up of the application as the controller enters a RUN state.
- When the configured RUN/STOP input is at logic 1, then the controller program is running unless otherwise commanded by EcoStruxure Machine Expert (RUN/STOP commands from EcoStruxure Machine Expert are allowed).

## ⚠ 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.**

For more information, refer to Embedded I/O configuration (see *Modicon M218 Logic Controller, Programming Guide*).

## Output Management

### Introduction

The Modicon M218 Logic Controller features regular outputs and fast outputs (PTO/PWM/FG).

The following output functions are configurable on transistor outputs:

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

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

### Fast Output Management Availability

The information below refers to all M218 logic controllers with fast outputs except TM218LDD24DUPHN and TM218LDD40DUPHNB:

| Function       |    | HSC                 |                     | PTO/PWM/FG   |              |
|----------------|----|---------------------|---------------------|--------------|--------------|
| Channel Number |    | 0                   | 1                   | 0            | 1            |
| Regular Output | Q0 | HSC0 reflex output0 | –                   | PTO0 Output0 | –            |
|                | Q1 | HSC0 reflex output1 | –                   | PTO0 Output1 | –            |
|                | Q2 | –                   | HSC2 reflex output0 | –            | PTO1 Output0 |
|                | Q3 | –                   | HSC2 reflex output1 | –            | PTO1 Output1 |

**NOTE:** If a fast output is configured for a specific function, it cannot be used for any other function.

The information below refers to the TM218LDD24DUPHN and TM218LDD40DUPHNB references:

| Function       |    | HSC                 |                     | PTO          |              |
|----------------|----|---------------------|---------------------|--------------|--------------|
| Channel Number |    | 0                   | 1                   | 0            | 1            |
| Regular Output | Q0 | –                   | –                   | PTO0 Output0 | –            |
|                | Q1 | –                   | –                   | PTO0 Output1 | –            |
|                | Q2 | –                   | –                   | –            | PTO1 Output0 |
|                | Q3 | –                   | –                   | –            | PTO1 Output1 |
|                | Q4 | HSC0 reflex output0 | –                   | –            | –            |
|                | Q5 | HSC0 reflex output1 | –                   | –            | –            |
|                | Q6 | –                   | HSC2 reflex output0 | –            | –            |
|                | Q7 | –                   | HSC2 reflex output1 | –            | –            |

For TM218LDD24DUPHN and TM218LDD40DUPHNB, the HSC reflex output change to (Q4-Q7), allows customers to use PTO and HSC reflex output at same time in application.

**NOTE:** If a fast output is not configured for a specific function, the output is a regular output by default.

### Fallback Modes (Behaviour 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 the fallback values. Two modes are available:

**Set all outputs to default:** Each output is set to the configured default value, either 0 or 1 (initially set to 0 in the configuration).

**Keep current values:** Each output remains in its current state.

The fallback settings that may be configured (fallback to 0, fallback to 1, or fallback to the current state) do not apply to outputs Q0, Q1, Q2 or Q3 if these outputs are configured for PTO, PWM, FG, or HSC operation. If an error is detected and results in the controller entering a fallback state, these outputs will assume a value of 0 regardless of the configured fallback setting.

## WARNING

### UNINTENDED EQUIPMENT OPERATION

Design and program your system so that controlled equipment assumes a safe state when the controller enters a fallback state if you use outputs Q0, Q1, Q2, or Q3 for PTO, PWM, FG, or HSC operation.

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

### NOTE:

- Fallback configuration for outputs does not apply when outputs Q0, Q1, Q2, and Q3 are used for PTO, PWM, FG or HSC operation. In these cases fallback value is always 0.
- In case of fallback for PTO operation, any ongoing move is aborted and ramp-down to 0 (controlled stop feature).

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

Some controllers only contain Category 2 relay outputs. See the information concerning your specific reference:

- TM218LDA16DRN
- TM218LDA24DRN
- TM218LDA24DRHN
- TM218LDAE24DRHN
- TM218LDA40DRN
- TM218LDA40DRPHN
- TM218LDAE40DRPHN
- TM218LDA40DR2HN
- TM218LDA40DR4PHN
- TM218LDA60DRN

There is a short-circuit protection for Category 1 from outputs to V-, however there is no other short-circuit protection on the outputs.

For TM218LDA\*\*\*PHN, in the case of short-circuit or over-current on outputs, there are different considerations for the 2 categories of outputs:

- Category 1 (Q0 to Q3): 4 fast outputs
- Category 2 (Q4 to Q9 or Q15): 6 or 12 relay outputs

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

| If...                                               | then...                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| you have short-circuit at 0 V on category 1         | the category 1 automatically goes into thermal protection mode (all fast, PWM or FG outputs set to 0; PTO outputs run an emergency stop deceleration) and are then periodically rearmed every 1 second to test the connection state (see warning below). For more information, refer to fast output wiring diagram. |
| you have short-circuit at 24 V on category 1        | no action is taken and the short-circuit can result in equipment damage (see warning below).                                                                                                                                                                                                                        |
| you have short-circuit at 0 V or 24 V on category 2 | no action is taken and no error is detectable.                                                                                                                                                                                                                                                                      |

For TM218LDD24DUPHN, in the case of short-circuit or over-current on outputs, there are different considerations for the 3 categories of outputs:

- Category 1 (Q0 to Q3): 4 fast outputs
- Category 2 (Q4 to Q7): 4 regular outputs
- Category 3 (Q8 to Q9): 2 regular outputs

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

| If...                                               | then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| you have short-circuit at 0 V or 24 V on category 1 | the category 1 automatically goes into thermal protection mode (all fast, PWM or FG outputs set to <b>predetermined state (1)</b> ; PTO outputs run an emergency stop deceleration) and are then periodically rearmed every 1 second to test the connection state (see warning below).<br>For more information, refer to fast output wiring diagram ( <a href="#">see page 112</a> ).<br><b>(1) Either 0 or 1 depending on the wiring logic (sink or source) of the output group</b> |
| you have short-circuit at 24 V on category 2 or 3   | the impacted category automatically goes into protection mode (all outputs to 0) and then the category is periodically rearmed every 10 seconds to test the connection state.<br>For more information, refer to regular output wiring diagram ( <a href="#">see page 110</a> ).                                                                                                                                                                                                      |
| you have short-circuit at 0 V on category 2 or 3    | no action is taken, however, no damage to the equipment is possible.                                                                                                                                                                                                                                                                                                                                                                                                                 |

For TM218LDD40DUPHNB, in the case of short-circuit or over-current on outputs, there are different considerations for the 4 categories of outputs:

- Category 1 (Q0 to Q3): 4 fast outputs
- Category 2 (Q4 to Q7): 4 regular outputs
- Category 3 (Q8 to Q11): 4 regular outputs
- Category 4 (Q12 to Q15): 4 regular outputs

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

| If...                                                | then...                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| you have short-circuit at 0 V or 24 V on category 1  | the category 1 automatically goes into thermal protection mode (all fast, PWM or FG outputs set to <b>predetermined state (1)</b> ; PTO outputs run an emergency stop deceleration) and are then periodically rearmed every 1 second to test the connection state (see warning below).<br>For more information, refer to fast output wiring diagram ( <a href="#">see page 154</a> ).<br><b>(1) Either 0 or 1 depending on the wiring logic (sink or source) of the output group</b> |
| you have short-circuit at 24 V on category 2, 3 or 4 | the impacted category automatically goes into protection mode (all outputs to 0) and then the category is periodically rearmed every 10 seconds to test the connection state (see warning below).<br>For more information, refer to regular output wiring diagram ( <a href="#">see page 152</a> ).                                                                                                                                                                                  |
| you have short-circuit at 0 V on category 2, 3 or 4  | no action is taken, however, no damage to the equipment is possible.                                                                                                                                                                                                                                                                                                                                                                                                                 |

**NOTE:** The information in the tables above does not apply to relay outputs.

For more information on protecting outputs, refer to your controller wiring diagram and to the general wiring rules ([see page 36](#)).

**NOTE:** The short-circuit diagnostic for each category is provided by the function `GetshortcutStatus` (see *Modicon M218 Logic Controller, System Functions and Variables, M218 PLC System Library Guide*).

## ! 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. For this controller, use the `GetshortcutStatus` function to force the category of outputs to remain at 0 (OFF).

The outputs of this equipment do not have built-in reverse polarity protection. Incorrectly connecting polarity can permanently damage the output circuits or otherwise result in unintended operation of the equipment.

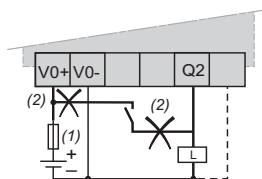
## NOTICE

### DAMAGE TO FAST OUTPUTS

- Ensure the use of adequate protection against short-circuits on the power supply to the fast outputs.
- Do not connect positive voltage to any of the DC fast output terminals.
- Comply with the wiring diagrams immediately that follow this message.

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

Example of incorrect wiring on Q2:



- 1 2 A fast-blow fuse
- 2 Incorrect wiring

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.

## ! WARNING

### INOPERABLE OUTPUTS

Use appropriate, external safety interlocks on outputs where personnel and/or equipment hazards exist.

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

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## Chapter 4

### M218 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 |
|---------|------------------------------|------|
| 4.1     | M218 Mechanical Requirements | 58   |
| 4.2     | M218 Electrical Requirements | 67   |

## Section 4.1

### M218 Mechanical Requirements

---

#### What Is in This Section?

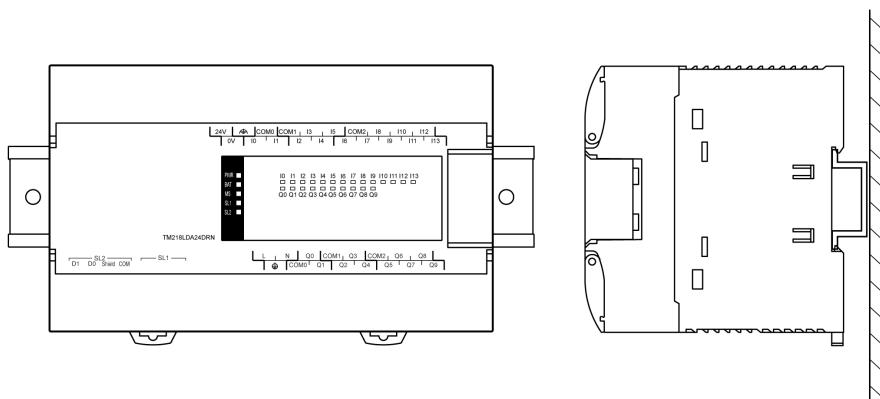
This section contains the following topics:

| Topic                                                  | Page |
|--------------------------------------------------------|------|
| Mounting Positions                                     | 59   |
| Minimum Clearances                                     | 60   |
| Top Hat Section Rail (DIN rail)                        | 61   |
| Installing and Removing the Controller with Expansions | 64   |
| Mounting on a Metallic Panel                           | 66   |

## Mounting Positions

### Correct Mounting Position

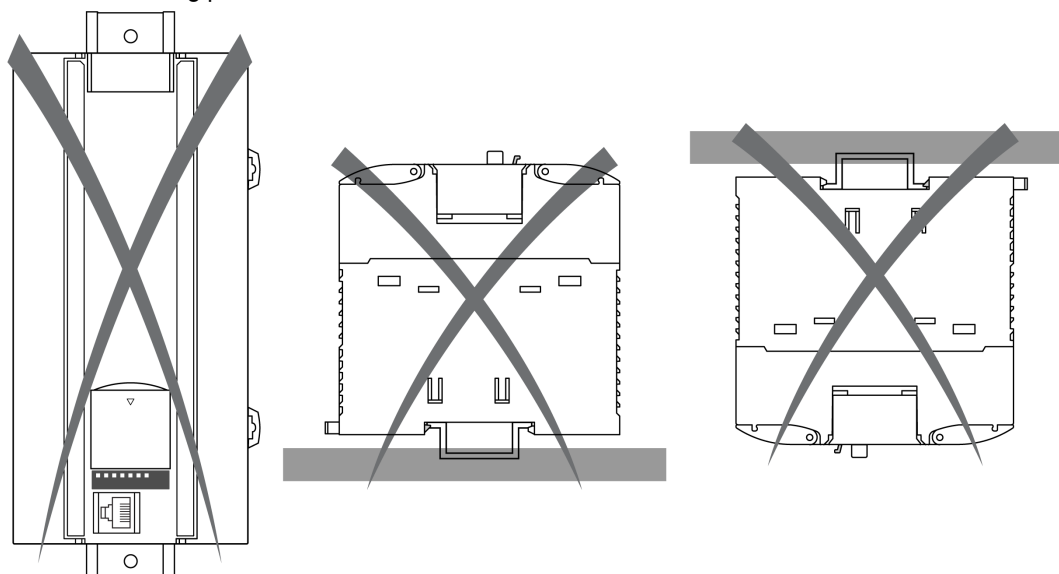
The Modicon M218 Logic Controller must be mounted horizontally on a vertical plane as shown in the illustration below:



**NOTE:** Keep adequate spacing for proper ventilation to maintain an ambient temperature between 0 °C (32 °F) and 55 °C (131 °F). See Minimum Clearances ([see page 60](#)).

### Incorrect Mounting Position

The Modicon M218 Logic Controller should only be positioned as shown in the Correct Mounting Position illustration to help ensure an adequate air flow through the product. The illustrations below show the incorrect mounting positions:



## Minimum Clearances

### 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.**

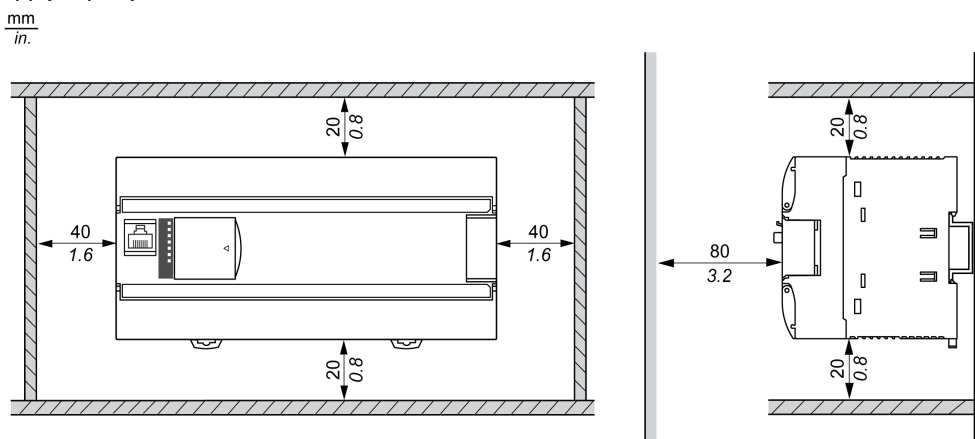
**NOTE:** Keep adequate spacing for proper ventilation and to maintain an ambient temperature between 0 °C (32 °F) and 55 °C (131 °F).

The Modicon M218 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 Modicon M218 Logic Controller and all sides of the cabinet (including the panel door).
- The Modicon M218 Logic Controller terminal blocks and the wiring ducts. This distance reduces electromagnetic interference between the controller and the wiring ducts.
- The Modicon M218 Logic Controller and other heat generating devices installed in the same cabinet.

The following illustration shows the minimum clearances for TM218LDAE40DRPHN controller and they apply equally to the other controllers:



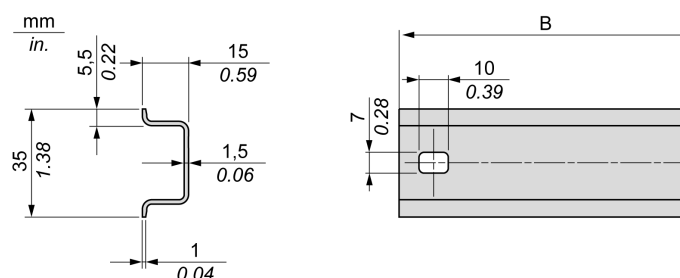
## Top Hat Section Rail (DIN rail)

### Dimensions of Top Hat Section Rail DIN Rail

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

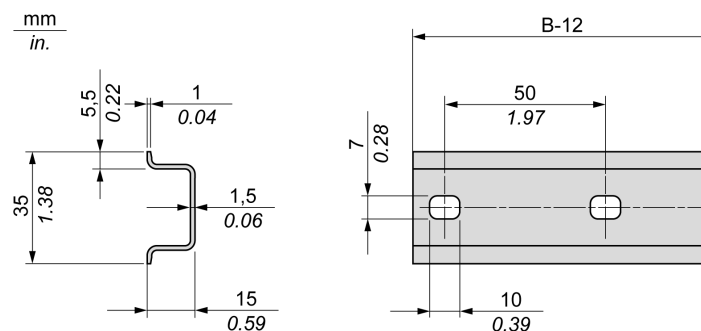
### Symmetric Top Hat Section Rails (DIN Rail)

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



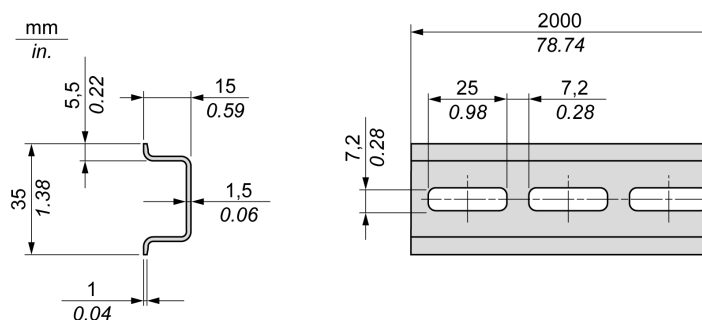
| Reference | Type | Rail Length (B)    |
|-----------|------|--------------------|
| NSYSR50A  | A    | 450 mm (17.71 in.) |
| NSYSR60A  | A    | 550 mm (21.65 in.) |
| NSYSR80A  | A    | 750 mm (29.52 in.) |
| NSYSR100A | A    | 950 mm (37.40 in.) |

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



| Reference | Type | Rail Length (B-12 mm) |
|-----------|------|-----------------------|
| NSYSR60   | A    | 588 mm (23.15 in.)    |
| NSYSR80   | A    | 788 mm (31.02 in.)    |
| NSYSR100  | A    | 988 mm (38.89 in.)    |
| NSYSR120  | A    | 1188 mm (46.77 in.)   |

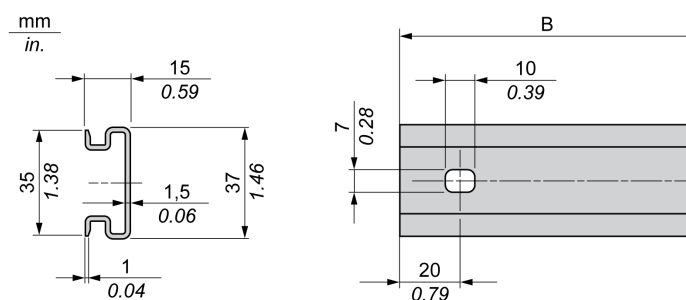
The following illustration and table indicate the references of the symmetric top hat section rails (DIN rail) of 2000 mm (78.74 in.):



| Reference                                                                                               | Type | Rail Length         |
|---------------------------------------------------------------------------------------------------------|------|---------------------|
| NSYSDR200 <sup>1</sup>                                                                                  | A    | 2000 mm (78.74 in.) |
| NSYSDR200D <sup>2</sup>                                                                                 | A    |                     |
| <div><div>1</div>Unperforated galvanized steel</div> <div><div>2</div>Perforated galvanized steel</div> |      |                     |

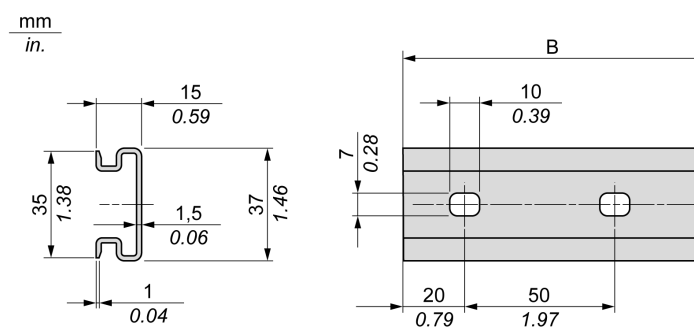
### Double-Profile Top Hat Section Rails (DIN rail)

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



| Reference | Type | Rail Length (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.) |

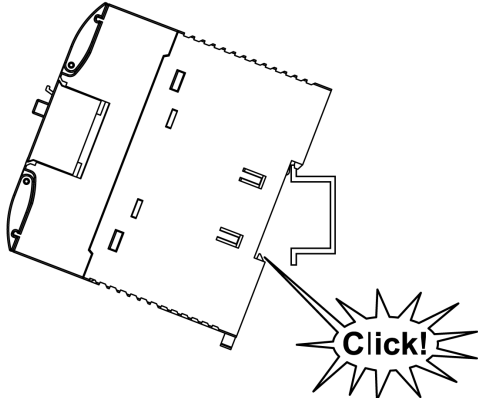
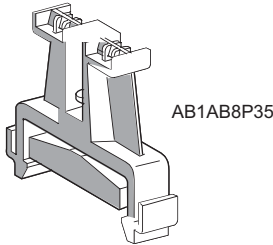
## Installing and Removing the Controller with Expansions

### Overview

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

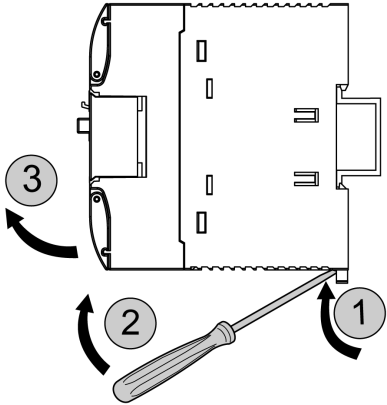
### Installing a Controller with its Expansions on a DIN Rail

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    | <p>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.</p>                                                                  |
| 3    | <p>Place 2 terminal block end clamps on both sides of the controller and expansion module assembly.</p>  <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)

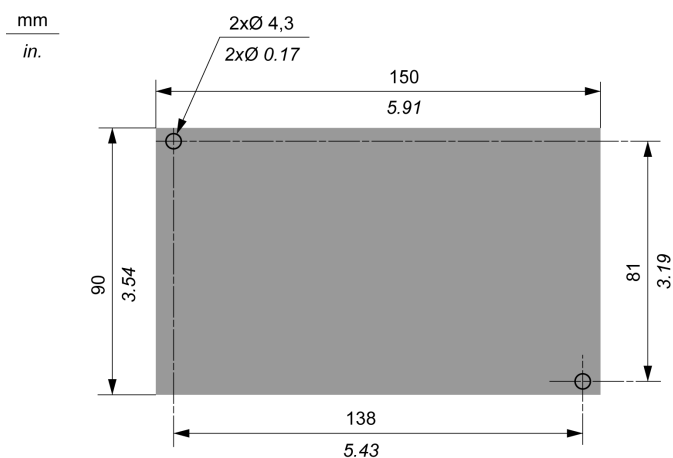
The following procedure describes how to remove a controller with its expansion modules from a top hat section rail (DIN rail):

| 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.                                                                   |

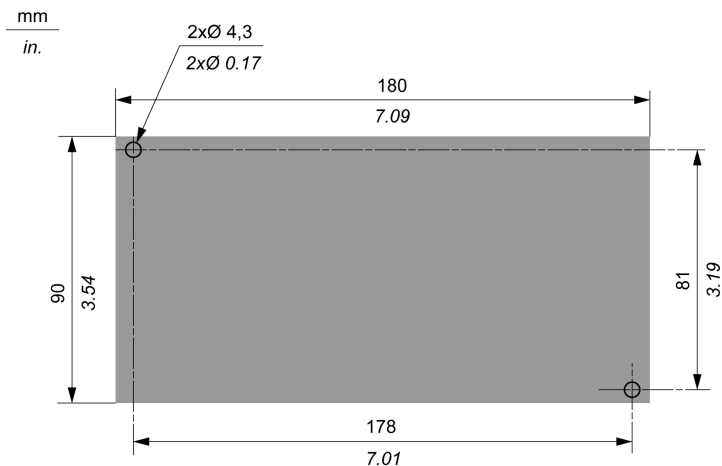
## Mounting on a Metallic Panel

### Mounting Holes

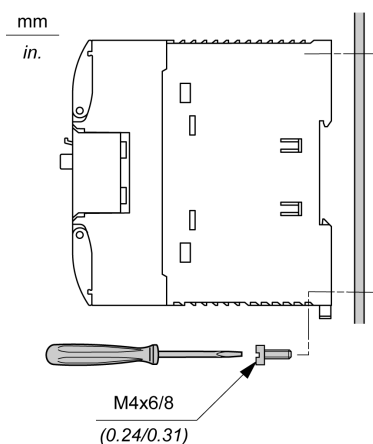
The following illustration shows the mounting holes for the Modicon M218 Logic Controller with 16 and 24 I/Os:



The following illustration shows the mounting holes for the Modicon M218 Logic Controller with 40 I/Os:



### Mounting the Modicon M218 Logic Controller on a Metallic Panel



---

## Section 4.2

### M218 Electrical Requirements

---

#### What Is in This Section?

This section contains the following topics:

| Topic                                   | Page |
|-----------------------------------------|------|
| Wiring Requirements                     | 68   |
| Power Supply Characteristics and Wiring | 69   |

## Wiring Requirements

### Overview

There are several rules that must be followed when wiring a Modicon M218 Logic Controller. Refer to Wiring Rules and Recommendations ([see page 34](#)) for details.

## Power Supply Characteristics and Wiring

### Overview

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

### 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 power supplies.

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

### ⚠ WARNING

#### UNINTENDED EQUIPMENT OPERATION

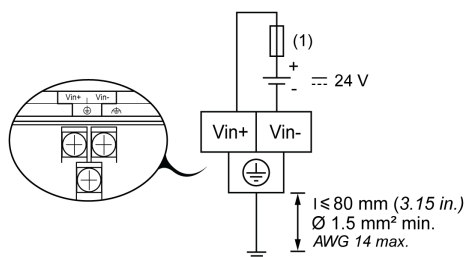
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

### DC Power Supply Characteristics

| Reference                                                                            | TM218LDD24DUPHN   | TM218LDD40DUPHNB |
|--------------------------------------------------------------------------------------|-------------------|------------------|
| Rated voltage                                                                        | 24 Vdc            |                  |
| Power interruption time                                                              | 10 ms at 20.4 Vdc |                  |
| Maximum inrush current                                                               | 50 A at 25°C      |                  |
| Continuous output power                                                              | 15 W              | 24 W             |
| Isolation between DC power supply and internal logic, I/O and protective ground (PE) | 500 Vdc           |                  |

### DC Power Supply Wiring Diagram



- 1 Use an external, slow-blow, 2 A type T fuse.

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 power supplies.

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

⚠ WARNING

**UNINTENDED EQUIPMENT OPERATION**

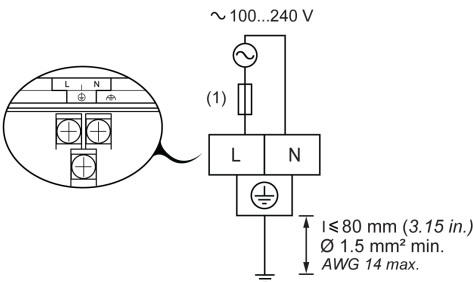
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

AC Power Supply Characteristics

| Reference                                                                            |                          | TM218LDA16DRN<br>TM218LDA24DRN<br>TM218LDA24DRHN<br>TM218LDAE24DRHN | TM218LDA40DRN<br>TM218LDA40DRPHN<br>TM218LDAE40DRPHN<br>TM218LDA40DR2HN<br>TM218LDA40DR4PHN<br>TM218LDA60DRN |
|--------------------------------------------------------------------------------------|--------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Voltage                                                                              | rated                    | 100...240 Vac                                                       |                                                                                                              |
|                                                                                      | limit (including ripple) | 85...264 Vac                                                        |                                                                                                              |
| Frequency                                                                            |                          | 50/60 Hz                                                            |                                                                                                              |
| Power interruption time                                                              |                          | 10 ms at 100 Vac                                                    |                                                                                                              |
| Maximum inrush current                                                               | at 110 Vac               | 30 A                                                                |                                                                                                              |
|                                                                                      | at 240 Vac               | 60 A                                                                |                                                                                                              |
| Continuous output power                                                              |                          | 25 W                                                                | 34 W                                                                                                         |
| Isolation between AC power supply and internal logic, I/O and protective ground (PE) |                          | 1780 Vac/2500 Vdc                                                   |                                                                                                              |

AC Power Supply Wiring Diagram



- 1 Use an external, slow-blow, 2 A type T fuse.

## Power interruption

The duration of power interruptions where the Modicon M218 Logic Controller continues normal operation is variable 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 M218 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.**



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# Chapter 5

## TM218LDA16DRN

---

### Overview

This chapter describes the TM218LDA16DRN controller.

### What Is in This Chapter?

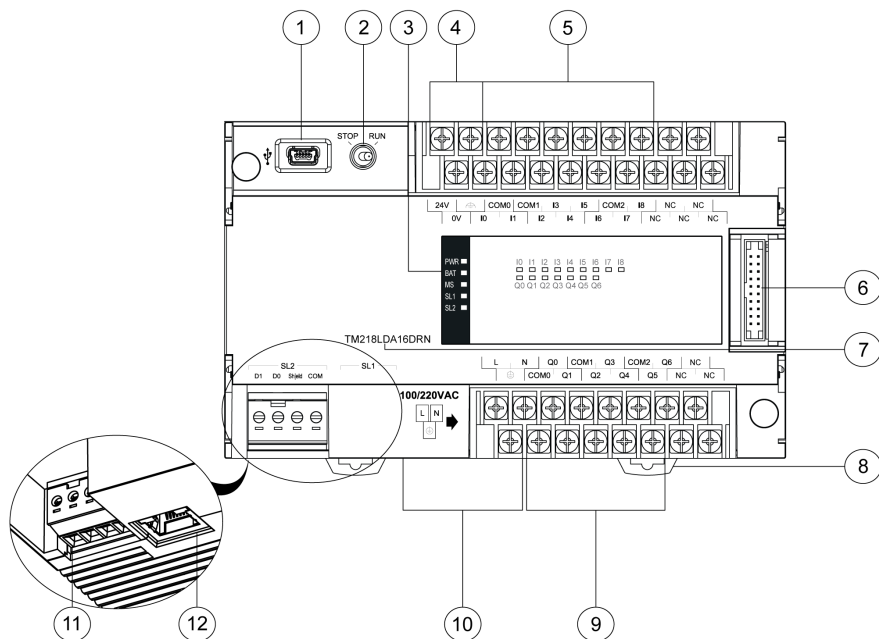
This chapter contains the following topics:

| Topic                       | Page |
|-----------------------------|------|
| TM218LDA16DRN Presentation  | 74   |
| TM218LDA16DRN Digital Input | 76   |
| TM218LDA16DRN Fast Inputs   | 79   |
| TM218LDA16DRN Relay Outputs | 80   |

## TM218LDA16DRN Presentation

### Overview

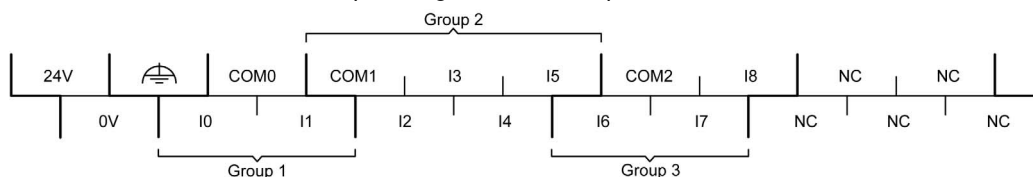
The following illustration shows the different components of the TM218LDA16DRN:



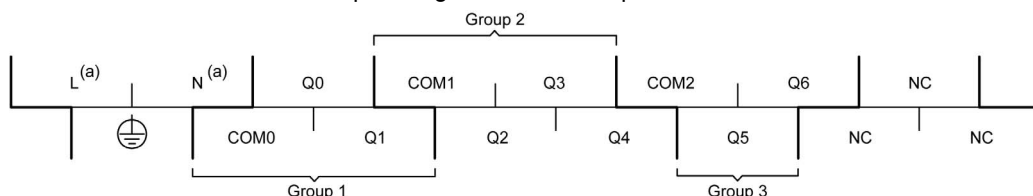
| N° | Description                                          |
|----|------------------------------------------------------|
| 1  | USB programming port ( <i>see page 224</i> )         |
| 2  | Run/Stop switch ( <i>see page 50</i> )               |
| 3  | System and I/O LEDs ( <i>see page 48</i> )           |
| 4  | 24 V sensor power supply terminal block              |
| 5  | Input terminal block ( <i>see page 75</i> )          |
| 6  | Ribbon cable connector                               |
| 7  | Reference number                                     |
| 8  | DIN rail clip                                        |
| 9  | Output terminal block ( <i>see page 75</i> )         |
| 10 | 100...220 Vac power supply terminal block and label  |
| 11 | Serial link 2/terminal block ( <i>see page 227</i> ) |
| 12 | Serial link 1/type RJ45 ( <i>see page 225</i> )      |

## Terminal Blocks

The illustration below shows the pin assignment of the input terminal block:



The illustration below shows the pin assignment of the output terminal block:



(a) 100...220 Vac power supply terminals are located in the output terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

**DANGER**

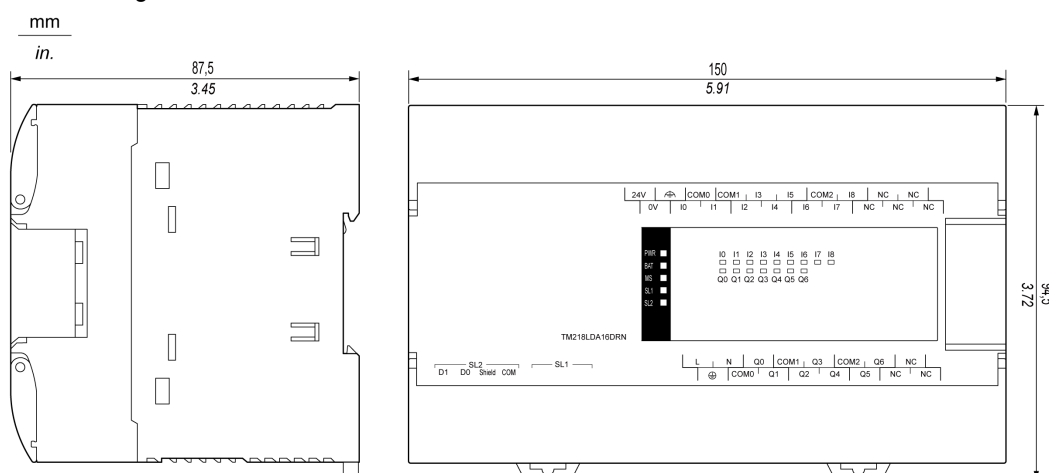
**HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

- 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.**

## Dimensions

The following illustration shows the external dimensions of the TM218LDA16DRN controller:



## TM218LDA16DRN Digital Input

### Overview

See Input Management ([see page 51](#)) for important information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input) or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the TM218LDA16DRN controller inputs:

| Function                                                          |    | Input function |            |        | HSC/PTO/PWM/FG |
|-------------------------------------------------------------------|----|----------------|------------|--------|----------------|
|                                                                   |    | None           | RUN/STOP   | Latch  |                |
| Filter type                                                       |    | Integrator     | Integrator | Bounce |                |
| Fast Input <sup>1</sup>                                           | I0 | X              | X          | –      | HSC            |
|                                                                   | I1 | X              | X          | –      | HSC            |
| Digital Input                                                     | I2 | X              | X          | –      | –              |
|                                                                   | I3 | X              | X          | –      | –              |
|                                                                   | I4 | X              | X          | –      | –              |
|                                                                   | I5 | X              | X          | –      | –              |
|                                                                   | I6 | X              | X          | –      | –              |
|                                                                   | I7 | X              | X          | –      | –              |
|                                                                   | I8 | X              | X          | –      | –              |
| X Yes<br>– No<br><sup>1</sup> Can also be used as a regular input |    |                |            |        |                |

You can use filters and functions to manage the controller inputs ([see page 51](#)).

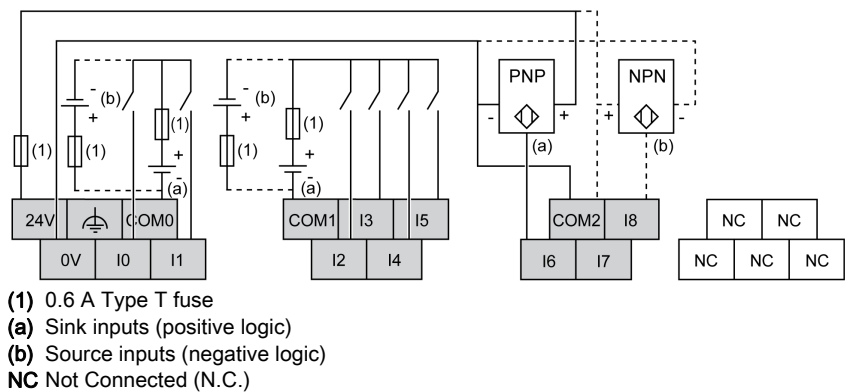
## Digital Input Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 7 mA                                                                                                    |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                  |
|                                                                                                                                                                                                                                                                                                | Current                             | 9 mA                                                                                                    |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 3.3 k $\Omega$                                                                                          |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                             |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                  |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                            |
| 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                                                                                                |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                    |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                 |
| Filtering                                                                                                                                                                                                                                                                                      |                                     | Default: 3 ms<br>Selectable: No filter (1 ms), 3 ms and 12 ms                                           |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                  |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |
| Cable type and length                                                                                                                                                                                                                                                                          |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                      |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |

Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller’s digital inputs:



**⚠ 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.**

**⚠ WARNING**

**UNINTENDED EQUIPMENT OPERATION**

Use the sensor and actuator power supply only for supplying power to sensors or actuators connected to the controller.  
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## TM218LDA16DRN Fast Inputs

### Overview

The TM218LDA16DRN controller is equipped with 2 Fast digital inputs (*see page 76*) which can be used as 10 kHz HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Inputs Characteristics

The table below describes the characteristics of the M218 controller reduced Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 9 mA                                                          |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                        |
|                                                                                                                                                                                                                                                                                                | Current                             | 12 mA                                                         |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 2.35 kΩ                                                       |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                   |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                        |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                  |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                      |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                       |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                        |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                      |
| Isolation (Photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                          |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                       |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                        |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>             |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                      |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                          |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                            |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in. pitch)<br>2 rows are removable |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | 10 kHz (100 μs)<br>Minimum transition duration: 40 μs         |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | Single phase counter                                          |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                               |

### Wiring Diagram

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 78*).

## TM218LDA16DRN Relay Outputs

### Overview

See Output Management (*see page 53*) for more information on managing outputs.

### 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 (4 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.**

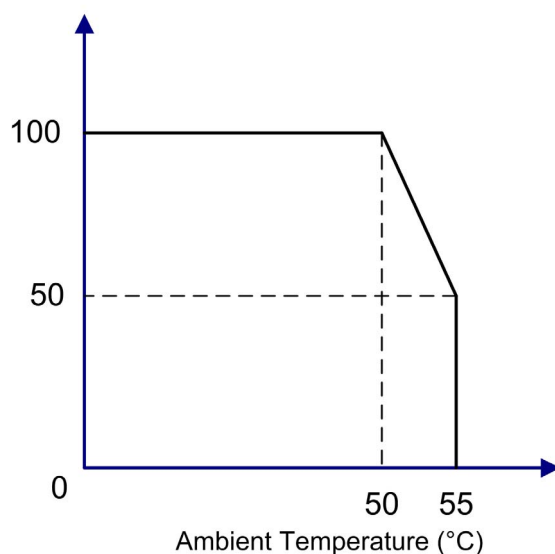
### Relay Output Characteristics

The table below describes the characteristics of the M218 controller relay outputs:

| Characteristic                                                                                                                       |                                           | Value                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                        |                                           | 24 Vdc, 220 Vac                                                                       |
| Input range                                                                                                                          |                                           | 5...30 Vdc, 100...250 Vac                                                             |
| Rated current                                                                                                                        |                                           | Maximum 2 A for each point (see de-rating curve below)                                |
| Current/group (4 points)                                                                                                             |                                           | 4 A (see de-rating curve below)                                                       |
| Inrush values                                                                                                                        | Maximum switching voltage                 | 250 Vac, 30 Vdc                                                                       |
|                                                                                                                                      | Current/point                             | 5 A                                                                                   |
| Isolation                                                                                                                            | Between channels within same category:    | None                                                                                  |
|                                                                                                                                      | Between channels in different categories: | 1780 Vac / 2500 Vdc                                                                   |
|                                                                                                                                      | Between channels and internal logic:      | 1780 Vac / 2500 Vdc                                                                   |
| Maximum output frequency                                                                                                             | With maximum load                         | 0.1 Hz                                                                                |
|                                                                                                                                      | Without load                              | 5 Hz                                                                                  |
| Contact opening time                                                                                                                 |                                           | Typically 5 ms                                                                        |
| Contact closing time                                                                                                                 |                                           | Typically 2 ms                                                                        |
| Resistive load                                                                                                                       |                                           | 2 A/point for 24 Vdc/220 Vac                                                          |
| Mechanical life                                                                                                                      |                                           | 20 million operation minimum at 25 °C (77 °F) for maximum current and voltage ratings |
| Cable length                                                                                                                         |                                           | Non-shielded: 150 m (492 ft)                                                          |
| Protection against short-circuit                                                                                                     |                                           | No                                                                                    |
| Terminal blocks                                                                                                                      |                                           | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                         |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <i>see page 36</i> ) for additional information on this topic. |                                           |                                                                                       |

The following illustration shows the Relay Output De-rating curve:

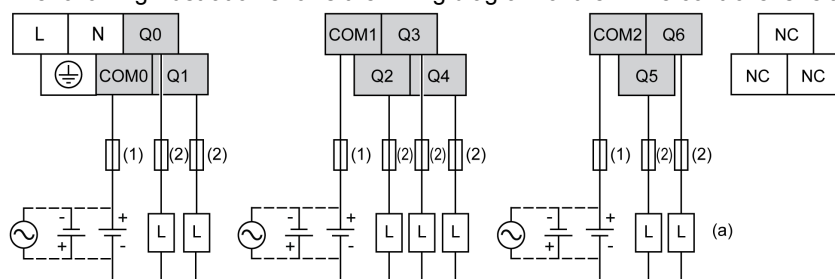
Output Load Current (%)



**NOTE:** 50% de-rating when all the relay outputs are used at 55 °C (131 °F).

### Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's relay outputs:



(1) 4 A Type T fuse

(2) 2 A Type T fuse

NC Not Connected (N.C.)

- (a) To improve the lifetime of the contacts and to protect from potential inductive load damage, connect:
- a free wheeling diode in parallel to each inductive DC load
  - a RC snubber in parallel of each inductive AC load

**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.

## ! 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.**



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# Chapter 6

## TM218LDA24DRN

---

### Overview

This chapter describes the TM218LDA24DRN controller.

### What Is in This Chapter?

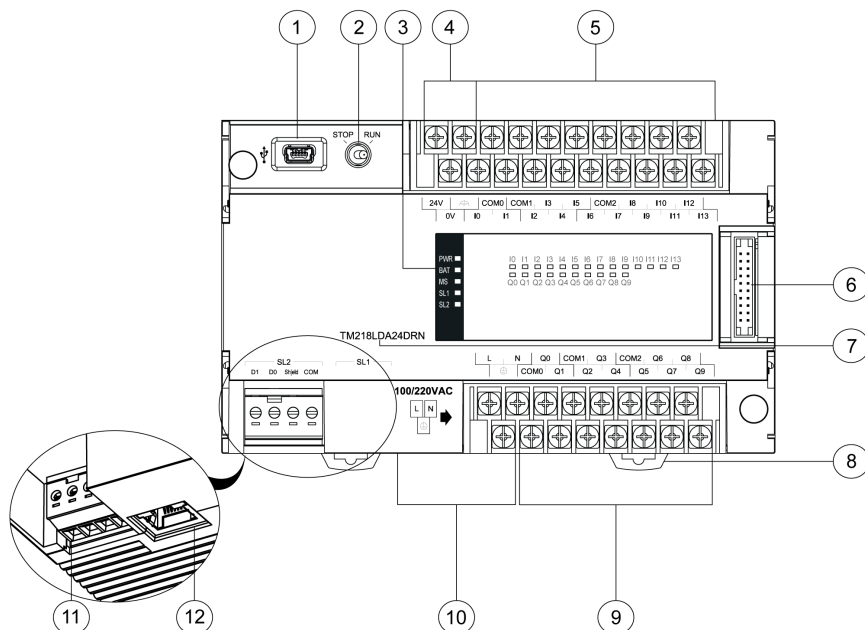
This chapter contains the following topics:

| Topic                       | Page |
|-----------------------------|------|
| TM218LDA24DRN Presentation  | 84   |
| TM218LDA24DRN Digital Input | 86   |
| TM218LDA24DRN Fast Input    | 88   |
| TM218LDA24DRN Relay Output  | 89   |

## TM218LDA24DRN Presentation

### Overview

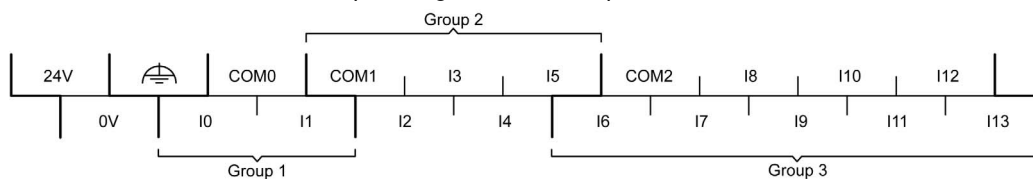
The following illustration shows the different components of the TM218LDA24DRN:



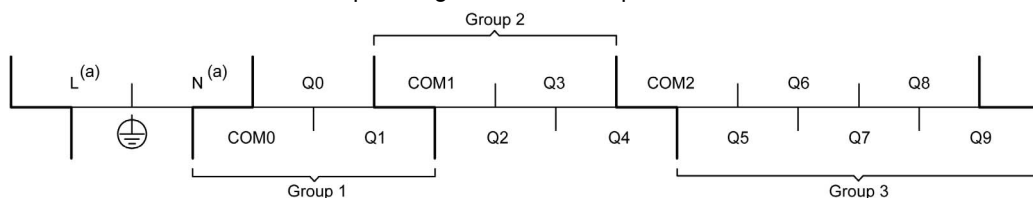
| N° | Description                                                   |
|----|---------------------------------------------------------------|
| 1  | USB programming port ( <a href="#">see page 224</a> )         |
| 2  | Run/Stop switch ( <a href="#">see page 50</a> )               |
| 3  | System and I/O LEDs ( <a href="#">see page 48</a> )           |
| 4  | 24 V sensor power supply terminal block                       |
| 5  | Input terminal block ( <a href="#">see page 85</a> )          |
| 6  | Ribbon cable connector                                        |
| 7  | Reference number                                              |
| 8  | DIN rail clip                                                 |
| 9  | Output terminal block ( <a href="#">see page 85</a> )         |
| 10 | 100...220 Vac power supply terminal block and label           |
| 11 | Serial link 2/terminal block ( <a href="#">see page 227</a> ) |
| 12 | Serial link 1/type RJ45 ( <a href="#">see page 225</a> )      |

## Terminal Blocks

The illustration below shows the pin assignment of the input terminal block:



The illustration below shows the pin assignment of the output terminal block:



(a) 100...220 Vac power supply terminals are located in the output terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

## **⚠ DANGER**

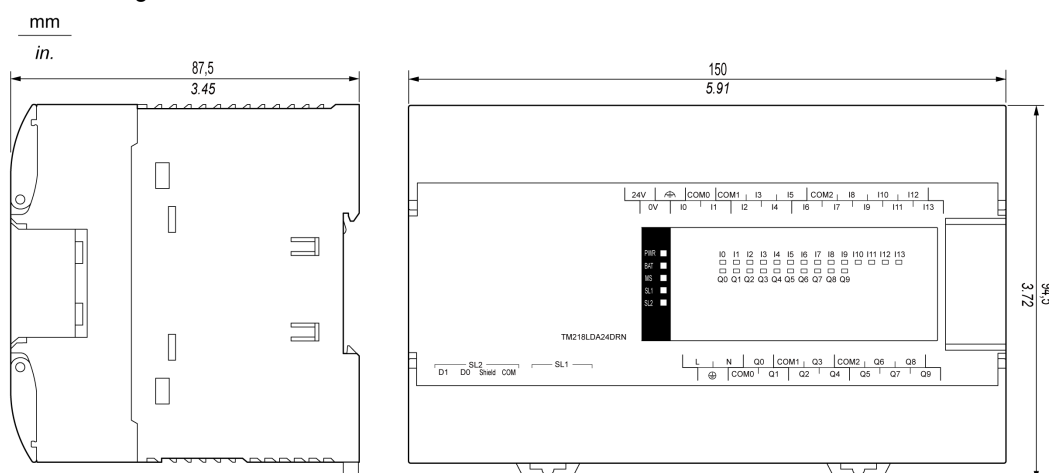
### HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- 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.**

## Dimensions

The following illustration shows the external dimensions of the TM218LDA24DRN controller:



## TM218LDA24DRN Digital Input

### Overview

See Input Management (*see page 51*) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input), or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the TM218LDA24DRN controller inputs:

| Function                                                                    |     | Input function |            |        | HSC/PTO/PWM/FG |
|-----------------------------------------------------------------------------|-----|----------------|------------|--------|----------------|
|                                                                             |     | None           | RUN/STOP   | Latch  |                |
| Filter type                                                                 |     | Integrator     | Integrator | Bounce |                |
| Fast Input <sup>1</sup>                                                     | I0  | X              | X          | –      | HSC            |
|                                                                             | I1  | X              | X          | –      | HSC            |
| Digital Input                                                               | I2  | X              | X          | –      | –              |
|                                                                             | I3  | X              | X          | –      | –              |
|                                                                             | I4  | X              | X          | –      | –              |
|                                                                             | I5  | X              | X          | –      | –              |
|                                                                             | I6  | X              | X          | –      | –              |
|                                                                             | I7  | X              | X          | –      | –              |
|                                                                             | I8  | X              | X          | –      | –              |
|                                                                             | I9  | X              | X          | –      | –              |
|                                                                             | I10 | X              | X          | –      | –              |
|                                                                             | I11 | X              | X          | –      | –              |
|                                                                             | I12 | X              | X          | –      | –              |
|                                                                             | I13 | X              | X          | –      | –              |
| <b>X</b> Yes<br><b>–</b> No<br><b>1</b> Can also be used as a regular input |     |                |            |        |                |

You can use filters and functions to manage the controller inputs (*see page 51*).

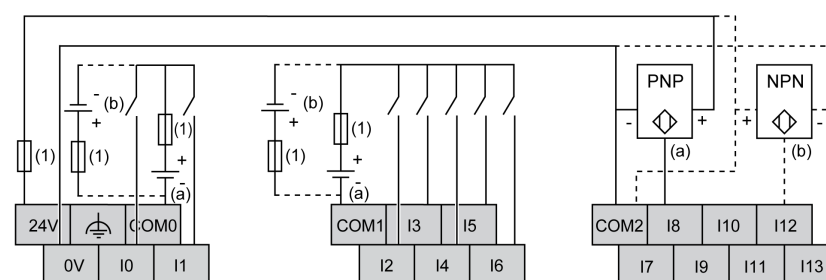
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                          |                                     | Value                                                                                                   |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                         |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                           |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                           | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                         | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                         |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                              |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                           |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                             |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                               | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                         | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                               |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                               |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                           |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                   |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                         |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                         |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| 1 Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

## Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller's digital inputs:



- (1)** 0.6 A Type T fuse  
**(a)** Sink inputs (positive logic)  
**(b)** Source inputs (negative logic)

## ⚠ WARNING

### UNINTENDED EQUIPMENT OPERATION

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

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

## TM218LDA24DRN Fast Input

### Overview

The TM218LDA24DRN controller is equipped with 2 Fast digital inputs (*see page 86*) which can be used as 10 kHz HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the M218 controller reduced Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 9 mA                                                          |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                        |
|                                                                                                                                                                                                                                                                                                | Current                             | 12 mA                                                         |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 2.35 kΩ                                                       |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                   |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                        |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                  |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                      |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                       |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                        |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                      |
| Isolation (Photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                          |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                       |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                        |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>             |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                      |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                          |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                            |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in. pitch)<br>2 rows are removable |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | 10 kHz (100 μs)<br>Minimum transition duration: 40 μs         |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | Single phase counter                                          |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                               |

### Wiring Diagram

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 87*).

## TM218LDA24DRN Relay Output

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

### 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 (4 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.**

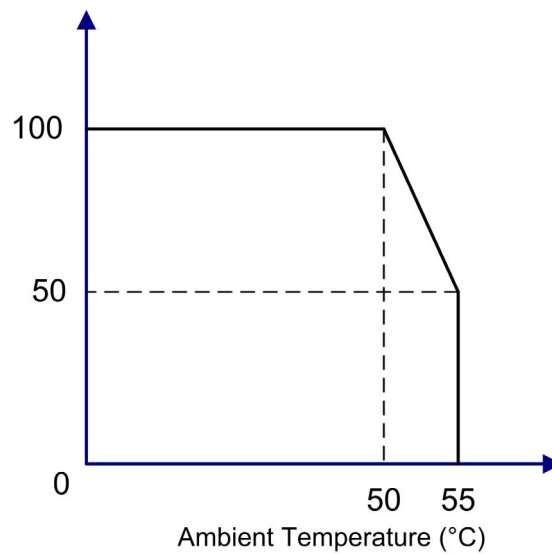
### Relay Output Characteristics

The table below describes the characteristics of the M218 controller relay outputs:

| Characteristic                                                                                                                                |                                           | Value                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                                           | 24 Vdc, 220 Vac                                                                       |
| Input range                                                                                                                                   |                                           | 5...30 Vdc, 100...250 Vac                                                             |
| Rated current                                                                                                                                 |                                           | Maximum 2 A for each point (see de-rating curve below)                                |
| Current/group (4 points)                                                                                                                      |                                           | 4 A (see de-rating curve below)                                                       |
| Inrush values                                                                                                                                 | Maximum switching voltage                 | 250 Vac, 30 Vdc                                                                       |
|                                                                                                                                               | Current/point                             | 5 A                                                                                   |
| Isolation                                                                                                                                     | Between channels within same category:    | None                                                                                  |
|                                                                                                                                               | Between channels in different categories: | 1780 Vac / 2500 Vdc                                                                   |
|                                                                                                                                               | Between channels and internal logic:      | 1780 Vac / 2500 Vdc                                                                   |
| Maximum output frequency                                                                                                                      | With maximum load                         | 0.1 Hz                                                                                |
|                                                                                                                                               | Without load                              | 5 Hz                                                                                  |
| Contact opening time                                                                                                                          |                                           | Typically 5 ms                                                                        |
| Contact closing time                                                                                                                          |                                           | Typically 2 ms                                                                        |
| Resistive load                                                                                                                                |                                           | 2 A/point for 24 Vdc/220 Vac                                                          |
| Mechanical life                                                                                                                               |                                           | 20 million operation minimum at 25 °C (77 °F) for maximum current and voltage ratings |
| Cable length                                                                                                                                  |                                           | Non-shielded: 150 m (492 ft)                                                          |
| Protection against short-circuit                                                                                                              |                                           | No                                                                                    |
| Terminal blocks                                                                                                                               |                                           | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                         |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                           |                                                                                       |

The following illustration shows the Relay Output De-rating curve:

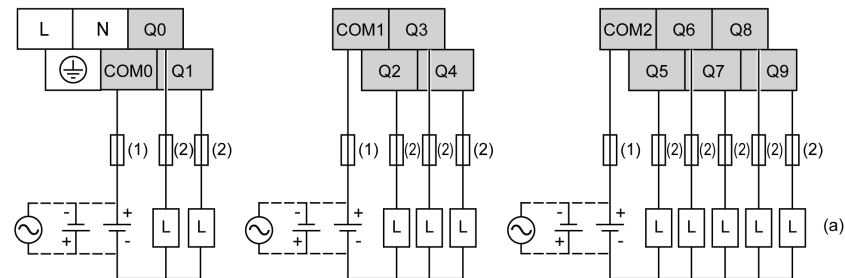
Output Load Current (%)



**NOTE:** 50% de-rating when all the relay outputs are used at 55 °C (131 °F).

### Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's relay outputs:



(1) 4 A Type T fuse

(2) 2 A Type T fuse

- (a) To improve the lifetime of the contacts, and to protect from potential inductive load damage, connect:
- a free wheeling diode in parallel to each inductive DC load
  - a RC snubber in parallel of each inductive AC load

**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.

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# Chapter 7

## TM218LDA24DRHN

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### Overview

This chapter describes the TM218LDA24DRHN controller.

### What Is in This Chapter?

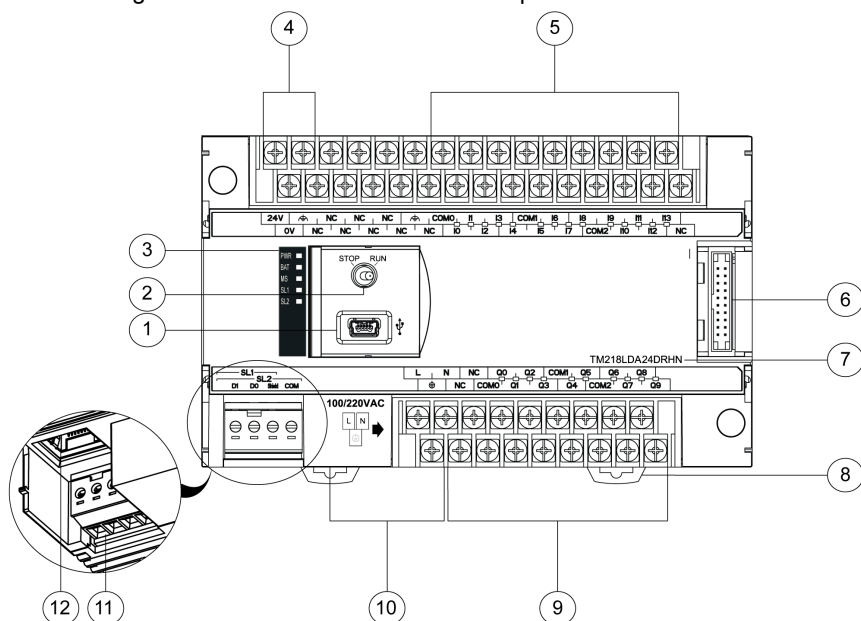
This chapter contains the following topics:

| Topic                        | Page |
|------------------------------|------|
| TM218LDA24DRHN Presentation  | 92   |
| TM218LDA24DRHN Digital Input | 94   |
| TM218LDA24DRHN Fast Input    | 97   |
| TM218LDA24DRHN Relay Output  | 99   |

## TM218LDA24DRHN Presentation

### Overview

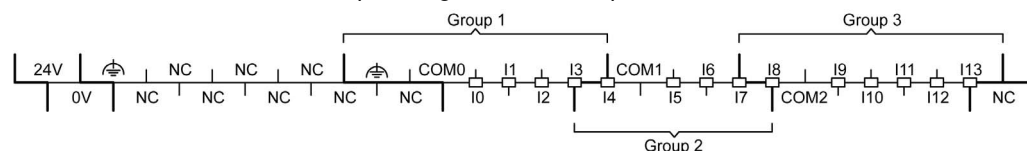
The following illustration shows the different components of the TM218LDA24DRHN controllers:



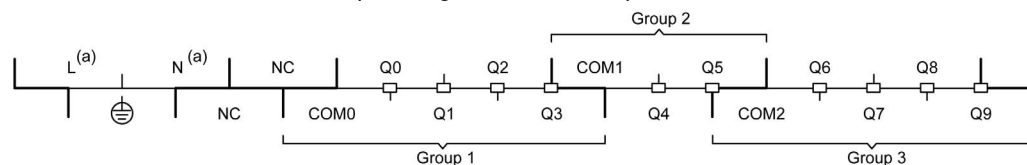
| N° | Description                                                   |
|----|---------------------------------------------------------------|
| 1  | USB programming port ( <a href="#">see page 224</a> )         |
| 2  | Run/Stop switch ( <a href="#">see page 50</a> )               |
| 3  | System LEDs ( <a href="#">see page 48</a> )                   |
| 4  | 24 V sensor power supply terminal block                       |
| 5  | Input terminal block ( <a href="#">see page 93</a> )          |
| 6  | Ribbon cable connector                                        |
| 7  | Reference number                                              |
| 8  | DIN rail clip                                                 |
| 9  | Output terminal block ( <a href="#">see page 93</a> )         |
| 10 | 100...220 Vac power supply terminal block and label           |
| 11 | Serial link 2/terminal block ( <a href="#">see page 227</a> ) |
| 12 | Serial link 1/type RJ45 ( <a href="#">see page 225</a> )      |

## Terminal Blocks

The illustration below shows the pin assignment of the input terminal block:



The illustration below shows the pin assignment of the output terminal block:



(a) 100...220 Vac power supply terminals are located in the output terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

## DANGER

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

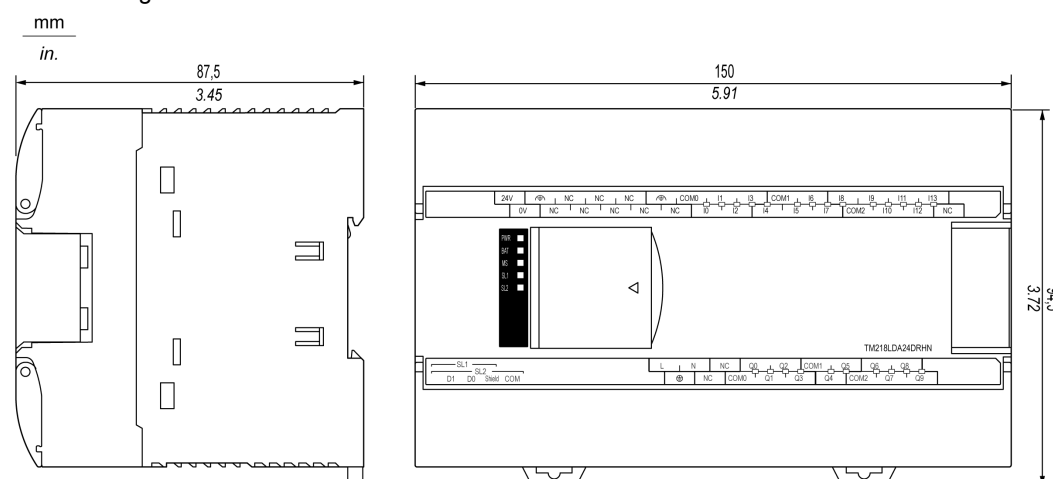
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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.**

**NOTE:** I/O status LEDs ([see page 49](#)) are embedded in the input and output terminal block labels.

## Dimensions

The following illustration shows the external dimensions of the TM218LDA24DRHN controller:



## TM218LDA24DRHN Digital Input

### Overview

See Input Management ([see page 51](#)) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input) or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the controller inputs:

| Function      |     | Input function |            |        |        | HSC/PTO/PWM/FG |
|---------------|-----|----------------|------------|--------|--------|----------------|
|               |     | None           | RUN/STOP   | Latch  | Event  |                |
| Filter type   |     | Integrator     | Integrator | Bounce | Bounce |                |
| Fast Input    | I0  | X              | X          | X      | X      | HSC            |
|               | I1  | X              | X          | X      | X      | HSC            |
|               | I2  | X              | X          | X      | X      | HSC            |
|               | I3  | X              | X          | X      | X      | HSC            |
| Digital Input | I4  | X              | X          | –      | –      | HSC            |
|               | I5  | X              | X          | –      | –      | HSC            |
|               | I6  | X              | X          | –      | –      | HSC            |
|               | I7  | X              | X          | –      | –      | HSC            |
|               | I8  | X              | X          | –      | –      | –              |
|               | I9  | X              | X          | –      | –      | –              |
|               | I10 | X              | X          | –      | –      | –              |
|               | I11 | X              | X          | –      | –      | –              |
|               | I12 | X              | X          | –      | –      | –              |
|               | I13 | X              | X          | –      | –      | –              |
| X Yes<br>– No |     |                |            |        |        |                |

You can use filters and functions to manage the controller inputs ([see page 51](#)).

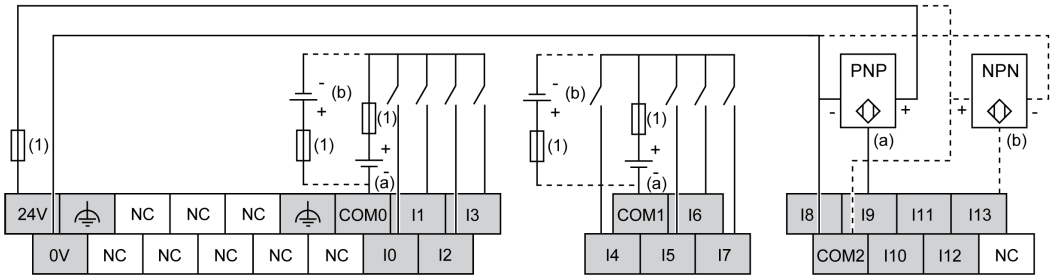
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                   |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                                |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                                | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                                      |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                          |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller’s digital inputs:



- (1) 0.6 A Type T fuse
- (a) Sink inputs (positive logic)
- (b) Source inputs (negative logic)
- NC Not Connected (N.C.)

**⚠ 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.**

**⚠ WARNING**

**UNINTENDED EQUIPMENT OPERATION**

Use the sensor and actuator power supply only for supplying power to sensors or actuators connected to the controller.  
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## TM218LDA24DRHN Fast Input

### Overview

The TM218LDA24DRHN controller is equipped with 4 Fast digital inputs (*see page 94*) which can be used as HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 10.7 mA                                                                                                                                  |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current                             | 13.7 mA                                                                                                                                  |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 1.96 kΩ                                                                                                                                  |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                                                              |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                                                   |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                                                             |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                                                                                                 |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                                                  |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                                                   |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                                                        |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                                                                                                     |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                                                       |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm, (0.29 in.) pitch<br>2 rows are removable                                                                           |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | A/B phase: 50 kHz (20 μs)<br>Single phase: 100 kHz<br>Pulse/Direction: 100 kHz<br>Minimum transition duration: 4 μs                      |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | <ul style="list-style-type: none"> <li>• A/B phase counter</li> <li>• Pulse/Direction counter</li> <li>• Single phase counter</li> </ul> |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                                                          |

**Wiring Diagram**

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 96*).

## TM218LDA24DRHN Relay Output

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

### 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 (4 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.

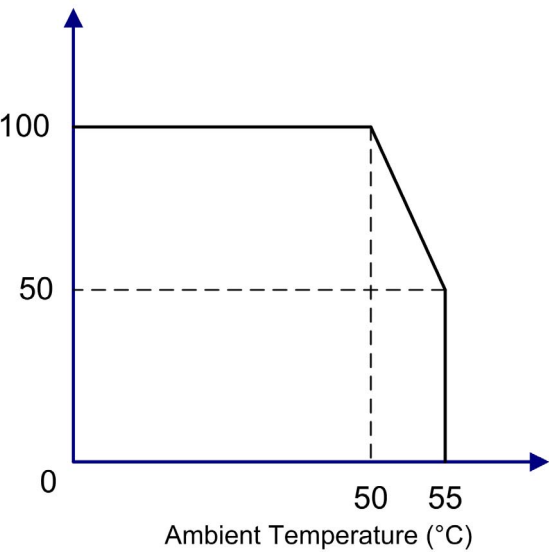
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Relay Output Characteristics

The table below describes the characteristics of the M218 controller relay outputs:

| Characteristic                                                                                                                                |                                           | Value                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                                           | 24 Vdc, 220 Vac                                                                       |
| Input range                                                                                                                                   |                                           | 5...30 Vdc, 100...250 Vac                                                             |
| Rated current                                                                                                                                 |                                           | Maximum 2 A for each point (see de-rating curve below)                                |
| Current/group (4 points)                                                                                                                      |                                           | 4 A (see de-rating curve below)                                                       |
| Inrush values                                                                                                                                 | Maximum switching voltage                 | 250 Vac, 30 Vdc                                                                       |
|                                                                                                                                               | Current/point                             | 5 A                                                                                   |
| Isolation                                                                                                                                     | Between channels within same category:    | None                                                                                  |
|                                                                                                                                               | Between channels in different categories: | 1780 Vac / 2500 Vdc                                                                   |
|                                                                                                                                               | Between channels and internal logic:      | 1780 Vac / 2500 Vdc                                                                   |
| Maximum output frequency                                                                                                                      | With maximum load                         | 0.1 Hz                                                                                |
|                                                                                                                                               | Without load                              | 5 Hz                                                                                  |
| Contact opening time                                                                                                                          |                                           | Typically 5 ms                                                                        |
| Contact closing time                                                                                                                          |                                           | Typically 2 ms                                                                        |
| Resistive load                                                                                                                                |                                           | 2 A/point for 24 Vdc/220 Vac                                                          |
| Mechanical life                                                                                                                               |                                           | 20 million operation minimum at 25 °C (77 °F) for maximum current and voltage ratings |
| Cable length                                                                                                                                  |                                           | Non-shielded: 150 m (492 ft)                                                          |
| Protection against short-circuit                                                                                                              |                                           | No                                                                                    |
| Terminal blocks                                                                                                                               |                                           | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                         |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                           |                                                                                       |

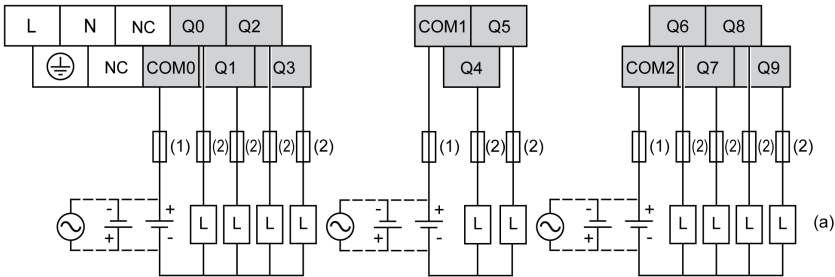
The following illustration shows the relay outputs de-rating curve:  
Output Load Current (%)



**NOTE:** 50% de-rating when all the relay outputs are used at 55 °C (131 °F).

Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's relay outputs:



- (1) 4 A Type T fuse
- (2) 2 A Type T fuse
- NC Not Connected (N.C.)

- (a) To improve the lifetime of the contacts, and to protect from potential damages by reverse EMF when using inductive load, it is recommended to connect:
- a free wheeling diode in parallel to each inductive DC load
  - a RC snubber in parallel of each inductive AC load

**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.

**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.**

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# Chapter 8

## TM218LDD24DUPHN

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### Overview

This chapter describes the TM218LDD24DUPHN controller.

### What Is in This Chapter?

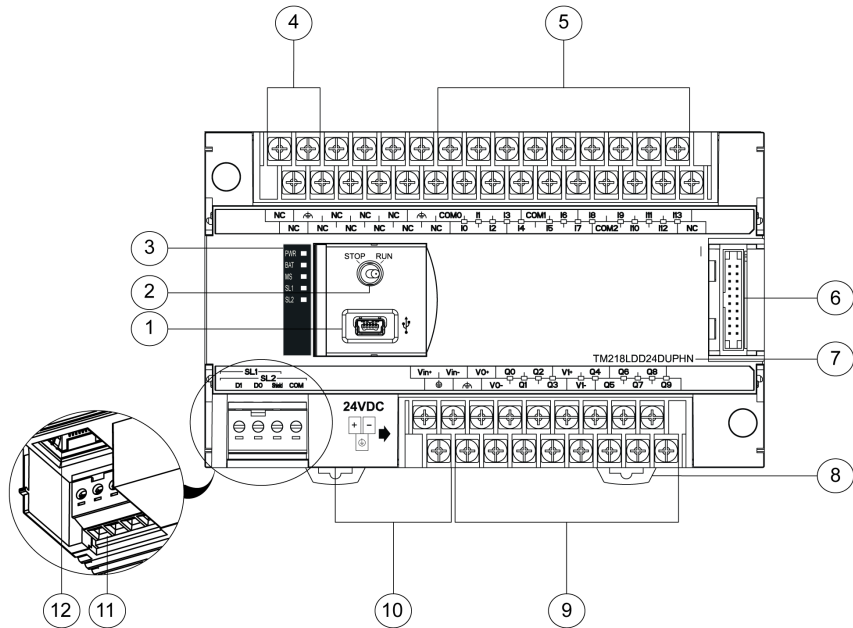
This chapter contains the following topics:

| Topic                          | Page |
|--------------------------------|------|
| TM218LDD24DUPHN Presentation   | 102  |
| TM218LDD24DUPHN Digital Input  | 104  |
| TM218LDD24DUPHN Fast Input     | 107  |
| TM218LDD24DUPHN Regular Output | 109  |
| TM218LDD24DUPHN Fast Output    | 111  |

TM218LDD24DUPHN Presentation

Overview

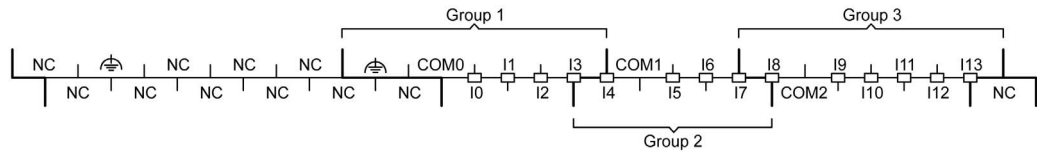
The following illustration shows the different components of the TM218LDD24DUPHN controllers:



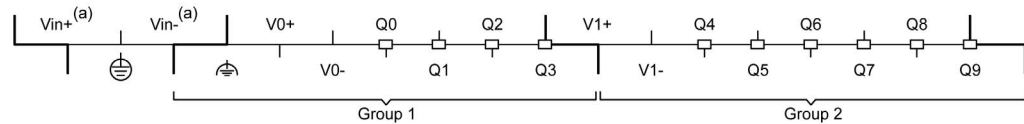
| N° | Description                                        |
|----|----------------------------------------------------|
| 1  | USB programming port <i>(see page 224)</i>         |
| 2  | Run/Stop switch <i>(see page 50)</i>               |
| 3  | System LEDs <i>(see page 48)</i>                   |
| 4  | Input terminal block <i>(see page 103)</i>         |
| 5  | Ribbon cable connector                             |
| 6  | Reference number                                   |
| 7  | DIN rail clip                                      |
| 8  | Output terminal block <i>(see page 103)</i>        |
| 9  | 24 Vdc power supply terminal block and label       |
| 10 | Serial link 2/terminal block <i>(see page 227)</i> |
| 11 | Serial link 1/type RJ45 <i>(see page 225)</i>      |

## Terminal Blocks

The illustration below shows the pin assignment of the input terminal block:



The illustration below shows the pin assignment of the output terminal block:



(a) 24 Vdc power supply terminals are located in the output terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

**DANGER**

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

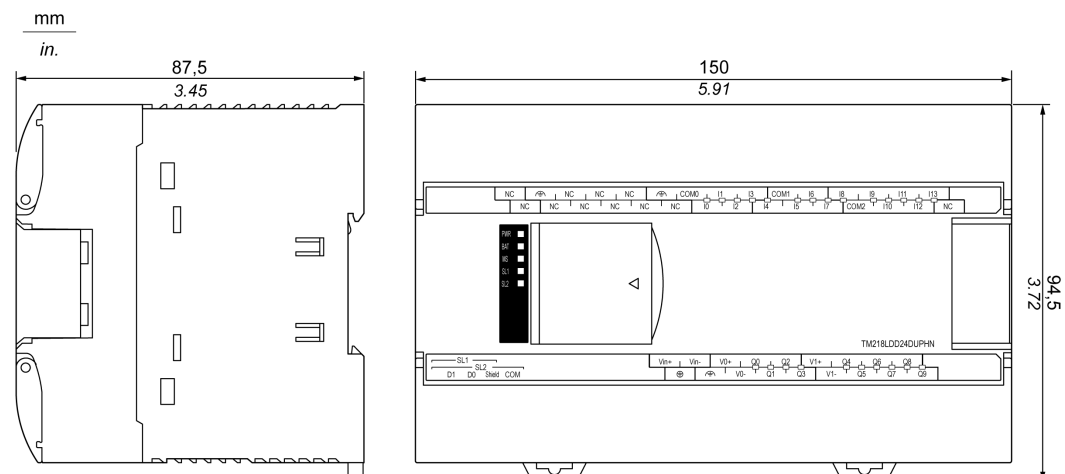
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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.**

**NOTE:** I/O status LEDs ([see page 49](#)) are embedded in the input and output terminal block labels.

## Dimensions

The following illustration shows the external dimensions of the TM218LDD24DUPHN controller:



## TM218LDD24DUPHN Digital Input

### Overview

See Input Management (*see page 51*) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input), or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the controller inputs:

| Function      |     | Input function |            |        |        | HSC/PTO/PWM/FG |
|---------------|-----|----------------|------------|--------|--------|----------------|
|               |     | None           | RUN/STOP   | Latch  | Event  |                |
| Filter type   |     | Integrator     | Integrator | Bounce | Bounce |                |
| Fast Input    | I0  | X              | X          | X      | X      | HSC            |
|               | I1  | X              | X          | X      | X      | HSC            |
|               | I2  | X              | X          | X      | X      | HSC            |
|               | I3  | X              | X          | X      | X      | HSC            |
| Digital Input | I4  | X              | X          | –      | –      | HSC            |
|               | I5  | X              | X          | –      | –      | HSC            |
|               | I6  | X              | X          | –      | –      | HSC            |
|               | I7  | X              | X          | –      | –      | HSC            |
|               | I8  | X              | X          | –      | –      | –              |
|               | I9  | X              | X          | –      | –      | –              |
|               | I10 | X              | X          | –      | –      | –              |
|               | I11 | X              | X          | –      | –      | –              |
|               | I12 | X              | X          | –      | –      | –              |
|               | I13 | X              | X          | –      | –      | –              |
| X Yes<br>– No |     |                |            |        |        |                |

You can use filters and functions to manage the controller inputs (*see page 51*).

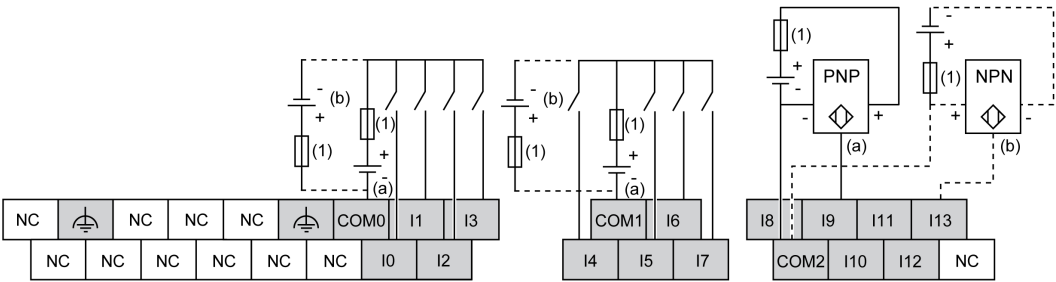
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                   |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                                |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                                | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                                      |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                          |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

Wiring Diagram

The following illustration describes the wiring diagram of the TM218LDD24DUPHN controller’s digital inputs:



- (1) 0.6 A Type T fuse
- (a) Sink inputs (positive logic)
- (b) Source inputs (negative logic)
- NC Not Connected (N.C.)

**⚠ 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.**

**⚠ WARNING**

**UNINTENDED EQUIPMENT OPERATION**

Use the sensor and actuator power supply only for supplying power to sensors or actuators connected to the controller.  
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## TM218LDD24DUPHN Fast Input

### Overview

The TM218LDD24DUPHN controller is equipped with 4 Fast digital inputs (*see page 104*) which can be used as HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 7.5 mA                                                                                                                                   |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current                             | 9.5 mA                                                                                                                                   |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 2.8 kΩ                                                                                                                                   |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                                                              |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                                                   |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                                                             |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                                                                                                 |
| Isolation (photo couple)                                                                                                                                                                                                                                                                       | Between channels                    | None                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                                                  |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                                                   |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                                                        |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                                                                                                     |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                                                       |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm, (0.29 in.) pitch<br>2 rows are removable                                                                           |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | A/B phase: 50 kHz (20 μs)<br>Single phase: 100 kHz<br>Pulse/Direction: 100 kHz<br>Minimum transition duration: 4 μs                      |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | <ul style="list-style-type: none"> <li>• A/B phase counter</li> <li>• Pulse/Direction counter</li> <li>• Single phase counter</li> </ul> |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                                                          |

## Wiring Diagram

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 106*).

## TM218LDD24DUPHN Regular Output

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.

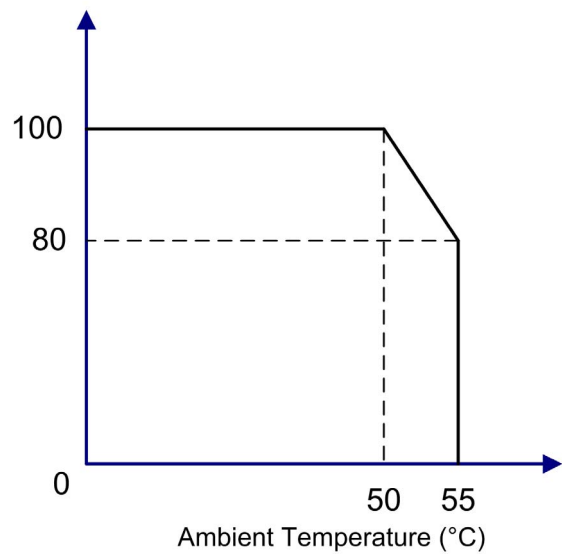
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Regular Output Characteristics

The table below describes the characteristics of the M218 controller regular outputs:

| Characteristic                                                                                                                                |                                    | Value                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                                    | 24 Vdc                                                                                                                                                                                                                                                                                    |
| Input range                                                                                                                                   |                                    | 20.4...28.8 Vdc                                                                                                                                                                                                                                                                           |
| Rated current                                                                                                                                 |                                    | Maximum 0.3 A for each point (see de-rating curve below)                                                                                                                                                                                                                                  |
| Current/group (4 points)                                                                                                                      |                                    | 1.2 A (see de-rating curve below)                                                                                                                                                                                                                                                         |
| Residual voltage                                                                                                                              |                                    | <1.5 Vdc for I = 0.1 A                                                                                                                                                                                                                                                                    |
| Delay                                                                                                                                         |                                    | Off to On (0.3 A Load):<br><ul style="list-style-type: none"> <li>• (Q4 to Q7): 30 <math>\mu</math>s</li> <li>• (Q8 to Q9): 50 <math>\mu</math>s</li> </ul> On to Off (0.3 A Load):<br><ul style="list-style-type: none"> <li>• (Q4 to Q7): 0.3 ms</li> <li>• (Q8 to Q9): 1 ms</li> </ul> |
| Isolation (photo coupler)                                                                                                                     | Between channels                   | None                                                                                                                                                                                                                                                                                      |
|                                                                                                                                               | Between channel and internal logic | 500 Vdc                                                                                                                                                                                                                                                                                   |
| Minimum resistor load                                                                                                                         |                                    | 80 $\Omega$ at 24 Vdc                                                                                                                                                                                                                                                                     |
| Cable length                                                                                                                                  |                                    | Non-shielded: 150 m (492 ft)                                                                                                                                                                                                                                                              |
| Protection against short-circuit                                                                                                              |                                    | Yes                                                                                                                                                                                                                                                                                       |
| Terminal blocks                                                                                                                               |                                    | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                                                                                                                                                                                                             |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                    |                                                                                                                                                                                                                                                                                           |

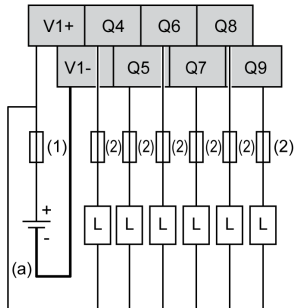
The following illustration shows the Regular Output De-rating curve:  
Output Load Current (%)



**NOTE:** 80% de-rating when all the outputs are used at 55 °C (131 °F).

Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's regular outputs:



- (1) 1.8 A Type T fuse
- (2) 0.3 A Type T fuse
- (a) Sink outputs (positive logic)

**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.

**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.**

## TM218LDD24DUPHN Fast Output

### Overview

The TM218LDD24DUPHN controller is equipped with 4 digital outputs which can be used for Fast outputs (*see page 53*).

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Output Characteristics

For additional information about fast output protection, refer to Protecting Outputs from Inductive Load Damage (*see page 36*).

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

Be sure to wire the Fast output correctly according to the wiring diagram.

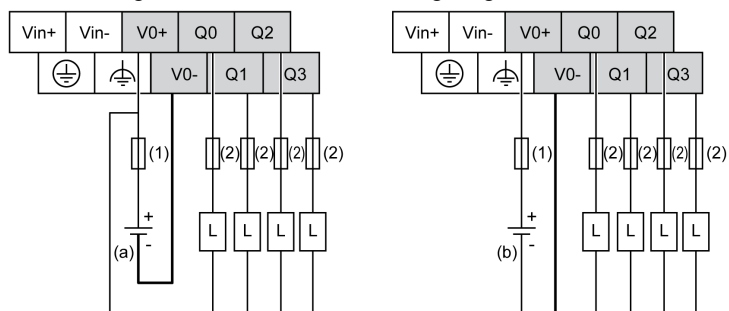
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The table below describes the characteristics of the M218 controller Fast outputs:

| Characteristic                           |                                                                | Value                                                         |
|------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------|
| Output type                              |                                                                | Push/Pull                                                     |
| Rated voltage                            |                                                                | 24 Vdc                                                        |
| PTO power supply input range             |                                                                | 19.2...28.8 Vdc                                               |
| PTO power supply reverse protection      |                                                                | Yes                                                           |
| PTO/PWM output current                   | Standard output                                                | 0.3 A                                                         |
|                                          | Fast output                                                    | 50 mA                                                         |
| Response time for origin auxiliary input |                                                                | 2 ms                                                          |
| Isolation resistance                     | Between Fast outputs and internal logic                        | > 10 MΩ                                                       |
|                                          | Between Power supply port and protective ground (PE) = 500 Vdc | > 10 MΩ                                                       |
| Residual voltage                         | for I = 0, 1 A                                                 | < 1.5 Vdc                                                     |
| Minimum load impedance                   |                                                                | 80 Ω                                                          |
| Maximum PTO output frequency             |                                                                | 100 kHz                                                       |
| Maximum PWM output frequency             |                                                                | 1 kHz                                                         |
| Accuracy                                 |                                                                | 20...100 Hz for 0.1%                                          |
|                                          |                                                                | 100 Hz...1 kHz for 1%                                         |
| PWM mode duty rate step                  |                                                                | 20 Hz...1 kHz for 0.1%                                        |
| Duty rate range                          |                                                                | 1...99%                                                       |
| Cable                                    | Type                                                           | Shielded, including 24 Vdc power supply                       |
|                                          | Length                                                         | Maximum 5 m (16 ft)                                           |
| Terminal blocks                          |                                                                | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable |

## Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's Fast outputs:



- (1) 2 A Type T fuse
- (2) 0.5 A Type T fuse
- (a) Sink outputs (positive logic)
- (b) Source outputs (negative logic)

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# Chapter 9

## TM218LDAE24DRHN

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### Overview

This chapter describes the TM218LDAE24DRHN controller.

### What Is in This Chapter?

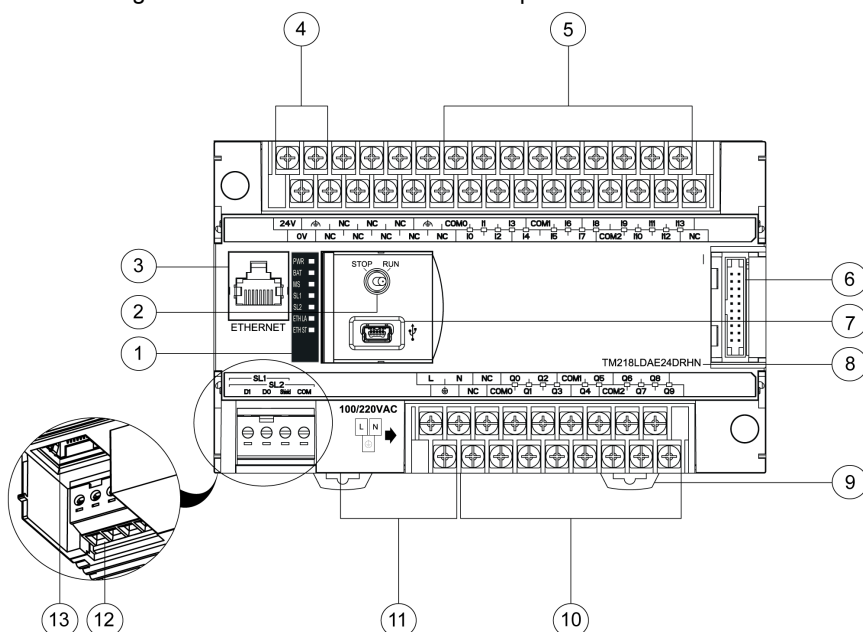
This chapter contains the following topics:

| Topic                         | Page |
|-------------------------------|------|
| TM218LDAE24DRHN Presentation  | 114  |
| TM218LDAE24DRHN Digital Input | 116  |
| TM218LDAE24DRHN Fast Input    | 119  |
| TM218LDAE24DRHN Relay Output  | 121  |

## TM218LDAE24DRHN Presentation

### Overview

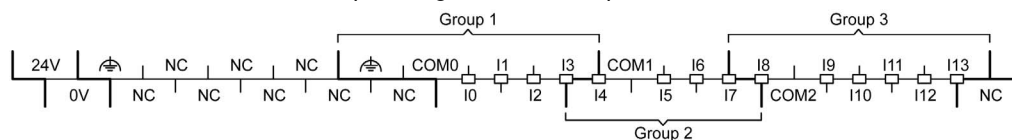
The following illustration shows the different components of TM218LDAE24DRHN controller:



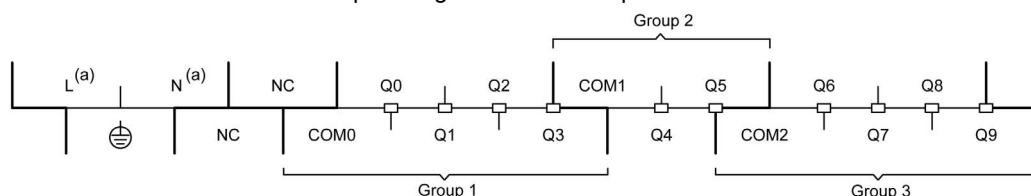
| N° | Description                                                   |
|----|---------------------------------------------------------------|
| 1  | System LEDs ( <a href="#">see page 48</a> )                   |
| 2  | Run/Stop switch ( <a href="#">see page 50</a> )               |
| 3  | Ethernet port ( <a href="#">see page 222</a> )                |
| 4  | 24 V sensor power supply terminal block                       |
| 5  | Input terminal block ( <a href="#">see page 115</a> )         |
| 6  | Ribbon cable connector                                        |
| 7  | USB programming port ( <a href="#">see page 224</a> )         |
| 8  | Reference number                                              |
| 9  | DIN rail clip                                                 |
| 10 | Output terminal block ( <a href="#">see page 115</a> )        |
| 11 | 100...220 Vac power supply terminal block and label           |
| 12 | Serial link 2/terminal block ( <a href="#">see page 227</a> ) |
| 13 | Serial link 1/type RJ45 ( <a href="#">see page 225</a> )      |

## Terminal Blocks

The illustration below shows the pin assignment of the input terminal block:



The illustration below shows the pin assignment of the output terminal block:



(a) 100...220 Vac power supply terminals are located in the output terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

## **⚡ ⚠ DANGER**

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

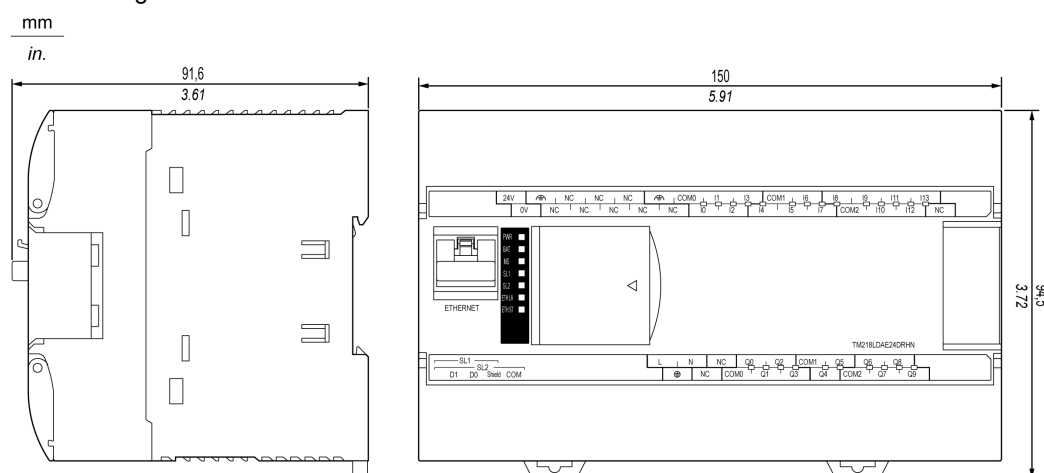
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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.**

**NOTE:** I/O status LEDs ([see page 49](#)) are embedded in the input and output terminal block labels.

## Dimensions

The following illustration shows the external dimensions of the TM218LDAE24DRHN controller:



## TM218LDAE24DRHN Digital Input

### Overview

See Input Management ([see page 51](#)) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input), or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the controller inputs:

| Function      |     | Input function |            |        |        | HSC/PTO/PWM/FG |
|---------------|-----|----------------|------------|--------|--------|----------------|
|               |     | None           | RUN/STOP   | Latch  | Event  |                |
| Filter type   |     | Integrator     | Integrator | Bounce | Bounce |                |
| Fast Input    | I0  | X              | X          | X      | X      | HSC            |
|               | I1  | X              | X          | X      | X      | HSC            |
|               | I2  | X              | X          | X      | X      | HSC            |
|               | I3  | X              | X          | X      | X      | HSC            |
| Digital Input | I4  | X              | X          | –      | –      | HSC            |
|               | I5  | X              | X          | –      | –      | HSC            |
|               | I6  | X              | X          | –      | –      | HSC            |
|               | I7  | X              | X          | –      | –      | HSC            |
|               | I8  | X              | X          | –      | –      | –              |
|               | I9  | X              | X          | –      | –      | –              |
|               | I10 | X              | X          | –      | –      | –              |
|               | I11 | X              | X          | –      | –      | –              |
|               | I12 | X              | X          | –      | –      | –              |
|               | I13 | X              | X          | –      | –      | –              |
| X Yes<br>– No |     |                |            |        |        |                |

You can use filters and functions to manage the controller inputs ([see page 51](#)).

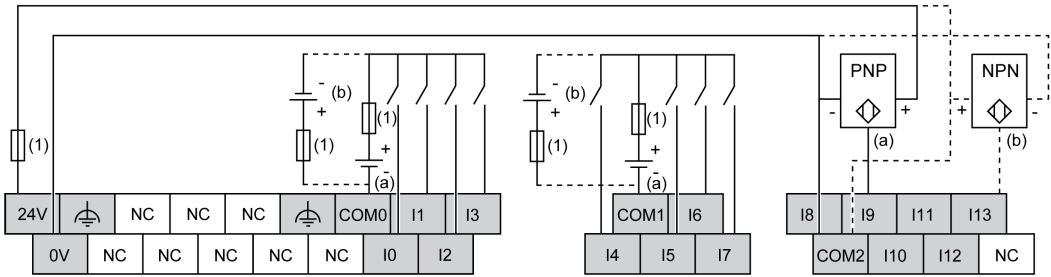
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                          |                                     | Value                                                                                                   |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                         |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                           |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                           | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                         | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                         |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                              |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                           |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                             |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                               | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                         | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                               |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                               |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                           |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                   |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                         |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                         |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| 1 Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller’s digital inputs:



- (1) 0.6 A Type T fuse
- (a) Sink inputs (positive logic)
- (b) Source inputs (negative logic)
- NC Not Connected (N.C.)

**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.**

**WARNING**

**UNINTENDED EQUIPMENT OPERATION**

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

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

## TM218LDAE24DRHN Fast Input

### Overview

The TM218LDAE24DRHN controller is equipped with 4 Fast digital inputs (*see page 116*) which can be used as HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 10.7 mA                                                                                                                                  |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current                             | 13.7 mA                                                                                                                                  |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 1.96 kΩ                                                                                                                                  |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                                                              |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                                                   |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                                                             |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                                                                                                 |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                                                  |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                                                   |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                                                        |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                                                                                                     |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                                                       |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm, (0.29 in.) pitch<br>2 rows are removable                                                                           |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | A/B phase: 50 kHz (20 μs)<br>Single phase: 100 kHz<br>Pulse/Direction: 100 kHz<br>Minimum transition duration: 4 μs                      |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | <ul style="list-style-type: none"> <li>• A/B phase counter</li> <li>• Pulse/Direction counter</li> <li>• Single phase counter</li> </ul> |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                                                          |

**Wiring Diagram**

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 118*).

## TM218LDAE24DRHN Relay Output

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

### 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 (4 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.

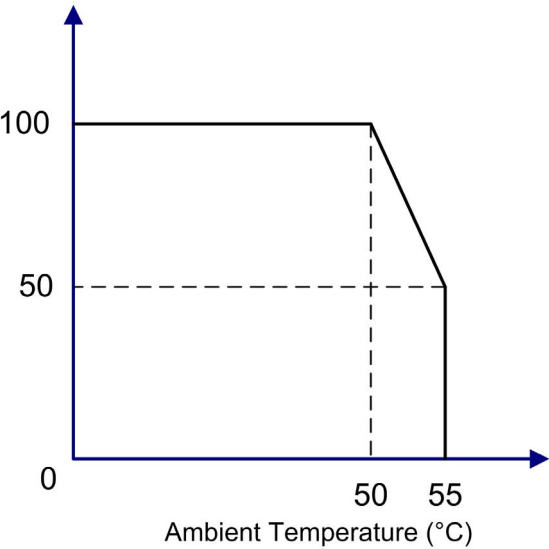
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Relay Output Characteristics

The table below describes the characteristics of the M218 controller relay outputs:

| Characteristic                                                                                                                                |                                           | Value                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                                           | 24 Vdc, 220 Vac                                                                       |
| Input range                                                                                                                                   |                                           | 5...30 Vdc, 100...250 Vac                                                             |
| Rated current                                                                                                                                 |                                           | Maximum 2 A for each point (see de-rating curve below)                                |
| Current/group (4 points)                                                                                                                      |                                           | 4 A (see de-rating curve below)                                                       |
| Inrush values                                                                                                                                 | Maximum switching voltage                 | 250 Vac, 30 Vdc                                                                       |
|                                                                                                                                               | Current/point                             | 5 A                                                                                   |
| Isolation                                                                                                                                     | Between channels within same category:    | None                                                                                  |
|                                                                                                                                               | Between channels in different categories: | 1780 Vac / 2500 Vdc                                                                   |
|                                                                                                                                               | Between channels and internal logic:      | 1780 Vac / 2500 Vdc                                                                   |
| Maximum output frequency                                                                                                                      | With maximum load                         | 0.1 Hz                                                                                |
|                                                                                                                                               | Without load                              | 5 Hz                                                                                  |
| Contact opening time                                                                                                                          |                                           | Typically 5 ms                                                                        |
| Contact closing time                                                                                                                          |                                           | Typically 2 ms                                                                        |
| Resistive load                                                                                                                                |                                           | 2 A/point for 24 Vdc/220 Vac                                                          |
| Mechanical life                                                                                                                               |                                           | 20 million operation minimum at 25 °C (77 °F) for maximum current and voltage ratings |
| Cable length                                                                                                                                  |                                           | Non-shielded: 150 m (492 ft)                                                          |
| Protection against short-circuit                                                                                                              |                                           | No                                                                                    |
| Terminal blocks                                                                                                                               |                                           | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                         |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                           |                                                                                       |

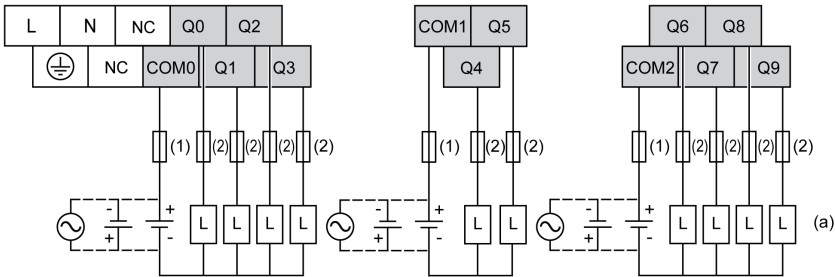
The following illustration shows the relay outputs de-rating curve:  
Output Load Current (%)



**NOTE:** 50% de-rating when all the relay outputs are used at 55 °C (131 °F).

Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's relay outputs:



- (1) 4 A Type T fuse
- (2) 2 A Type T fuse
- NC Not Connected (N.C.)

- (a) To improve the lifetime of the contacts, and to protect from potential inductive load damage, it is recommended to connect:
- a free wheeling diode in parallel to each inductive DC load
  - a RC snubber in parallel of each inductive AC load

**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.

**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.**

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# Chapter 10

## TM218LDA40DRN

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### Overview

This chapter describes the TM218LDA40DRN controller.

### What Is in This Chapter?

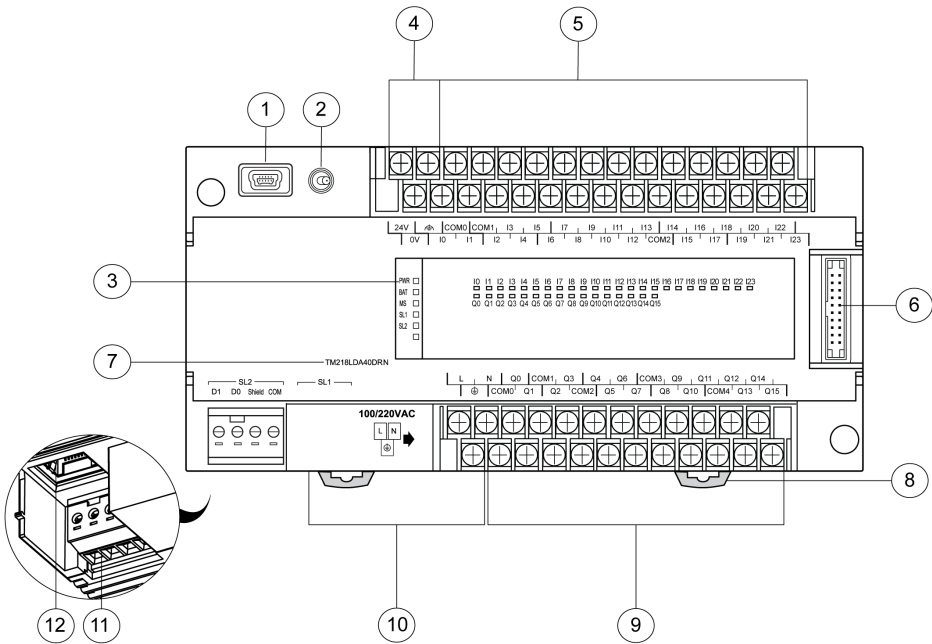
This chapter contains the following topics:

| Topic                       | Page |
|-----------------------------|------|
| TM218LDA40DRN Presentation  | 124  |
| TM218LDA40DRN Digital Input | 126  |
| TM218LDA40DRN Fast Input    | 128  |
| TM218LDA40DRN Relay Output  | 129  |

TM218LDA40DRN Presentation

Overview

The following illustration shows the different components of the TM218LDA40DRN controller:



| N° | Description                                         |
|----|-----------------------------------------------------|
| 1  | USB programming port <i>(see page 224)</i>          |
| 2  | Run/Stop switch <i>(see page 50)</i>                |
| 3  | System and I/O LEDs <i>(see page 48)</i>            |
| 4  | 24 V sensor power supply terminal block             |
| 5  | Input terminal block <i>(see page 125)</i>          |
| 6  | Ribbon cable connector                              |
| 7  | Reference number                                    |
| 8  | DIN rail clip                                       |
| 9  | Output terminal block <i>(see page 125)</i>         |
| 10 | 100...220 Vac power supply terminal block and label |
| 11 | Serial link 2/type RJ45 <i>(see page 227)</i>       |
| 12 | Serial link 1/type RJ45 <i>(see page 225)</i>       |



## TM218LDA40DRN Digital Input

### Overview

See Input Management (*see page 51*) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input), or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the TM218LDA40DRN controller inputs:

| Function                                                          |     | Input function |            |        | HSC/PTO/PWM/FG |
|-------------------------------------------------------------------|-----|----------------|------------|--------|----------------|
|                                                                   |     | None           | RUN/STOP   | Latch  |                |
| Filter type                                                       |     | Integrator     | Integrator | Bounce |                |
| Fast Input <sup>1</sup>                                           | I0  | X              | X          | –      | HSC            |
|                                                                   | I1  | X              | X          | –      | HSC            |
| Digital Input                                                     | I2  | X              | X          | –      | –              |
|                                                                   | I3  | X              | X          | –      | –              |
|                                                                   | I4  | X              | X          | –      | –              |
|                                                                   | I5  | X              | X          | –      | –              |
|                                                                   | I6  | X              | X          | –      | –              |
|                                                                   | I7  | X              | X          | –      | –              |
|                                                                   | I8  | X              | X          | –      | –              |
|                                                                   | I9  | X              | X          | –      | –              |
|                                                                   | I10 | X              | X          | –      | –              |
|                                                                   | I11 | X              | X          | –      | –              |
|                                                                   | I12 | X              | X          | –      | –              |
|                                                                   | I13 | X              | X          | –      | –              |
|                                                                   | I14 | X              | X          | –      | –              |
|                                                                   | I15 | X              | X          | –      | –              |
|                                                                   | I16 | X              | X          | –      | –              |
|                                                                   | I17 | X              | X          | –      | –              |
|                                                                   | I18 | X              | X          | –      | –              |
|                                                                   | I19 | X              | X          | –      | –              |
|                                                                   | I20 | X              | X          | –      | –              |
|                                                                   | I21 | X              | X          | –      | –              |
|                                                                   | I22 | X              | X          | –      | –              |
|                                                                   | I23 | X              | X          | –      | –              |
| X Yes<br>– No<br><sup>1</sup> Can also be used as a regular input |     |                |            |        |                |

You can use filters and functions to manage the controller inputs (*see page 51*).

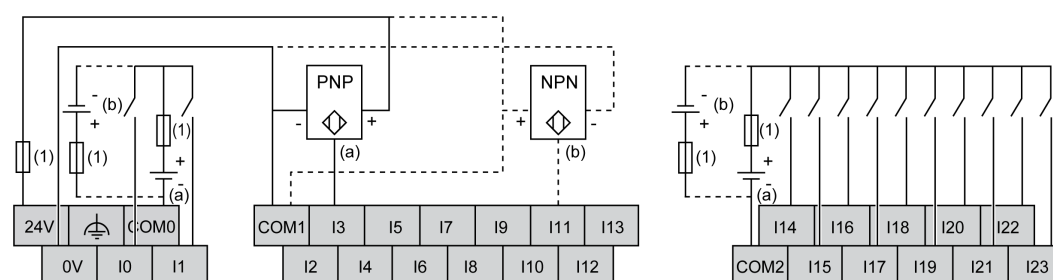
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                          |                                     | Value                                                                                                   |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                         |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                           |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                           | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                         | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                         |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                              |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                           |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                             |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                               | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                         | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                               |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                               |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                           |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                   |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                         |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                         |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| 1 Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

## Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller's digital inputs:



- (1)** 0.6 A Type T fuse  
**(a)** Sink inputs (positive logic)  
**(b)** Source inputs (negative logic)

## ⚠ WARNING

### UNINTENDED EQUIPMENT OPERATION

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

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

## TM218LDA40DRN Fast Input

### Overview

The TM218LDA40DRN controller is equipped with 2 Fast digital inputs (*see page 126*) which can be used as 10 kHz HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the M218 controller reduced Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 9 mA                                                          |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                        |
|                                                                                                                                                                                                                                                                                                | Current                             | 12 mA                                                         |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 2.35 kΩ                                                       |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                   |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                        |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                  |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                      |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                       |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                        |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                      |
| Isolation (Photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                          |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                       |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                        |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>             |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                      |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                          |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                            |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in. pitch)<br>2 rows are removable |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | 10 kHz (100 μs)<br>Minimum transition duration: 40 μs         |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | Single phase counter                                          |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                               |

### Wiring Diagram

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 127*).

## TM218LDA40DRN Relay Output

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

|  <b>DANGER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>FIRE HAZARD</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| <ul style="list-style-type: none"> <li>• Use only the correct wire sizes for the current capacity of the I/O channels and power supplies.</li> <li>• 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).</li> <li>• For common conductors of relay output wiring (4 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).</li> </ul> |  |
| <b>Failure to follow these instructions will result in death or serious injury.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |

|  <b>WARNING</b>            |  |
|-------------------------------------------------------------------------------------------------------------|--|
| <b>UNINTENDED EQUIPMENT OPERATION</b>                                                                       |  |
| Do not exceed any of the rated values specified in the environmental and electrical characteristics tables. |  |
| <b>Failure to follow these instructions can result in death, serious injury, or equipment damage.</b>       |  |

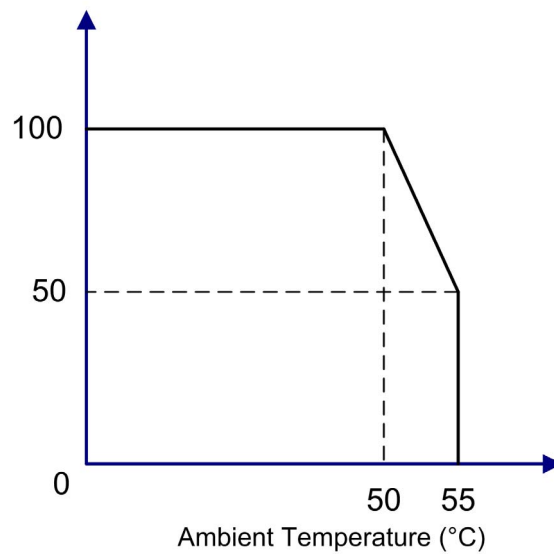
### Relay Output Characteristics

The table below describes the characteristics of the M218 controller relay outputs:

| Characteristic                                                                                                                                |                                           | Value                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                                           | 24 Vdc, 220 Vac                                                                       |
| Input range                                                                                                                                   |                                           | 5...30 Vdc, 100...250 Vac                                                             |
| Rated current                                                                                                                                 |                                           | Maximum 2 A for each point (see de-rating curve below)                                |
| Current/group (4 points)                                                                                                                      |                                           | 4 A (see de-rating curve below)                                                       |
| Inrush values                                                                                                                                 | Maximum switching voltage                 | 250 Vac, 30 Vdc                                                                       |
|                                                                                                                                               | Current/point                             | 5 A                                                                                   |
| Isolation                                                                                                                                     | Between channels within same category:    | None                                                                                  |
|                                                                                                                                               | Between channels in different categories: | 1780 Vac / 2500 Vdc                                                                   |
|                                                                                                                                               | Between channels and internal logic:      | 1780 Vac / 2500 Vdc                                                                   |
| Maximum output frequency                                                                                                                      | With maximum load                         | 0.1 Hz                                                                                |
|                                                                                                                                               | Without load                              | 5 Hz                                                                                  |
| Contact opening time                                                                                                                          |                                           | Typically 5 ms                                                                        |
| Contact closing time                                                                                                                          |                                           | Typically 2 ms                                                                        |
| Resistive load                                                                                                                                |                                           | 2 A/point for 24 Vdc/220 Vac                                                          |
| Mechanical life                                                                                                                               |                                           | 20 million operation minimum at 25 °C (77 °F) for maximum current and voltage ratings |
| Cable length                                                                                                                                  |                                           | Non-shielded: 150 m (492 ft)                                                          |
| Protection against short-circuit                                                                                                              |                                           | No                                                                                    |
| Terminal blocks                                                                                                                               |                                           | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                         |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                           |                                                                                       |

The following illustration shows the relay outputs de-rating curve:

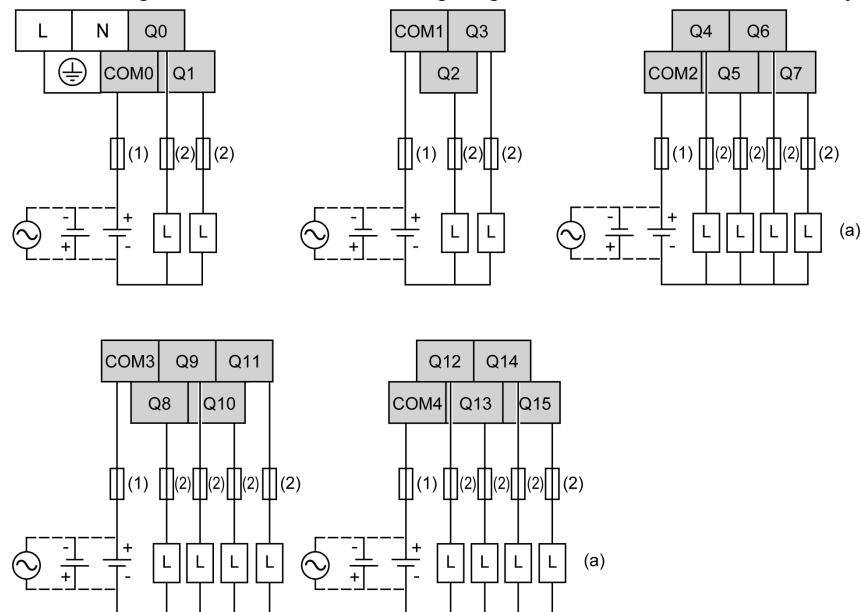
Output Load Current (%)



**NOTE:** 50% de-rating when all the relay outputs are used at 55 °C (131 °F).

### Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's relay outputs:



- (1) 4 A Type T fuse  
(2) 2 A Type T fuse

(a) To improve the lifetime of the contacts, and to protect from potential inductive load damage, it is recommended to connect:

- a free wheeling diode in parallel to each inductive DC load
- a RC snubber in parallel of each inductive AC load

**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.

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# Chapter 11

## TM218LDA40DRPHN

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### Overview

This chapter describes the TM218LDA40DRPHN controller.

### What Is in This Chapter?

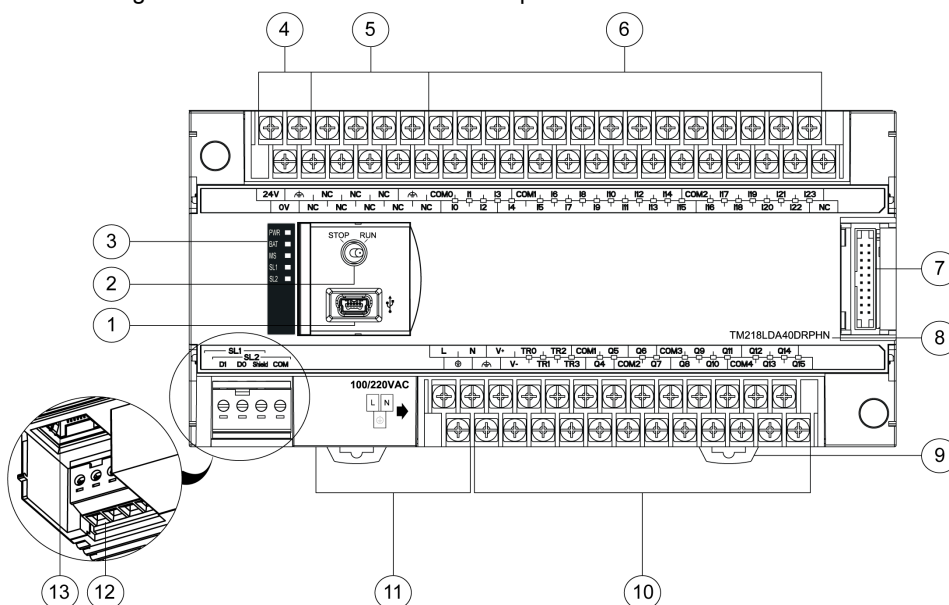
This chapter contains the following topics:

| Topic                         | Page |
|-------------------------------|------|
| TM218LDA40DRPHN Presentation  | 132  |
| TM218LDA40DRPHN Digital Input | 134  |
| TM218LDA40DRPHN Fast Input    | 137  |
| TM218LDA40DRPHN Relay Output  | 139  |
| TM218LDA40DRPHN Fast Output   | 141  |

## TM218LDA40DRPHN Presentation

### Overview

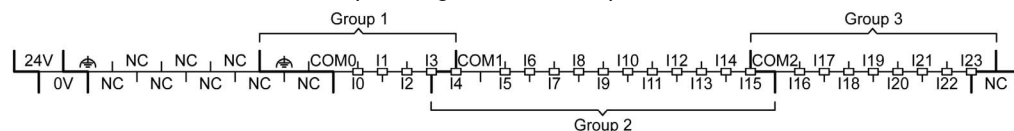
The following illustration shows the different components of TM218LDA40DRPHN controller:



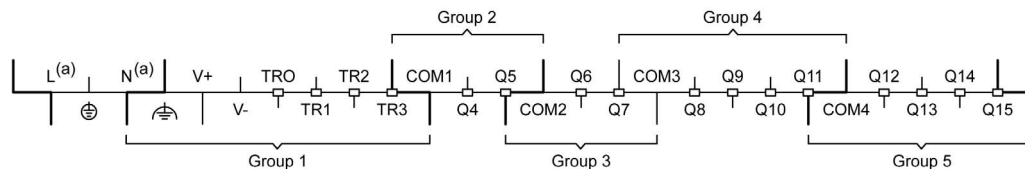
| N° | Description                                          |
|----|------------------------------------------------------|
| 1  | USB programming port ( <i>see page 224</i> )         |
| 2  | Run/Stop switch ( <i>see page 50</i> )               |
| 3  | System LEDs ( <i>see page 48</i> )                   |
| 4  | 24 V sensor power supply terminal block              |
| 5  | Not used in this controller model                    |
| 6  | Input terminal block ( <i>see page 133</i> )         |
| 7  | Ribbon cable connector                               |
| 8  | Reference number                                     |
| 9  | DIN rail clip                                        |
| 10 | Output terminal block ( <i>see page 133</i> )        |
| 11 | 100...220 Vac power supply terminal block and label  |
| 12 | Serial link 2/terminal block ( <i>see page 227</i> ) |
| 13 | Serial link 1/type RJ45 ( <i>see page 225</i> )      |

## Terminal Blocks

The illustration below shows the pin assignment of the input terminal block:



The illustration below shows the pin assignment of the output terminal block:



(a) 100...220 Vac power supply terminals are located in the output terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

## DANGER

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

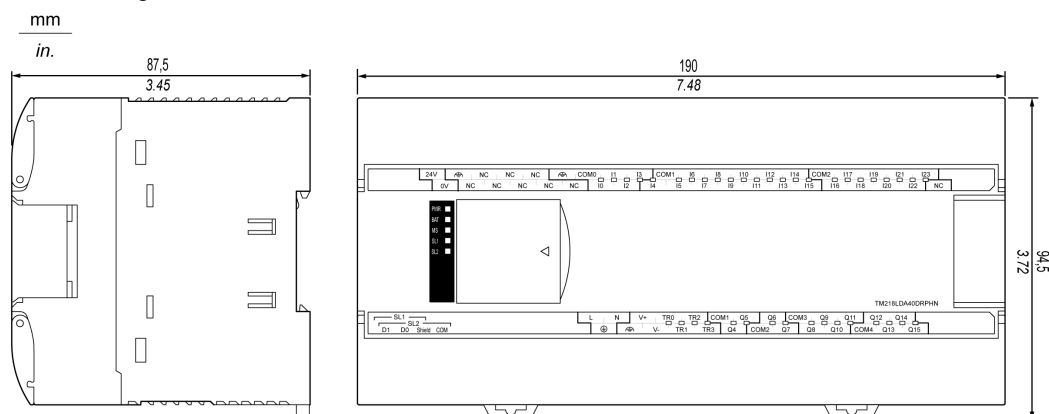
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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.**

**NOTE:** I/O status LEDs ([see page 49](#)) are embedded in the input and output terminal block labels.

## Dimensions

The following illustration shows the external dimensions of the TM218LDA40DRPHN controller:



## TM218LDA40DRPHN Digital Input

### Overview

See Input Management ([see page 51](#)) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input), or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the controller inputs:

| Function      |     | Input function |            |        |        | HSC/PTO/PWM/FG |
|---------------|-----|----------------|------------|--------|--------|----------------|
|               |     | None           | RUN/STOP   | Latch  | Event  |                |
| Filter type   |     | Integrator     | Integrator | Bounce | Bounce |                |
| Fast Input    | I0  | X              | X          | X      | X      | HSC            |
|               | I1  | X              | X          | X      | X      | HSC            |
|               | I2  | X              | X          | X      | X      | HSC            |
|               | I3  | X              | X          | X      | X      | HSC            |
| Digital Input | I4  | X              | X          | –      | –      | HSC            |
|               | I5  | X              | X          | –      | –      | HSC            |
|               | I6  | X              | X          | –      | –      | HSC            |
|               | I7  | X              | X          | –      | –      | HSC            |
|               | I8  | X              | X          | –      | –      | –              |
|               | I9  | X              | X          | –      | –      | –              |
|               | I10 | X              | X          | –      | –      | –              |
|               | I11 | X              | X          | –      | –      | –              |
|               | I12 | X              | X          | –      | –      | –              |
|               | I13 | X              | X          | –      | –      | –              |
|               | I14 | X              | X          | –      | –      | –              |
|               | I15 | X              | X          | –      | –      | –              |
|               | I16 | X              | X          | –      | –      | –              |
|               | I17 | X              | X          | –      | –      | –              |
|               | I18 | X              | X          | –      | –      | –              |
|               | I19 | X              | X          | –      | –      | –              |
|               | I20 | X              | X          | –      | –      | –              |
|               | I21 | X              | X          | –      | –      | –              |
|               | I22 | X              | X          | –      | –      | –              |
|               | I23 | X              | X          | –      | –      | –              |
| X Yes<br>– No |     |                |            |        |        |                |

You can use filters and functions to manage the controller inputs ([see page 51](#)).

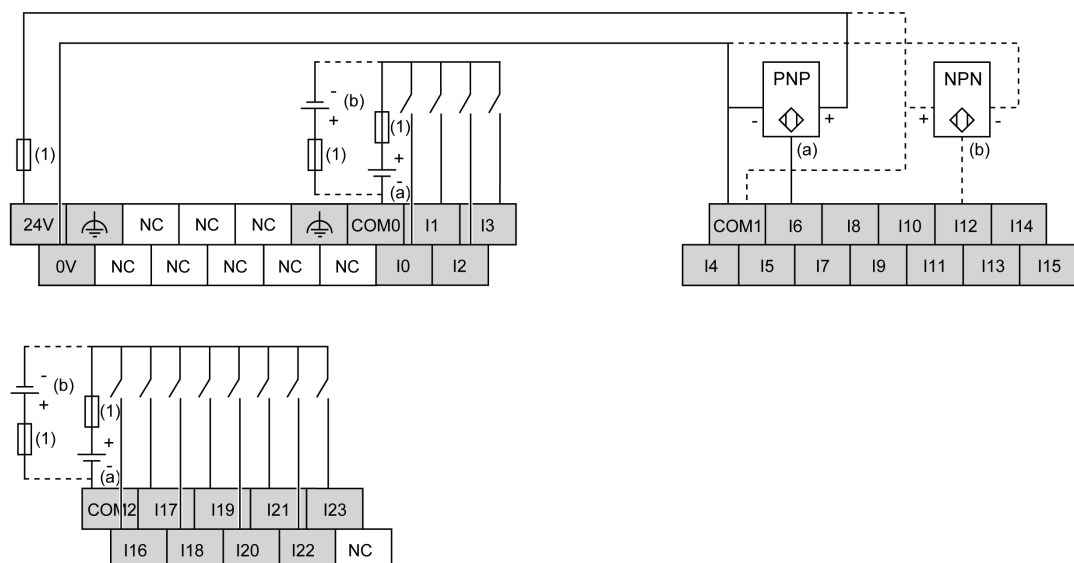
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                   |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                                |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                                | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                                      |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                          |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

## Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller's digital inputs:



- (1)** 0.6 A Type T fuse  
**(a)** Sink inputs (positive logic)  
**(b)** Source inputs (negative logic)  
**NC** Not Connected (N.C.)

** 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.**

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

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

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

## TM218LDA40DRPHN Fast Input

### Overview

The TM218LDA40DRPHN controller is equipped with 4 Fast digital inputs (*see page 134*) which can be used as HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 10.7 mA                                                                                                                                  |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current                             | 13.7 mA                                                                                                                                  |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 1.96 kΩ                                                                                                                                  |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                                                              |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                                                   |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                                                             |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                                                                                                 |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                                                  |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                                                   |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                                                        |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                                                                                                     |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                                                       |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm, (0.29 in.) pitch<br>2 rows are removable                                                                           |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | A/B phase: 50 kHz (20 μs)<br>Single phase: 100 kHz<br>Pulse/Direction: 100 kHz<br>Minimum transition duration: 4 μs                      |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | <ul style="list-style-type: none"> <li>• A/B phase counter</li> <li>• Pulse/Direction counter</li> <li>• Single phase counter</li> </ul> |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                                                          |

**Wiring Diagram**

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 135*).

## TM218LDA40DRPHN Relay Output

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

### 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 (4 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.**

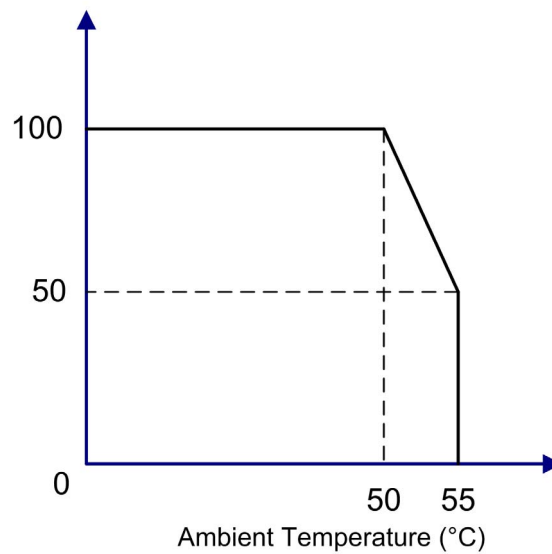
### Relay Output Characteristics

The table below describes the characteristics of the M218 controller relay outputs:

| Characteristic                                                                                                                                |                                           | Value                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                                           | 24 Vdc, 220 Vac                                                                       |
| Input range                                                                                                                                   |                                           | 5...30 Vdc, 100...250 Vac                                                             |
| Rated current                                                                                                                                 |                                           | Maximum 2 A for each point (see de-rating curve below)                                |
| Current/group (4 points)                                                                                                                      |                                           | 4 A (see de-rating curve below)                                                       |
| Inrush values                                                                                                                                 | Maximum switching voltage                 | 250 Vac, 30 Vdc                                                                       |
|                                                                                                                                               | Current/point                             | 5 A                                                                                   |
| Isolation                                                                                                                                     | Between channels within same category:    | None                                                                                  |
|                                                                                                                                               | Between channels in different categories: | 1780 Vac / 2500 Vdc                                                                   |
|                                                                                                                                               | Between channels and internal logic:      | 1780 Vac / 2500 Vdc                                                                   |
| Maximum output frequency                                                                                                                      | With maximum load                         | 0.1 Hz                                                                                |
|                                                                                                                                               | Without load                              | 5 Hz                                                                                  |
| Contact opening time                                                                                                                          |                                           | Typically 5 ms                                                                        |
| Contact closing time                                                                                                                          |                                           | Typically 2 ms                                                                        |
| Resistive load                                                                                                                                |                                           | 2 A/point for 24 Vdc/220 Vac                                                          |
| Mechanical life                                                                                                                               |                                           | 20 million operation minimum at 25 °C (77 °F) for maximum current and voltage ratings |
| Cable length                                                                                                                                  |                                           | Non-shielded: 150 m (492 ft)                                                          |
| Protection against short-circuit                                                                                                              |                                           | No                                                                                    |
| Terminal blocks                                                                                                                               |                                           | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                         |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                           |                                                                                       |

The following illustration shows the Relay Outputs De-rating curve:

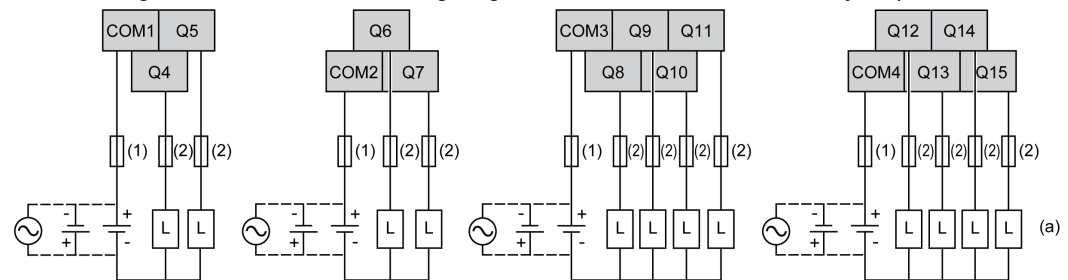
Output Load Current (%)



**NOTE:** 50% de-rating when all the relay outputs are used at 55 °C (131 °F).

### Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's relay outputs:



(1) 4 A Type T fuse

(2) 2 A Type T fuse

(a) To improve the lifetime of the contacts, and to protect from potential inductive load damage, it is recommended to connect:

- a free wheeling diode in parallel to each inductive DC load
- a RC snubber in parallel of each inductive AC load

**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.

## TM218LDA40DRPHN Fast Output

### Overview

The TM218LDA40DRPHN controller is equipped with 4 digital outputs which can be used for Fast outputs (*see page 53*).

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Output Characteristics

For additional information about fast output protection, refer to Protecting Outputs from Inductive Load Damage (*see page 36*).

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

Be sure to wire the Fast output correctly according to the wiring diagram.

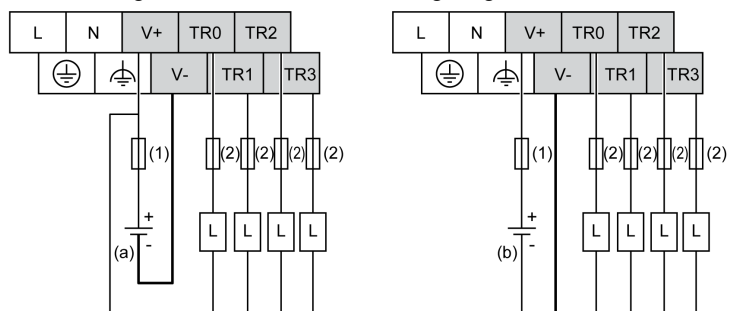
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The table below describes the characteristics of the M218 controller Fast outputs:

| Characteristic                           |                                                                | Value                                                         |
|------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------|
| Output type                              |                                                                | Push/Pull                                                     |
| Rated voltage                            |                                                                | 24 Vdc                                                        |
| PTO power supply input range             |                                                                | 19.2...28.8 Vdc                                               |
| PTO power supply reverse protection      |                                                                | Yes                                                           |
| PTO/PWM output current                   | Standard output                                                | 0.3 A                                                         |
|                                          | Fast output                                                    | 50 mA                                                         |
| Response time for origin auxiliary input |                                                                | 2 ms                                                          |
| Isolation resistance                     | Between Fast outputs and internal logic                        | > 10 MΩ                                                       |
|                                          | Between Power supply port and protective ground (PE) = 500 Vdc | > 10 MΩ                                                       |
| Residual voltage                         | for I = 0, 1 A                                                 | < 1.5 Vdc                                                     |
| Minimum load impedance                   |                                                                | 80 Ω                                                          |
| Maximum PTO output frequency             |                                                                | 100 kHz                                                       |
| Maximum PWM output frequency             |                                                                | 1 kHz                                                         |
| Accuracy                                 |                                                                | 20...100 Hz for 0.1%                                          |
|                                          |                                                                | 100 Hz...1 kHz for 1%                                         |
| PWM mode duty rate step                  |                                                                | 20 Hz...1 kHz for 0.1%                                        |
| Duty rate range                          |                                                                | 1...99%                                                       |
| Cable                                    | Type                                                           | Shielded, including 24 Vdc power supply                       |
|                                          | Length                                                         | Maximum 5 m (16 ft)                                           |
| Terminal blocks                          |                                                                | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable |

## Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's Fast outputs:



- (1) 2 A Type T fuse
- (2) 0.5 A Type T fuse
- (a) Sink outputs (positive logic)
- (b) Source outputs (negative logic)

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# Chapter 12

## TM218LDD40DUPHNB

---

### Overview

This chapter describes the TM218LDD40DUPHNB controller.

### What Is in This Chapter?

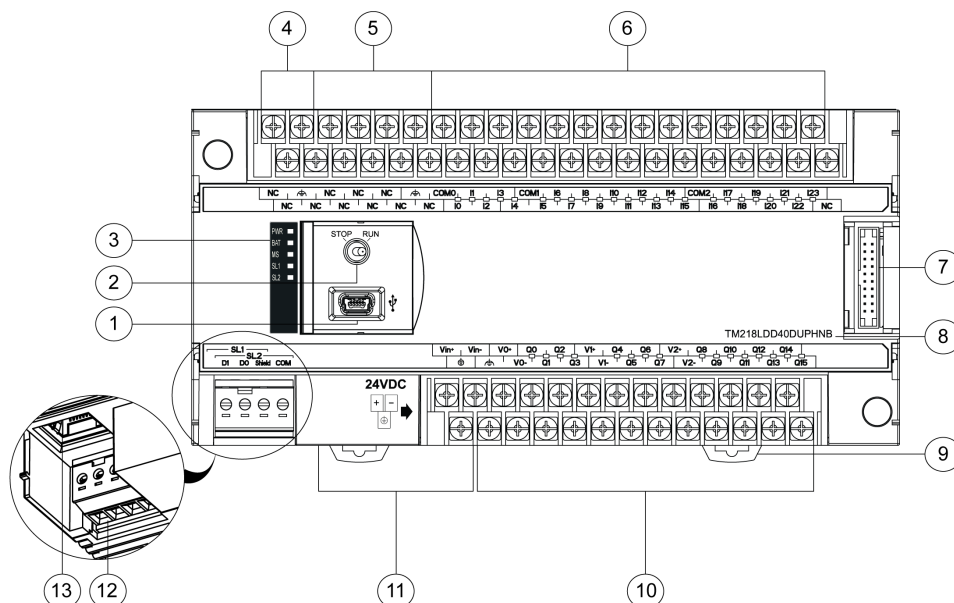
This chapter contains the following topics:

| Topic                           | Page |
|---------------------------------|------|
| TM218LDD40DUPHNB Presentation   | 144  |
| TM218LDD40DUPHNB Digital Input  | 146  |
| TM218LDD40DUPHNB Fast Input     | 149  |
| TM218LDD40DUPHNB Regular Output | 151  |
| TM218LDD40DUPHNB Fast Output    | 153  |

## TM218LDD40DUPHNB Presentation

### Overview

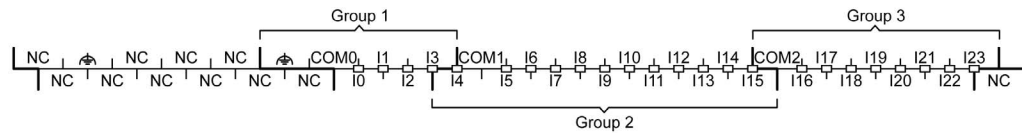
The following illustration shows the different components of TM218LDD40DUPHNB controller:



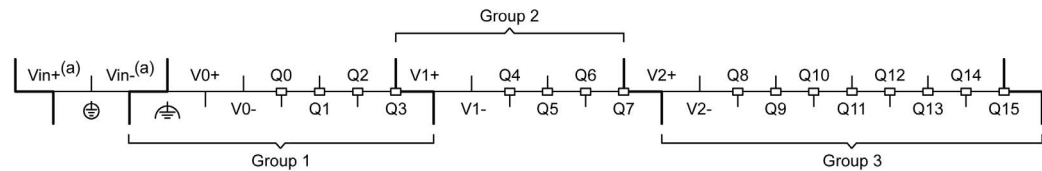
| N° | Description                                                   |
|----|---------------------------------------------------------------|
| 1  | USB programming port ( <a href="#">see page 224</a> )         |
| 2  | Run/Stop switch ( <a href="#">see page 50</a> )               |
| 3  | System LEDs ( <a href="#">see page 48</a> )                   |
| 4  | Not used in this controller model                             |
| 5  | Not used in this controller model                             |
| 6  | Input terminal block ( <a href="#">see page 145</a> )         |
| 7  | Ribbon cable connector                                        |
| 8  | Reference number                                              |
| 9  | DIN rail clip                                                 |
| 10 | Output terminal block ( <a href="#">see page 145</a> )        |
| 11 | 24 Vdc power supply terminal block and label                  |
| 12 | Serial link 2/terminal block ( <a href="#">see page 227</a> ) |
| 13 | Serial link 1/type RJ45 ( <a href="#">see page 225</a> )      |

## Terminal Blocks

The illustration below shows the pin assignment of the input terminal block:



The illustration below shows the pin assignment of the output terminal block:



(a) 24 Vdc power supply terminals are located in the output terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

**DANGER**

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

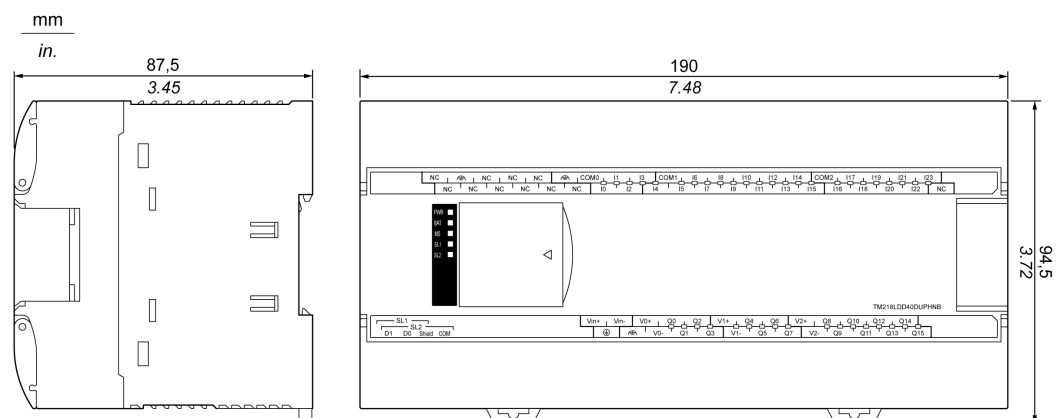
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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.**

**NOTE:** I/O status LEDs ([see page 49](#)) are embedded in the input and output terminal block labels.

## Dimensions

The following illustration shows the external dimensions of the TM218LDD40DUPHNB controller:



## TM218LDD40DUPHNB Digital Input

### Overview

See Input Management ([see page 51](#)) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input), or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the controller inputs:

| Function      |     | Input function |            |        |        | HSC/PTO/PWM/FG |
|---------------|-----|----------------|------------|--------|--------|----------------|
|               |     | None           | RUN/STOP   | Latch  | Event  |                |
| Filter type   |     | Integrator     | Integrator | Bounce | Bounce |                |
| Fast Input    | I0  | X              | X          | X      | X      | HSC            |
|               | I1  | X              | X          | X      | X      | HSC            |
|               | I2  | X              | X          | X      | X      | HSC            |
|               | I3  | X              | X          | X      | X      | HSC            |
| Digital Input | I4  | X              | X          | –      | –      | HSC            |
|               | I5  | X              | X          | –      | –      | HSC            |
|               | I6  | X              | X          | –      | –      | HSC            |
|               | I7  | X              | X          | –      | –      | HSC            |
|               | I8  | X              | X          | –      | –      | –              |
|               | I9  | X              | X          | –      | –      | –              |
|               | I10 | X              | X          | –      | –      | –              |
|               | I11 | X              | X          | –      | –      | –              |
|               | I12 | X              | X          | –      | –      | –              |
|               | I13 | X              | X          | –      | –      | –              |
|               | I14 | X              | X          | –      | –      | –              |
|               | I15 | X              | X          | –      | –      | –              |
|               | I16 | X              | X          | –      | –      | –              |
|               | I17 | X              | X          | –      | –      | –              |
|               | I18 | X              | X          | –      | –      | –              |
|               | I19 | X              | X          | –      | –      | –              |
|               | I20 | X              | X          | –      | –      | –              |
|               | I21 | X              | X          | –      | –      | –              |
|               | I22 | X              | X          | –      | –      | –              |
|               | I23 | X              | X          | –      | –      | –              |
| X Yes<br>– No |     |                |            |        |        |                |

You can use filters and functions to manage the controller inputs ([see page 51](#)).

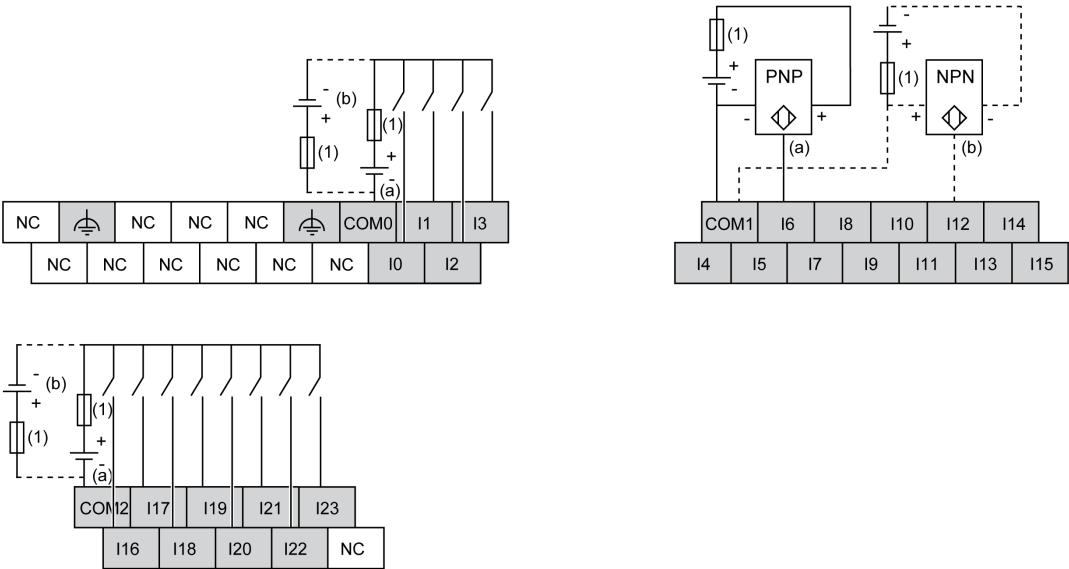
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                          |                                     | Value                                                                                                   |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                         |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                           |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                           | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                         | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                         |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                              |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                           |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                             |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                               | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                         | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                               |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                               |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                           |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                   |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                         |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                         |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| 1 Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller’s digital inputs:



- (1) 0.6 A Type T fuse
- (a) Sink inputs (positive logic)
- (b) Source inputs (negative logic)
- NC Not Connected (N.C.)

**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.**

**WARNING**

**UNINTENDED EQUIPMENT OPERATION**

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

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

## TM218LDD40DUPHNB Fast Input

### Overview

The TM218LDD40DUPHNB controller is equipped with 4 Fast digital inputs ([see page 146](#)) which can be used as HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 7.5 mA                                                                                                                                   |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current                             | 9.5 mA                                                                                                                                   |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 2.8 kΩ                                                                                                                                   |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                                                              |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                                                   |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                                                             |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                                                                                                 |
| Isolation (photo couple)                                                                                                                                                                                                                                                                       | Between channels                    | None                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                                                  |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                                                   |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                                                        |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                                                                                                     |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                                                       |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm, (0.29 in.) pitch<br>2 rows are removable                                                                           |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | A/B phase: 50 kHz (20 μs)<br>Single phase: 100 kHz<br>Pulse/Direction: 100 kHz<br>Minimum transition duration: 4 μs                      |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | <ul style="list-style-type: none"> <li>• A/B phase counter</li> <li>• Pulse/Direction counter</li> <li>• Single phase counter</li> </ul> |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                                                          |

### Wiring Diagram

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 148*).

## TM218LDD40DUPHNB Regular Output

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.

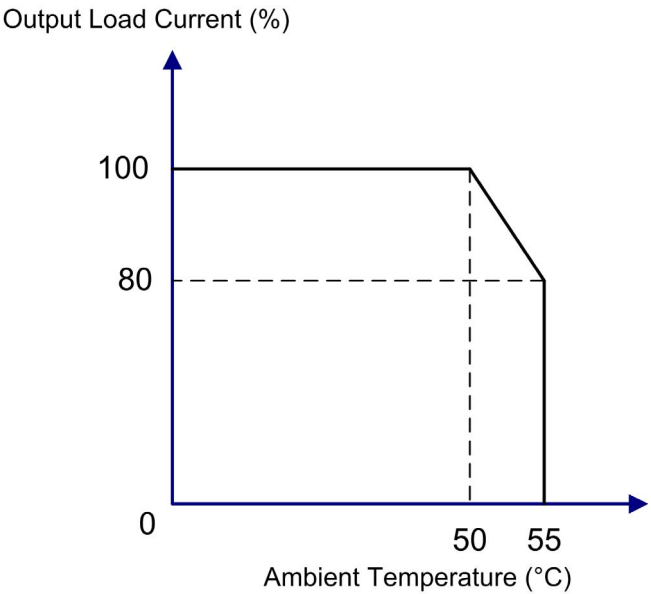
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Regular Output Characteristics

The table below describes the characteristics of the M218 controller regular outputs:

| Characteristic                                                                                                                                |                                    | Value                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                                    | 24 Vdc                                                                                                                                                                                                                                                        |
| Input range                                                                                                                                   |                                    | 20.4...28.8 Vdc                                                                                                                                                                                                                                               |
| Rated current                                                                                                                                 |                                    | Maximum 0.3 A for each point (see de-rating curve below)                                                                                                                                                                                                      |
| Current/group (4 points)                                                                                                                      |                                    | 1.2 A (see de-rating curve below)                                                                                                                                                                                                                             |
| Residual voltage                                                                                                                              |                                    | <1.5 Vdc for I = 0.1 A                                                                                                                                                                                                                                        |
| Delay                                                                                                                                         |                                    | Off to On (0.3 A Load):<br><ul style="list-style-type: none"> <li>• (Q4 to Q7): 30 µs</li> <li>• (Q8 to Q15): 50 µs</li> </ul> On to Off (0.3 A Load):<br><ul style="list-style-type: none"> <li>• (Q4 to Q7): 0.3 ms</li> <li>• (Q8 to Q15): 1 ms</li> </ul> |
| Isolation (photo coupler)                                                                                                                     | Between channels                   | None                                                                                                                                                                                                                                                          |
|                                                                                                                                               | Between channel and internal logic | 500 Vdc                                                                                                                                                                                                                                                       |
| Minimum resistor load                                                                                                                         |                                    | 80 Ω at 24 Vdc                                                                                                                                                                                                                                                |
| Cable length                                                                                                                                  |                                    | Non-shielded: 150 m (492 ft)                                                                                                                                                                                                                                  |
| Protection against short-circuit                                                                                                              |                                    | Yes                                                                                                                                                                                                                                                           |
| Terminal blocks                                                                                                                               |                                    | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                                                                                                                                                                                 |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                    |                                                                                                                                                                                                                                                               |

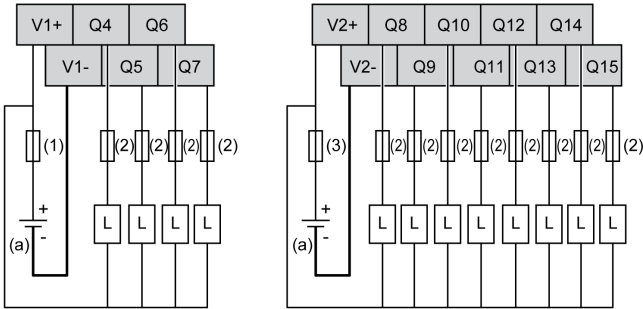
The following illustration shows the regular output de-rating curve:



**NOTE:** 80% de-rating when all the outputs are used at 55 °C (131 °F).

Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's regular outputs:



**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.

## TM218LDD40DUPHNB Fast Output

### Overview

The TM218LDD40DUPHNB controller is equipped with 2 regular outputs which can be used for Fast outputs (*see page 53*).

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### PTO Output Characteristics

For additional information about fast output protection, refer to Protecting Outputs from Inductive Load Damage (*see page 36*).

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

Be sure to wire the Fast output correctly according to the wiring diagram.

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

The table below describes the characteristics of the M218 controller Fast outputs:

| Characteristic                           |                                                                | Value                                                         |
|------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------|
| Output type                              |                                                                | Push/Pull                                                     |
| Rated voltage                            |                                                                | 24 Vdc                                                        |
| PTO power supply input range             |                                                                | 19.2...28.8 Vdc                                               |
| PTO power supply reverse protection      |                                                                | Yes                                                           |
| PTO/PWM output current                   | Standard output                                                | 0.3 A                                                         |
|                                          | Fast output                                                    | 50 mA                                                         |
| Response time for origin auxiliary input |                                                                | 2 ms                                                          |
| Isolation resistance                     | Between Fast outputs and internal logic                        | > 10 MΩ                                                       |
|                                          | Between Power supply port and protective ground (PE) = 500 Vdc | > 10 MΩ                                                       |
| Residual voltage                         | for I = 0, 1 A                                                 | < 1.5 Vdc                                                     |
| Minimum load impedance                   |                                                                | 80 Ω                                                          |
| Maximum PTO output frequency             |                                                                | 100 kHz                                                       |
| Maximum PWM output frequency             |                                                                | 1 kHz                                                         |
| Accuracy                                 |                                                                | 20...100 Hz for 0.1%                                          |
|                                          |                                                                | 100 Hz...1 kHz for 1%                                         |
| PWM mode duty rate step                  |                                                                | 20 Hz...1 kHz for 0.1%                                        |
| Duty rate range                          |                                                                | 1...99%                                                       |
| Cable                                    | Type                                                           | Shielded, including 24 Vdc power supply                       |
|                                          | Length                                                         | Maximum 5 m (16 ft)                                           |
| Terminal blocks                          |                                                                | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable |



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# Chapter 13

## TM218LDAE40DRPHN

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### Overview

This chapter describes the TM218LDAE40DRPHN controller.

### What Is in This Chapter?

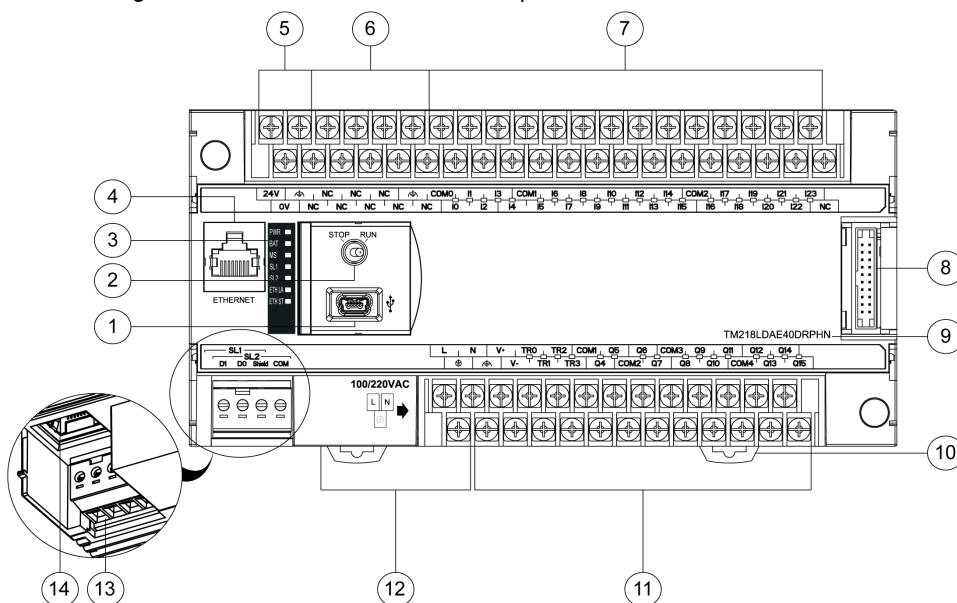
This chapter contains the following topics:

| Topic                          | Page |
|--------------------------------|------|
| TM218LDAE40DRPHN Presentation  | 156  |
| TM218LDAE40DRPHN Digital Input | 158  |
| TM218LDAE40DRPHN Fast Input    | 161  |
| TM218LDAE40DRPHN Relay Output  | 163  |
| TM218LDAE40DRPHN Fast Output   | 165  |

## TM218LDAE40DRPHN Presentation

### Overview

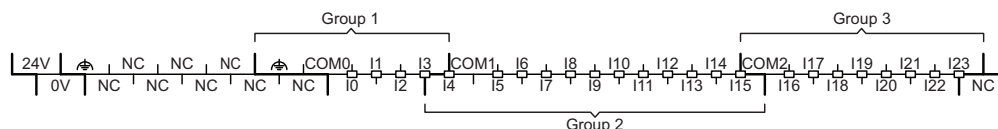
The following illustration shows the different components of the TM218LDAE40DRPHN controller:



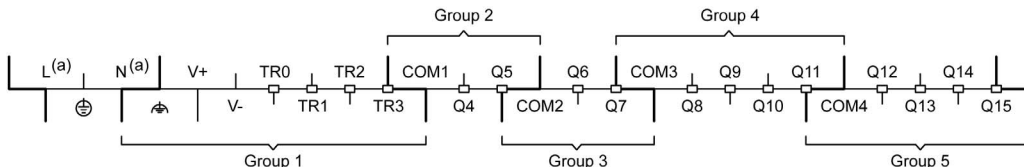
| N° | Description                                                   |
|----|---------------------------------------------------------------|
| 1  | USB programming port ( <a href="#">see page 224</a> )         |
| 2  | Run/Stop switch ( <a href="#">see page 50</a> )               |
| 3  | System LEDs ( <a href="#">see page 48</a> )                   |
| 4  | Ethernet port ( <a href="#">see page 222</a> )                |
| 5  | 24 V sensor power supply terminal block                       |
| 6  | Not used in this controller model                             |
| 7  | Input terminal block ( <a href="#">see page 157</a> )         |
| 8  | Ribbon cable connector                                        |
| 9  | Reference number                                              |
| 10 | DIN rail clip                                                 |
| 11 | Output terminal block ( <a href="#">see page 157</a> )        |
| 12 | 100...220 Vac power supply terminal block and label           |
| 13 | Serial link 2/terminal block ( <a href="#">see page 227</a> ) |
| 14 | Serial link 1/type RJ45 ( <a href="#">see page 225</a> )      |

## Terminal Blocks

The illustration below shows the pin assignment of the input terminal block:



The illustration below shows the pin assignment of the output terminal block:



(a) 100...220 Vac power supply terminals are located in the output terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

## ⚡ ⚠ DANGER

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

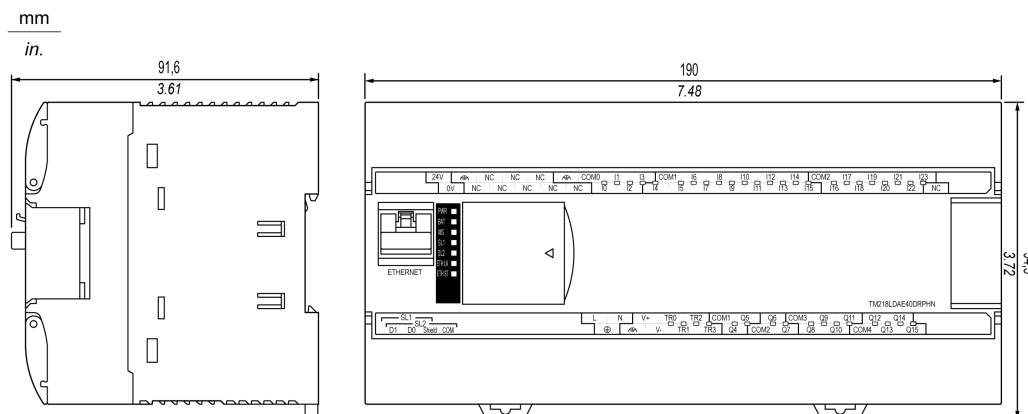
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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.**

**NOTE:** I/O status LEDs ([see page 49](#)) are embedded in the input and output terminal block labels.

## Dimensions

The following figure shows the external dimensions of the TM218LDAE40DRPHN controller:



## TM218LDAE40DRPHN Digital Input

### Overview

See Input Management ([see page 51](#)) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input), or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the controller inputs:

| Function      |     | Input function |            |        |        | HSC/PTO/PWM/FG |
|---------------|-----|----------------|------------|--------|--------|----------------|
|               |     | None           | RUN/STOP   | Latch  | Event  |                |
| Filter type   |     | Integrator     | Integrator | Bounce | Bounce |                |
| Fast Input    | I0  | X              | X          | X      | X      | HSC            |
|               | I1  | X              | X          | X      | X      | HSC            |
|               | I2  | X              | X          | X      | X      | HSC            |
|               | I3  | X              | X          | X      | X      | HSC            |
| Digital Input | I4  | X              | X          | –      | –      | HSC            |
|               | I5  | X              | X          | –      | –      | HSC            |
|               | I6  | X              | X          | –      | –      | HSC            |
|               | I7  | X              | X          | –      | –      | HSC            |
|               | I8  | X              | X          | –      | –      | –              |
|               | I9  | X              | X          | –      | –      | –              |
|               | I10 | X              | X          | –      | –      | –              |
|               | I11 | X              | X          | –      | –      | –              |
|               | I12 | X              | X          | –      | –      | –              |
|               | I13 | X              | X          | –      | –      | –              |
|               | I14 | X              | X          | –      | –      | –              |
|               | I15 | X              | X          | –      | –      | –              |
|               | I16 | X              | X          | –      | –      | –              |
|               | I17 | X              | X          | –      | –      | –              |
|               | I18 | X              | X          | –      | –      | –              |
|               | I19 | X              | X          | –      | –      | –              |
|               | I20 | X              | X          | –      | –      | –              |
|               | I21 | X              | X          | –      | –      | –              |
|               | I22 | X              | X          | –      | –      | –              |
|               | I23 | X              | X          | –      | –      | –              |
| X Yes<br>– No |     |                |            |        |        |                |

You can use filters and functions to manage the controller inputs ([see page 51](#)).

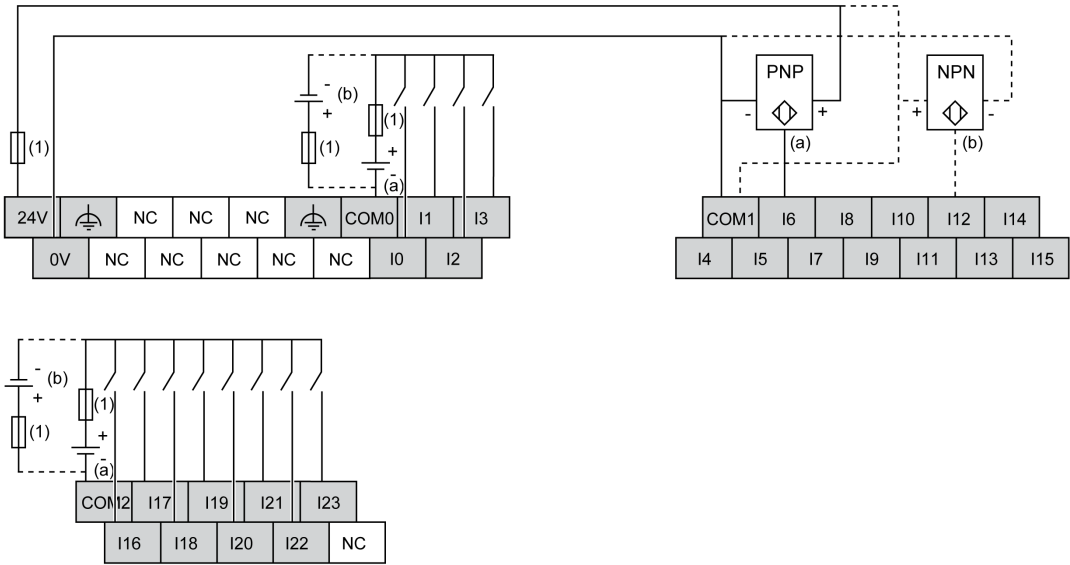
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                   |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                                |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                                | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                                      |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                          |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller’s digital inputs:



- (1) 0.6 A Type T fuse  
(a) Sink inputs (positive logic)  
(b) Source inputs (negative logic)  
NC Not Connected (N.C.)

**⚠ 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.**

**⚠ WARNING**

**UNINTENDED EQUIPMENT OPERATION**

Use the sensor and actuator power supply only for supplying power to sensors or actuators connected to the controller.  
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## TM218LDAE40DRPHN Fast Input

### Overview

The TM218LDAE40DRPHN controller is equipped with 4 Fast digital inputs (*see page 158*) which can be used as HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 10.7 mA                                                                                                                                  |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current                             | 13.7 mA                                                                                                                                  |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 1.96 kΩ                                                                                                                                  |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                                                              |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                                                   |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                                                             |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                                                                                                 |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                                                  |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                                                   |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                                                        |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                                                                                                     |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                                                       |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm, (0.29 in.) pitch<br>2 rows are removable                                                                           |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | A/B phase: 50 kHz (20 μs)<br>Single phase: 100 kHz<br>Pulse/Direction: 100 kHz<br>Minimum transition duration: 4 μs                      |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | <ul style="list-style-type: none"> <li>• A/B phase counter</li> <li>• Pulse/Direction counter</li> <li>• Single phase counter</li> </ul> |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                                                          |

**Wiring Diagram**

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 160*).

## TM218LDAE40DRPHN Relay Output

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

### 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 (4 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.**

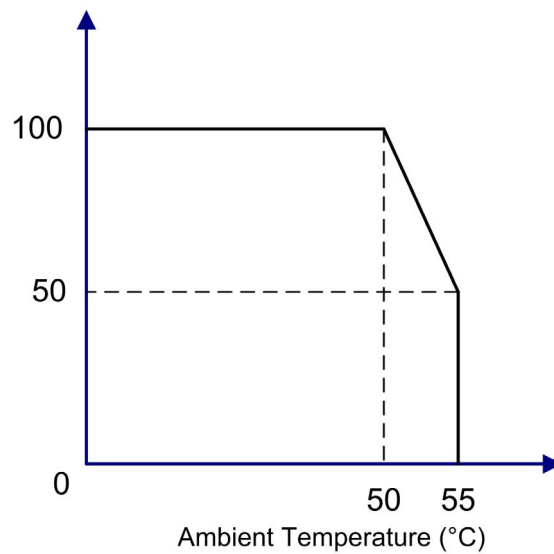
### Relay Output Characteristics

The table below describes the characteristics of the M218 controller relay outputs:

| Characteristic                                                                                                                                |                                           | Value                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                                           | 24 Vdc, 220 Vac                                                                       |
| Input range                                                                                                                                   |                                           | 5...30 Vdc, 100...250 Vac                                                             |
| Rated current                                                                                                                                 |                                           | Maximum 2 A for each point (see de-rating curve below)                                |
| Current/group (4 points)                                                                                                                      |                                           | 4 A (see de-rating curve below)                                                       |
| Inrush values                                                                                                                                 | Maximum switching voltage                 | 250 Vac, 30 Vdc                                                                       |
|                                                                                                                                               | Current/point                             | 5 A                                                                                   |
| Isolation                                                                                                                                     | Between channels within same category:    | None                                                                                  |
|                                                                                                                                               | Between channels in different categories: | 1780 Vac / 2500 Vdc                                                                   |
|                                                                                                                                               | Between channels and internal logic:      | 1780 Vac / 2500 Vdc                                                                   |
| Maximum output frequency                                                                                                                      | With maximum load                         | 0.1 Hz                                                                                |
|                                                                                                                                               | Without load                              | 5 Hz                                                                                  |
| Contact opening time                                                                                                                          |                                           | Typically 5 ms                                                                        |
| Contact closing time                                                                                                                          |                                           | Typically 2 ms                                                                        |
| Resistive load                                                                                                                                |                                           | 2 A/point for 24 Vdc/220 Vac                                                          |
| Mechanical life                                                                                                                               |                                           | 20 million operation minimum at 25 °C (77 °F) for maximum current and voltage ratings |
| Cable length                                                                                                                                  |                                           | Non-shielded: 150 m (492 ft)                                                          |
| Protection against short-circuit                                                                                                              |                                           | No                                                                                    |
| Terminal blocks                                                                                                                               |                                           | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                         |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                           |                                                                                       |

The following illustration shows the Relay Outputs De-rating curve:

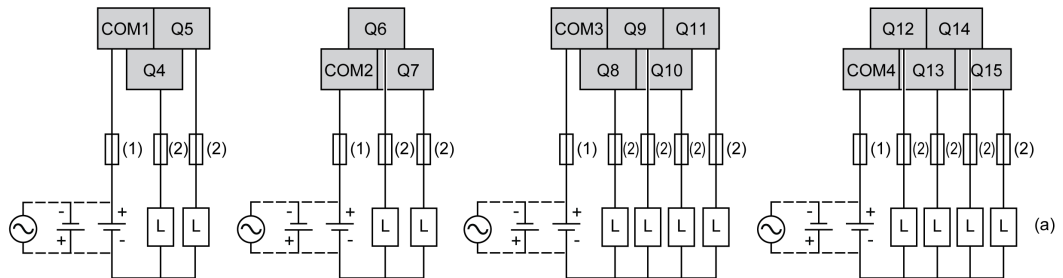
Output Load Current (%)



**NOTE:** 50% de-rating when all the relay outputs are used at 55 °C (131 °F).

### Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's relay outputs:



(1) 4 A Type T fuse

(2) 2 A Type T fuse

NC Not Connected (N.C.)

(a) To improve the lifetime of the contacts, and to protect from potential inductive load damage, it is recommended to connect:

- a free wheeling diode in parallel to each inductive DC load
- a RC snubber in parallel of each inductive AC load

**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.

## TM218LDAE40DRPHN Fast Output

### Overview

The TM218LDAE40DRPHN controller is equipped with 4 digital outputs which can be used for Fast outputs (*see page 53*).

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Output Characteristics

For additional information about fast output protection, refer to Protecting Outputs from Inductive Load Damage (*see page 36*).

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

Be sure to wire the Fast output correctly according to the wiring diagram.

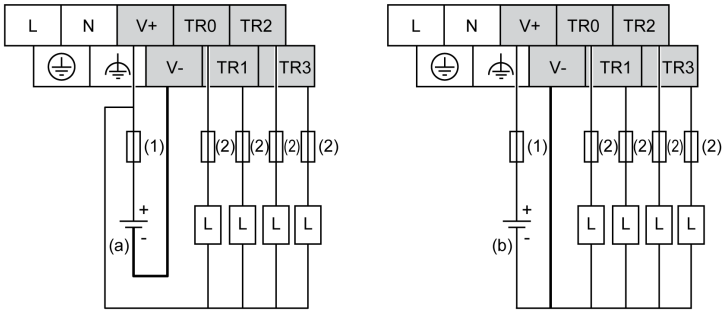
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The table below describes the characteristics of the M218 controller Fast outputs:

| Characteristic                           |                                                                | Value                                                         |
|------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------|
| Output type                              |                                                                | Push/Pull                                                     |
| Rated voltage                            |                                                                | 24 Vdc                                                        |
| PTO power supply input range             |                                                                | 19.2...28.8 Vdc                                               |
| PTO power supply reverse protection      |                                                                | Yes                                                           |
| PTO/PWM output current                   | Standard output                                                | 0.3 A                                                         |
|                                          | Fast output                                                    | 50 mA                                                         |
| Response time for origin auxiliary input |                                                                | 2 ms                                                          |
| Isolation resistance                     | Between Fast outputs and internal logic                        | > 10 MΩ                                                       |
|                                          | Between Power supply port and protective ground (PE) = 500 Vdc | > 10 MΩ                                                       |
| Residual voltage                         | for I = 0, 1 A                                                 | < 1.5 Vdc                                                     |
| Minimum load impedance                   |                                                                | 80 Ω                                                          |
| Maximum PTO output frequency             |                                                                | 100 kHz                                                       |
| Maximum PWM output frequency             |                                                                | 1 kHz                                                         |
| Accuracy                                 |                                                                | 20...100 Hz for 0.1%                                          |
|                                          |                                                                | 100 Hz...1 kHz for 1%                                         |
| PWM mode duty rate step                  |                                                                | 20 Hz...1 kHz for 0.1%                                        |
| Duty rate range                          |                                                                | 1...99%                                                       |
| Cable                                    | Type                                                           | Shielded, including 24 Vdc power supply                       |
|                                          | Length                                                         | Maximum 5 m (16 ft)                                           |
| Terminal blocks                          |                                                                | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable |

Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's Fast outputs:



- (1) 2 A Type T fuse
- (2) 0.5 A Type T fuse
- (a) Sink outputs (positive logic)
- (b) Source outputs (negative logic)

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# Chapter 14

## TM218LDA40DR2HN

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### Overview

This chapter describes the TM218LDA40DR2HN controller.

### What Is in This Chapter?

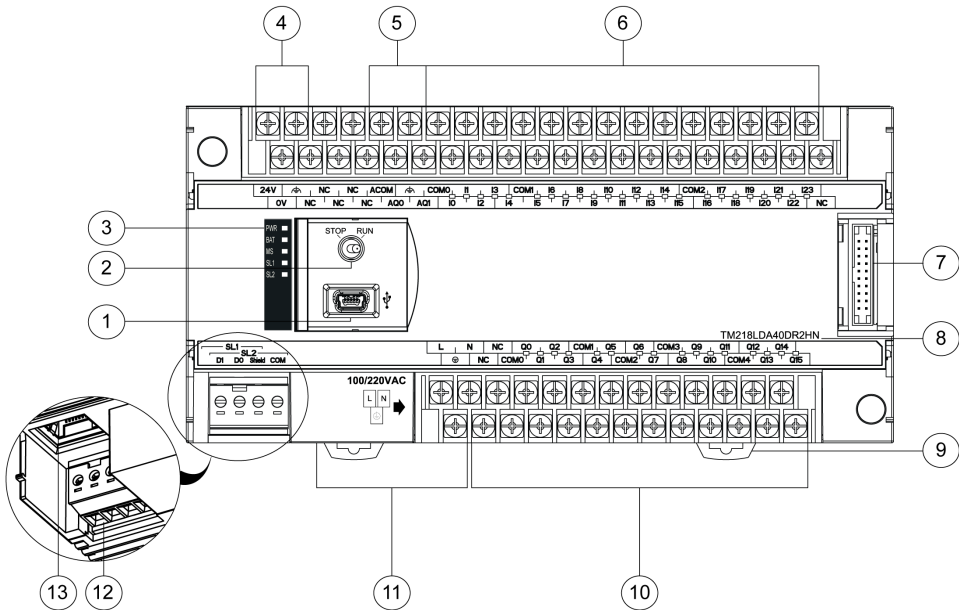
This chapter contains the following topics:

| Topic                         | Page |
|-------------------------------|------|
| TM218LDA40DR2HN Presentation  | 168  |
| TM218LDA40DR2HN Digital Input | 170  |
| TM218LDA40DR2HN Fast Input    | 173  |
| TM218LDA40DR2HN Relay Output  | 175  |
| TM218LDA40DR2HN Analog Output | 177  |

TM218LDA40DR2HN Presentation

Overview

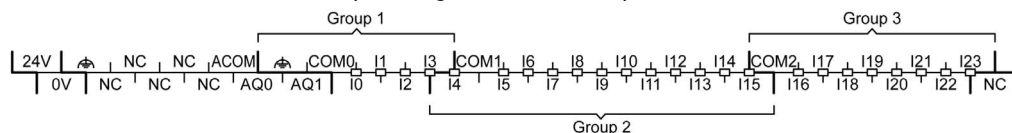
The following illustration shows the different components of the TM218LDA40DR2HN controller:



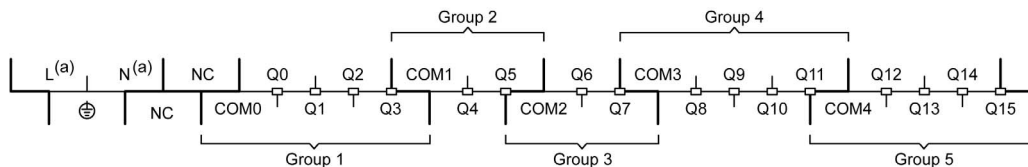
| N° | Description                                         |
|----|-----------------------------------------------------|
| 1  | USB programming port <i>(see page 224)</i>          |
| 2  | Run/Stop switch <i>(see page 50)</i>                |
| 3  | System LEDs <i>(see page 48)</i>                    |
| 4  | 24 V sensor power supply terminal block             |
| 5  | Analog output terminal block <i>(see page 169)</i>  |
| 6  | Input terminal block <i>(see page 169)</i>          |
| 7  | Ribbon cable connector                              |
| 8  | Reference number                                    |
| 9  | DIN rail clip                                       |
| 10 | Output terminal block <i>(see page 169)</i>         |
| 11 | 100...220 Vac power supply terminal block and label |
| 12 | Serial link 2/terminal block <i>(see page 227)</i>  |
| 13 | Serial link 1/type RJ45 <i>(see page 225)</i>       |

## Terminal Blocks

The illustration below shows the pin assignment of the 24-pin terminal block:



The illustration below shows the pin assignment of the 16-pin terminal block:



(a) 100...220 Vac power supply terminals are located in the 16-pin terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

## ⚡ ⚠ DANGER

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

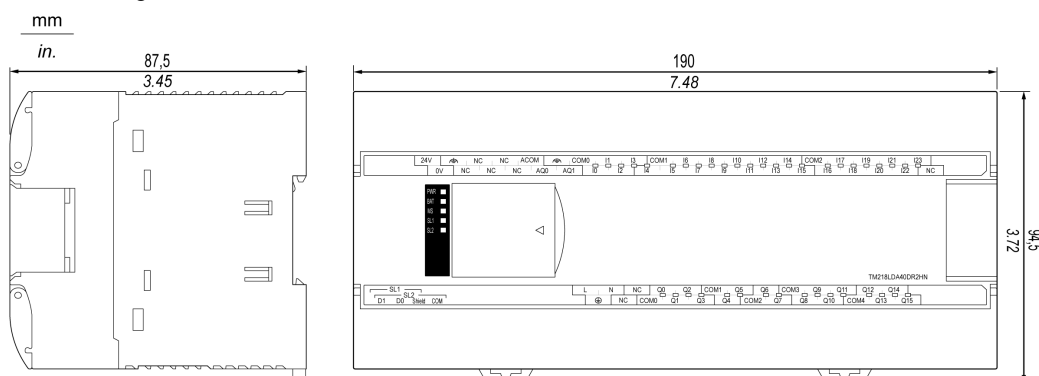
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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.**

**NOTE:** I/O status LEDs ([see page 49](#)) are embedded in the terminal block labels.

## Dimensions

The following illustration shows the external dimensions of the TM218LDA40DR2HN controller:



## TM218LDA40DR2HN Digital Input

### Overview

See Input Management ([see page 51](#)) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input), or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the controller inputs:

| Function      |     | Input function |            |        |        | HSC/PTO/PWM/FG |
|---------------|-----|----------------|------------|--------|--------|----------------|
|               |     | None           | RUN/STOP   | Latch  | Event  |                |
| Filter type   |     | Integrator     | Integrator | Bounce | Bounce |                |
| Fast Input    | I0  | X              | X          | X      | X      | HSC            |
|               | I1  | X              | X          | X      | X      | HSC            |
|               | I2  | X              | X          | X      | X      | HSC            |
|               | I3  | X              | X          | X      | X      | HSC            |
| Digital Input | I4  | X              | X          | –      | –      | HSC            |
|               | I5  | X              | X          | –      | –      | HSC            |
|               | I6  | X              | X          | –      | –      | HSC            |
|               | I7  | X              | X          | –      | –      | HSC            |
|               | I8  | X              | X          | –      | –      | –              |
|               | I9  | X              | X          | –      | –      | –              |
|               | I10 | X              | X          | –      | –      | –              |
|               | I11 | X              | X          | –      | –      | –              |
|               | I12 | X              | X          | –      | –      | –              |
|               | I13 | X              | X          | –      | –      | –              |
|               | I14 | X              | X          | –      | –      | –              |
|               | I15 | X              | X          | –      | –      | –              |
|               | I16 | X              | X          | –      | –      | –              |
|               | I17 | X              | X          | –      | –      | –              |
|               | I18 | X              | X          | –      | –      | –              |
|               | I19 | X              | X          | –      | –      | –              |
|               | I20 | X              | X          | –      | –      | –              |
|               | I21 | X              | X          | –      | –      | –              |
|               | I22 | X              | X          | –      | –      | –              |
|               | I23 | X              | X          | –      | –      | –              |
| X Yes<br>– No |     |                |            |        |        |                |

You can use filters and functions to manage the controller inputs ([see page 51](#)).

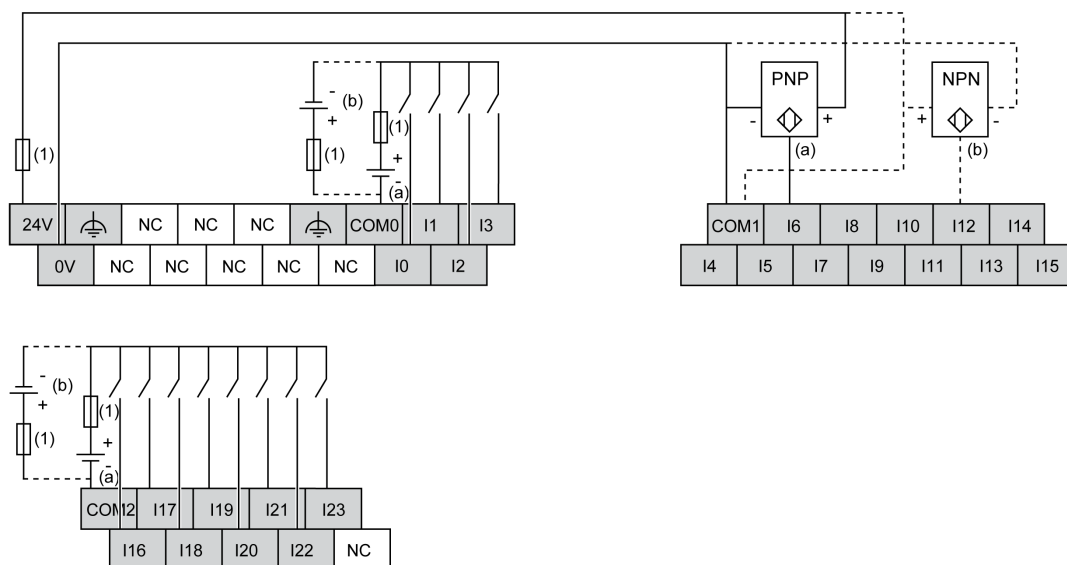
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                          |                                     | Value                                                                                                   |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                         |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                           |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                           | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                         | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                         |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                              |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                           |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                             |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                               | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                         | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                               |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                               |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                           |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                   |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                         |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                         |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| 1 Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

## Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller's digital inputs:



- (1) 0.6 A Type T fuse  
(a) Sink inputs (positive logic)  
(b) Source inputs (negative logic)  
NC Not Connected (N.C.)

## 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.**

## WARNING

## UNINTENDED EQUIPMENT OPERATION

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

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

## TM218LDA40DR2HN Fast Input

### Overview

The TM218LDA40DR2HN controller is equipped with 4 Fast digital inputs (*see page 170*) which can be used as HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 10.7 mA                                                                                                                                  |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current                             | 13.7 mA                                                                                                                                  |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 1.96 kΩ                                                                                                                                  |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                                                              |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                                                   |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                                                             |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                                                                                                 |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                                                  |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                                                   |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                                                        |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                                                                                                     |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                                                       |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm, (0.29 in.) pitch<br>2 rows are removable                                                                           |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | A/B phase: 50 kHz (20 μs)<br>Single phase: 100 kHz<br>Pulse/Direction: 100 kHz<br>Minimum transition duration: 4 μs                      |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | <ul style="list-style-type: none"> <li>• A/B phase counter</li> <li>• Pulse/Direction counter</li> <li>• Single phase counter</li> </ul> |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                                                          |

**Wiring Diagram**

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 172*).

## TM218LDA40DR2HN Relay Output

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

### 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 (4 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.

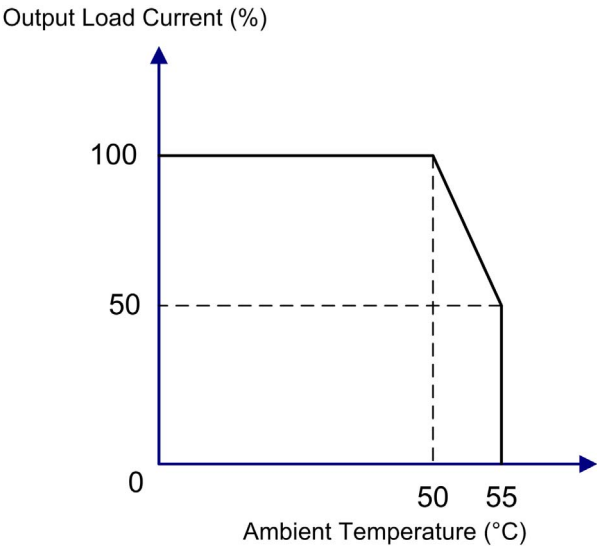
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Relay Output Characteristics

The table below describes the characteristics of the M218 controller relay outputs:

| Characteristic                                                                                                                                |                                           | Value                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                                           | 24 Vdc, 220 Vac                                                                       |
| Input range                                                                                                                                   |                                           | 5...30 Vdc, 100...250 Vac                                                             |
| Rated current                                                                                                                                 |                                           | Maximum 2 A for each point (see de-rating curve below)                                |
| Current/group (4 points)                                                                                                                      |                                           | 4 A (see de-rating curve below)                                                       |
| Inrush values                                                                                                                                 | Maximum switching voltage                 | 250 Vac, 30 Vdc                                                                       |
|                                                                                                                                               | Current/point                             | 5 A                                                                                   |
| Isolation                                                                                                                                     | Between channels within same category:    | None                                                                                  |
|                                                                                                                                               | Between channels in different categories: | 1780 Vac / 2500 Vdc                                                                   |
|                                                                                                                                               | Between channels and internal logic:      | 1780 Vac / 2500 Vdc                                                                   |
| Maximum output frequency                                                                                                                      | With maximum load                         | 0.1 Hz                                                                                |
|                                                                                                                                               | Without load                              | 5 Hz                                                                                  |
| Contact opening time                                                                                                                          |                                           | Typically 5 ms                                                                        |
| Contact closing time                                                                                                                          |                                           | Typically 2 ms                                                                        |
| Resistive load                                                                                                                                |                                           | 2 A/point for 24 Vdc/220 Vac                                                          |
| Mechanical life                                                                                                                               |                                           | 20 million operation minimum at 25 °C (77 °F) for maximum current and voltage ratings |
| Cable length                                                                                                                                  |                                           | Non-shielded: 150 m (492 ft)                                                          |
| Protection against short-circuit                                                                                                              |                                           | No                                                                                    |
| Terminal blocks                                                                                                                               |                                           | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                         |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                           |                                                                                       |

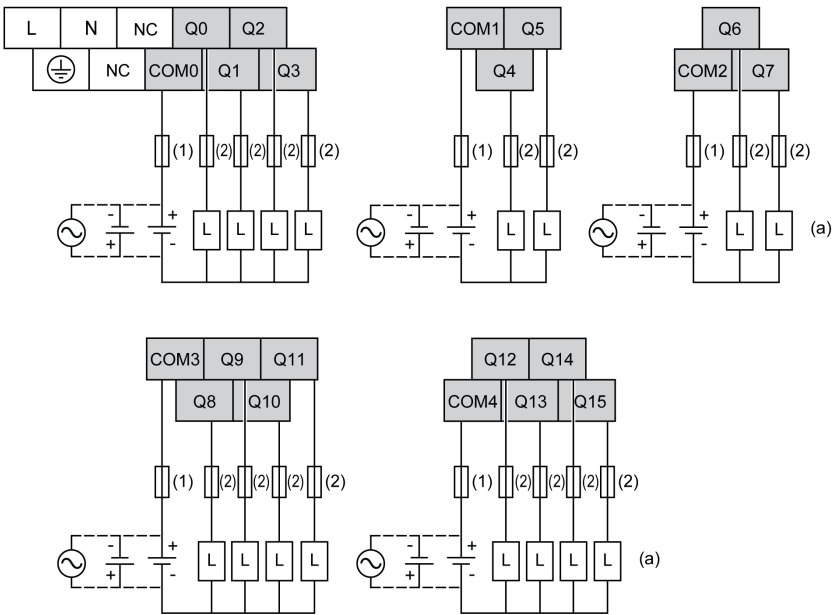
The following illustration shows the relay outputs de-rating curve:



**NOTE:** 50% de-rating when all the relay outputs are used at 55 °C (131 °F).

Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's relay outputs:



- (1) 4 A Type T fuse  
(2) 2 A Type T fuse  
NC Not Connected (N.C.)

- (a) To improve the lifetime of the contacts, and to protect from potential inductive load damage, it is recommended to connect:
- a free wheeling diode in parallel to each inductive DC load
  - a RC snubber in parallel of each inductive AC load

**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.

**⚠ 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.**

## TM218LDA40DR2HN Analog Output

### Overview

The TM218LDA40DR2HN controller is equipped with 2 analog outputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

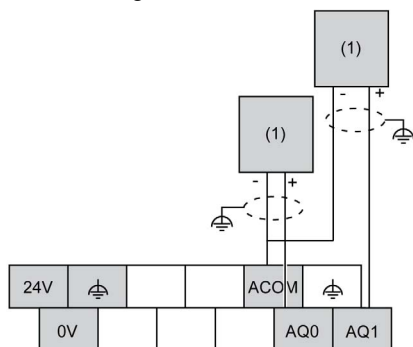
### Analog Output Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller analog outputs:

| Characteristic                                                         |                                                                        | Voltage output                                                                                                                                                                                             | Current output          |
|------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Maximum number of outputs                                              |                                                                        | 2                                                                                                                                                                                                          |                         |
| Output range                                                           |                                                                        | -10... +10 Vdc/0...+10 Vdc                                                                                                                                                                                 | 0...20 mA / 4...20 mA   |
| Connectable I/O terminals                                              |                                                                        | Removable terminals                                                                                                                                                                                        |                         |
| Load impedance                                                         |                                                                        | > 2 kΩ                                                                                                                                                                                                     | > 300 Ω                 |
| Application load type                                                  |                                                                        | Resistive load                                                                                                                                                                                             |                         |
| Setting time                                                           |                                                                        | 10 ms                                                                                                                                                                                                      |                         |
| Total output system transfer time                                      |                                                                        | 10 ms + 1 scan time                                                                                                                                                                                        |                         |
| Output tolerance                                                       | Maximum deviation at 25 °C (77 °F) without electromagnetic disturbance | ± 1% of the full scale                                                                                                                                                                                     |                         |
|                                                                        | Maximum deviation                                                      | ± 2.5% of the full scale                                                                                                                                                                                   |                         |
| Digital resolution                                                     |                                                                        | 12 bits, including sign                                                                                                                                                                                    |                         |
| Temperature drift                                                      |                                                                        | ± 0.06% of the full scale                                                                                                                                                                                  |                         |
| Output ripple                                                          |                                                                        | ±50 mV                                                                                                                                                                                                     |                         |
| Cross talk                                                             |                                                                        | 60 db                                                                                                                                                                                                      |                         |
| Non-linearity                                                          |                                                                        | ± 0.5% of the full scale                                                                                                                                                                                   |                         |
| Output value of LSB                                                    |                                                                        | 6 mV                                                                                                                                                                                                       | 10 μA                   |
| Protection type                                                        |                                                                        | Photo coupler between input and internal circuit                                                                                                                                                           |                         |
| Output protection                                                      |                                                                        | short-circuit protection                                                                                                                                                                                   | Open circuit protection |
| Output behavior if input power supply is less than the power threshold |                                                                        | Set to 0                                                                                                                                                                                                   |                         |
| Cable                                                                  | Type                                                                   | Shielded                                                                                                                                                                                                   |                         |
|                                                                        | Length                                                                 | 3 m (9.84 ft)<br><b>NOTE:</b> Compliance to electromagnetic immunity standards is limited to a 3 m (9.84 ft) cable length. In all cases, a maximum cable length of 10 m (32.80 ft) should not be exceeded. |                         |

## Wiring Diagram

The following illustration shows the wiring diagram of the Modicon M218 Logic Controller analog outputs:



(1) Voltage/Current preactuator

### **⚠ 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.**

### **⚠ 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.

For more information, refer to the TM218 System Wiring Rules and Recommendation (*see page 34*).

### ***NOTICE***

#### **INOPERABLE EQUIPMENT**

Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel.

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

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# Chapter 15

## TM218LDA40DR4PHN

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### Overview

This chapter describes the TM218LDA40DR4PHN controller.

### What Is in This Chapter?

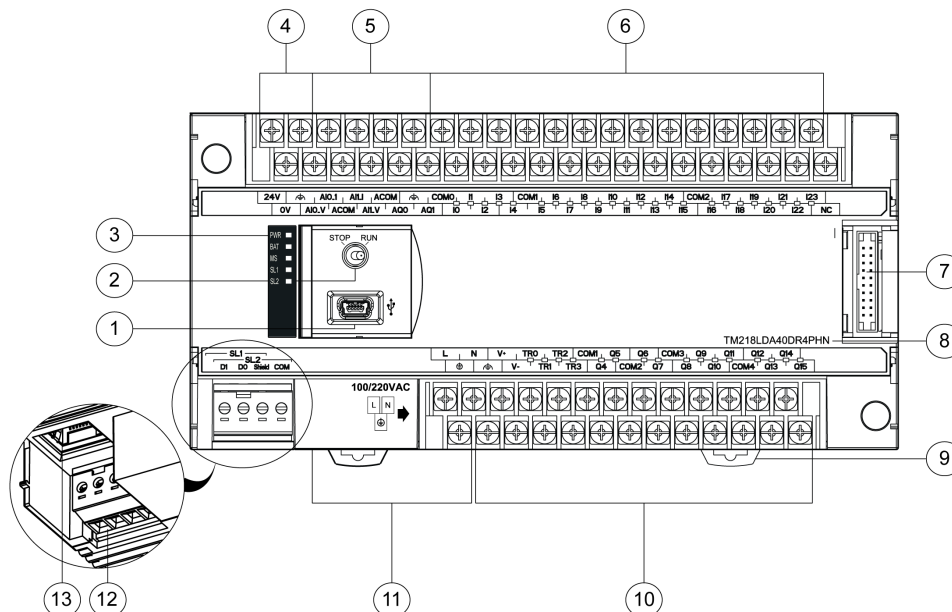
This chapter contains the following topics:

| Topic                          | Page |
|--------------------------------|------|
| TM218LDA40DR4PHN Presentation  | 180  |
| TM218LDA40DR4PHN Digital Input | 182  |
| TM218LDA40DR4PHN Fast Input    | 185  |
| TM218LDA40DR4PHN Analog Input  | 187  |
| TM218LDA40DR4PHN Relay Output  | 189  |
| TM218LDA40DR4PHN Fast Output   | 191  |
| TM218LDA40DR4PHN Analog Output | 193  |

## TM218LDA40DR4PHN Presentation

### Overview

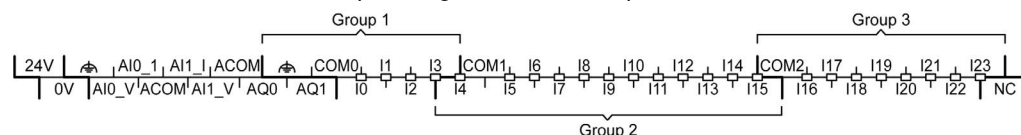
The following illustration shows the different components of the TM218LDA40DR4PHN controller:



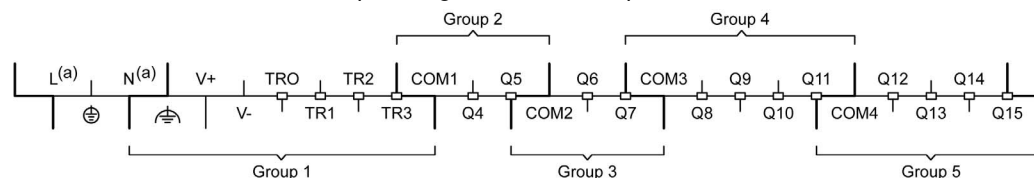
| N° | Description                                                                            |
|----|----------------------------------------------------------------------------------------|
| 1  | USB programming port ( <i>see page 224</i> )                                           |
| 2  | Run/Stop switch ( <i>see page 50</i> )                                                 |
| 3  | System LEDs ( <i>see page 48</i> )                                                     |
| 4  | 24 V sensor power supply terminal block                                                |
| 5  | Analog input ( <i>see page 187</i> ) and output ( <i>see page 193</i> ) terminal block |
| 6  | Input terminal block ( <i>see page 181</i> )                                           |
| 7  | Ribbon cable connector                                                                 |
| 8  | Reference number                                                                       |
| 9  | DIN rail clip                                                                          |
| 10 | Output terminal block ( <i>see page 181</i> )                                          |
| 11 | 100...220 Vac power supply terminal block and label                                    |
| 12 | Serial link 2/terminal block ( <i>see page 227</i> )                                   |
| 13 | Serial link 1/type RJ45 ( <i>see page 225</i> )                                        |

## Terminal Blocks

The illustration below shows the pin assignment of the 24-pin terminal block:



The illustration below shows the pin assignment of the 16-pin terminal block:



(a) 100...220 Vac power supply terminals are located in the 16-pin terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

## ⚠ DANGER

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

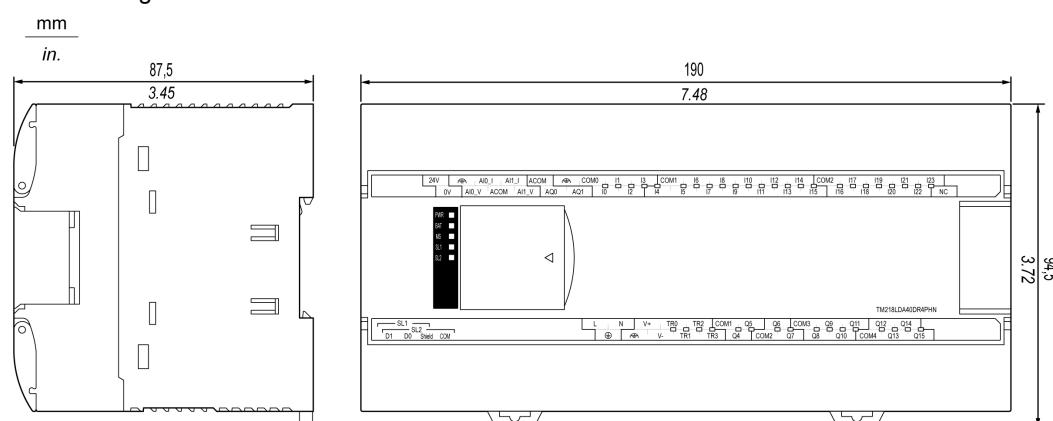
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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.**

**NOTE:** I/O status LEDs ([see page 49](#)) are embedded in the terminal block labels.

## Dimensions

The following illustration shows the external dimensions of the TM218LDA40DR4PHN controller:



## TM218LDA40DR4PHN Digital Input

### Overview

See Input Management ([see page 51](#)) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input), or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the controller inputs:

| Function      |     | Input function |            |        |        | HSC/PTO/PWM/FG |
|---------------|-----|----------------|------------|--------|--------|----------------|
|               |     | None           | RUN/STOP   | Latch  | Event  |                |
| Filter type   |     | Integrator     | Integrator | Bounce | Bounce |                |
| Fast Input    | I0  | X              | X          | X      | X      | HSC            |
|               | I1  | X              | X          | X      | X      | HSC            |
|               | I2  | X              | X          | X      | X      | HSC            |
|               | I3  | X              | X          | X      | X      | HSC            |
| Digital Input | I4  | X              | X          | –      | –      | HSC            |
|               | I5  | X              | X          | –      | –      | HSC            |
|               | I6  | X              | X          | –      | –      | HSC            |
|               | I7  | X              | X          | –      | –      | HSC            |
|               | I8  | X              | X          | –      | –      | –              |
|               | I9  | X              | X          | –      | –      | –              |
|               | I10 | X              | X          | –      | –      | –              |
|               | I11 | X              | X          | –      | –      | –              |
|               | I12 | X              | X          | –      | –      | –              |
|               | I13 | X              | X          | –      | –      | –              |
|               | I14 | X              | X          | –      | –      | –              |
|               | I15 | X              | X          | –      | –      | –              |
|               | I16 | X              | X          | –      | –      | –              |
|               | I17 | X              | X          | –      | –      | –              |
|               | I18 | X              | X          | –      | –      | –              |
|               | I19 | X              | X          | –      | –      | –              |
|               | I20 | X              | X          | –      | –      | –              |
|               | I21 | X              | X          | –      | –      | –              |
|               | I22 | X              | X          | –      | –      | –              |
|               | I23 | X              | X          | –      | –      | –              |
| X Yes<br>– No |     |                |            |        |        |                |

You can use filters and functions to manage the controller inputs ([see page 51](#)).

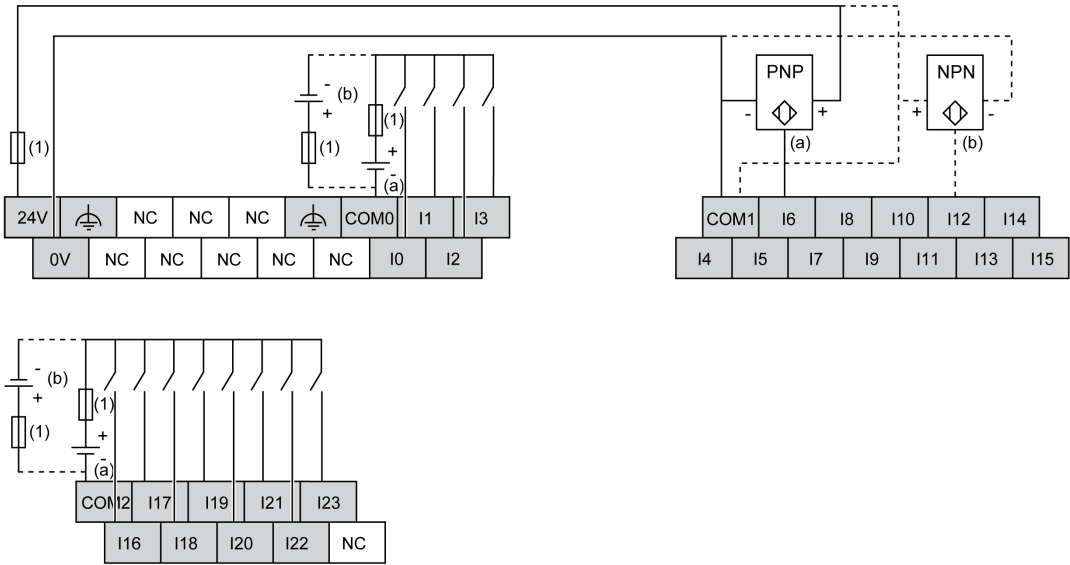
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                   |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                                |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                                | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                                      |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                          |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller’s digital inputs:



- (1) 0.6 A Type T fuse
- (a) Sink inputs (positive logic)
- (b) Source inputs (negative logic)
- NC Not Connected (N.C.)

**⚠ 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.**

**⚠ WARNING**

**UNINTENDED EQUIPMENT OPERATION**

Use the sensor and actuator power supply only for supplying power to sensors or actuators connected to the controller.  
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## TM218LDA40DR4PHN Fast Input

### Overview

The TM218LDA40DR4PHN controller is equipped with 4 Fast digital inputs (*see page 182*) which can be used as HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 10.7 mA                                                                                                                                  |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current                             | 13.7 mA                                                                                                                                  |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 1.96 kΩ                                                                                                                                  |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                                                              |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                                                   |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                                                             |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                                                                                                 |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                                                  |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                                                   |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                                                        |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                                                                                                     |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                                                       |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm, (0.29 in.) pitch<br>2 rows are removable                                                                           |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | A/B phase: 50 kHz (20 μs)<br>Single phase: 100 kHz<br>Pulse/Direction: 100 kHz<br>Minimum transition duration: 4 μs                      |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | <ul style="list-style-type: none"> <li>• A/B phase counter</li> <li>• Pulse/Direction counter</li> <li>• Single phase counter</li> </ul> |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                                                          |

### Wiring Diagram

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 184*).

## TM218LDA40DR4PHN Analog Input

### Overview

The TM218LDA40DR4PHN controller is equipped with 2 analog inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

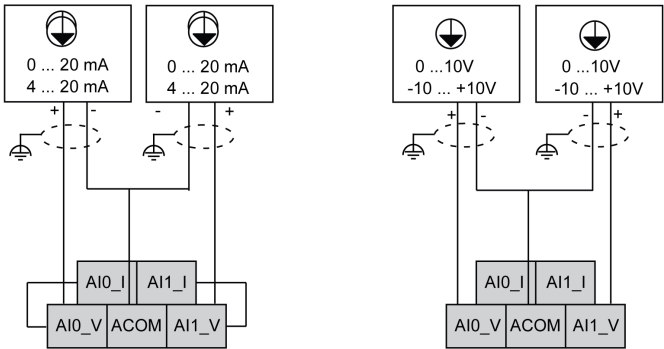
### Analog Input Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller analog inputs:

| Characteristic                        |                                                                        | Voltage input                                                                                                                                                                                              | Current input       |
|---------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Number of maximum input channel       |                                                                        | 2                                                                                                                                                                                                          |                     |
| Input type                            |                                                                        | Single-ended                                                                                                                                                                                               |                     |
| Input range                           |                                                                        | -10... +10 Vdc/0...+10 Vdc                                                                                                                                                                                 | 0...20 mA/4...20 mA |
| Input impedance                       |                                                                        | > 1 MΩ                                                                                                                                                                                                     | 250 ± 5% Ω          |
| Connectable I/O terminals             |                                                                        | Removable terminals                                                                                                                                                                                        |                     |
| Sample duration time                  |                                                                        | 10 ms per channel + 1 scan time                                                                                                                                                                            |                     |
| Total input system transfer time      |                                                                        | 20 ms + 1 scan time                                                                                                                                                                                        |                     |
| Input tolerance                       | Maximum deviation at 25 °C (77 °F) without electromagnetic disturbance | ± 1% of the full scale                                                                                                                                                                                     |                     |
|                                       | Maximum deviation                                                      | ± 2.5% of the full scale                                                                                                                                                                                   |                     |
| Digital resolution                    |                                                                        | 12 bits, including sign                                                                                                                                                                                    |                     |
| Temperature drift                     |                                                                        | ± 0.06% of the full scale                                                                                                                                                                                  |                     |
| Common mode characteristics           |                                                                        | 80 db                                                                                                                                                                                                      |                     |
| Cross talk                            |                                                                        | 60 db                                                                                                                                                                                                      |                     |
| Non-linearity                         |                                                                        | ± 0.4% of full scale                                                                                                                                                                                       |                     |
| Input value of LSB                    |                                                                        | 5 mV                                                                                                                                                                                                       | 10 µA               |
| Maximum allowed overload (no damages) |                                                                        | ±30 Vdc (less than 5 minutes)<br>±15 Vdc (No damage)                                                                                                                                                       | ±30 mA dc           |
| Protection type                       |                                                                        | Photo coupler between input and internal circuit                                                                                                                                                           |                     |
| Cable                                 | Type                                                                   | Shielded                                                                                                                                                                                                   |                     |
|                                       | Length                                                                 | 3 m (9.84 ft)<br><b>NOTE:</b> Compliance to electromagnetic immunity standards is limited to a 3 m (9.84 ft) cable length. In all cases, a maximum cable length of 10 m (32.80 ft) should not be exceeded. |                     |

Wiring Diagram

The following illustration shows the wiring diagram of the Modicon M218 Logic Controller analog inputs:



**! 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.

For more information, refer to the TM218 System Wiring Rules and Recommendation (*see page 34*).

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert, you may damage the analog circuit.

***NOTICE***

**INOPERABLE EQUIPMENT**

Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel.

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

## TM218LDA40DR4PHN Relay Output

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

### 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 (4 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.**

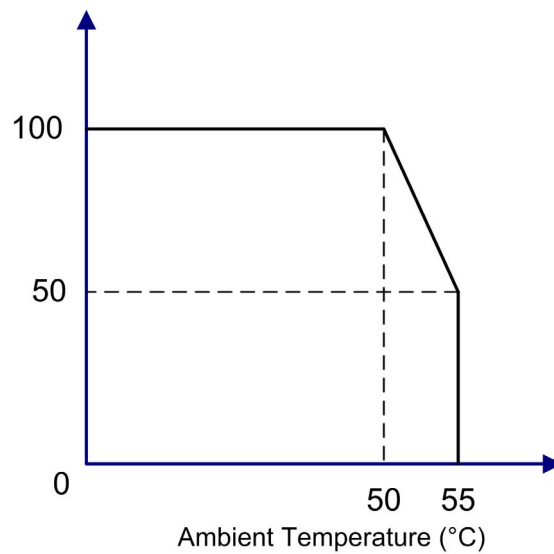
### Relay Output Characteristics

The table below describes the characteristics of the M218 controller relay outputs:

| Characteristic                                                                                                                                |                                           | Value                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                                           | 24 Vdc, 220 Vac                                                                       |
| Input range                                                                                                                                   |                                           | 5...30 Vdc, 100...250 Vac                                                             |
| Rated current                                                                                                                                 |                                           | Maximum 2 A for each point (see de-rating curve below)                                |
| Current/group (4 points)                                                                                                                      |                                           | 4 A (see de-rating curve below)                                                       |
| Inrush values                                                                                                                                 | Maximum switching voltage                 | 250 Vac, 30 Vdc                                                                       |
|                                                                                                                                               | Current/point                             | 5 A                                                                                   |
| Isolation                                                                                                                                     | Between channels within same category:    | None                                                                                  |
|                                                                                                                                               | Between channels in different categories: | 1780 Vac / 2500 Vdc                                                                   |
|                                                                                                                                               | Between channels and internal logic:      | 1780 Vac / 2500 Vdc                                                                   |
| Maximum output frequency                                                                                                                      | With maximum load                         | 0.1 Hz                                                                                |
|                                                                                                                                               | Without load                              | 5 Hz                                                                                  |
| Contact opening time                                                                                                                          |                                           | Typically 5 ms                                                                        |
| Contact closing time                                                                                                                          |                                           | Typically 2 ms                                                                        |
| Resistive load                                                                                                                                |                                           | 2 A/point for 24 Vdc/220 Vac                                                          |
| Mechanical life                                                                                                                               |                                           | 20 million operation minimum at 25 °C (77 °F) for maximum current and voltage ratings |
| Cable length                                                                                                                                  |                                           | Non-shielded: 150 m (492 ft)                                                          |
| Protection against short-circuit                                                                                                              |                                           | No                                                                                    |
| Terminal blocks                                                                                                                               |                                           | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                         |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                           |                                                                                       |

The following illustration shows the relay outputs de-rating curve:

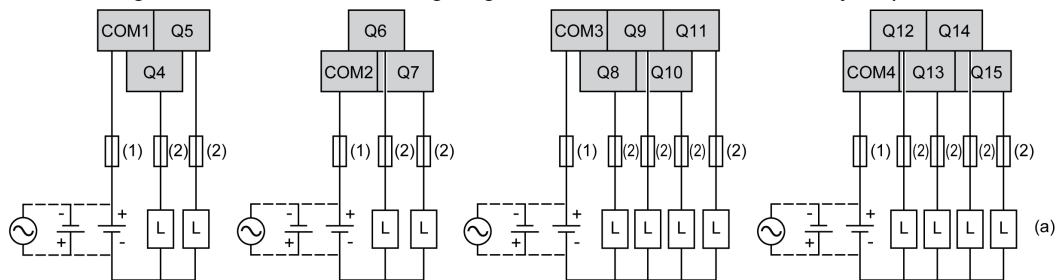
Output Load Current (%)



**NOTE:** 50% de-rating when all the relay outputs are used at 55 °C (131 °F).

### Wiring Diagram

The following illustration shows the wiring diagram of the M218 controller's relay outputs:



(1) 4 A Type T fuse

(2) 2 A Type T fuse

NC Not Connected (N.C.)

(a) To improve the lifetime of the contacts, and to protect from potential inductive load damage, it is recommended to connect:

- a free wheeling diode in parallel to each inductive DC load
- a RC snubber in parallel of each inductive AC load

**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.

## TM218LDA40DR4PHN Fast Output

### Overview

The TM218LDA40DR4PHN controller is equipped with 4 digital outputs which can be used for Fast outputs (*see page 53*).

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Output Characteristics

For additional information about fast output protection, refer to Protecting Outputs from Inductive Load Damage (*see page 36*).

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

Be sure to wire the Fast output correctly according to the wiring diagram.

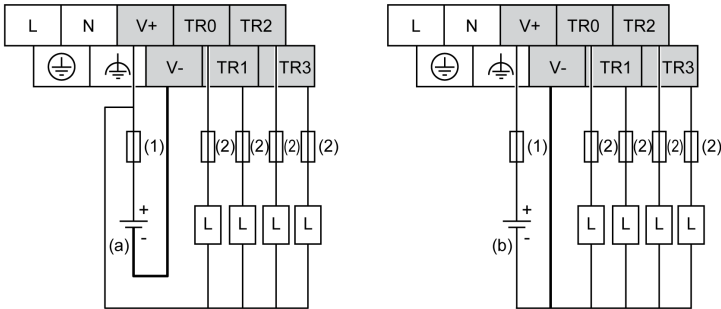
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The table below describes the characteristics of the M218 controller Fast outputs:

| Characteristic                           |                                                                | Value                                                         |
|------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------|
| Output type                              |                                                                | Push/Pull                                                     |
| Rated voltage                            |                                                                | 24 Vdc                                                        |
| PTO power supply input range             |                                                                | 19.2...28.8 Vdc                                               |
| PTO power supply reverse protection      |                                                                | Yes                                                           |
| PTO/PWM output current                   | Standard output                                                | 0.3 A                                                         |
|                                          | Fast output                                                    | 50 mA                                                         |
| Response time for origin auxiliary input |                                                                | 2 ms                                                          |
| Isolation resistance                     | Between Fast outputs and internal logic                        | > 10 MΩ                                                       |
|                                          | Between Power supply port and protective ground (PE) = 500 Vdc | > 10 MΩ                                                       |
| Residual voltage                         | for I = 0, 1 A                                                 | < 1.5 Vdc                                                     |
| Minimum load impedance                   |                                                                | 80 Ω                                                          |
| Maximum PTO output frequency             |                                                                | 100 kHz                                                       |
| Maximum PWM output frequency             |                                                                | 1 kHz                                                         |
| Accuracy                                 |                                                                | 20...100 Hz for 0.1%                                          |
|                                          |                                                                | 100 Hz...1 kHz for 1%                                         |
| PWM mode duty rate step                  |                                                                | 20 Hz...1 kHz for 0.1%                                        |
| Duty rate range                          |                                                                | 1...99%                                                       |
| Cable                                    | Type                                                           | Shielded, including 24 Vdc power supply                       |
|                                          | Length                                                         | Maximum 5 m (16 ft)                                           |
| Terminal blocks                          |                                                                | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable |

Wiring Diagram

This illustration shows the wiring diagram of the M218 controller's Fast outputs:



- (1) 2 A Type T fuse
- (2) 0.5 A Type T fuse
- (a) Sink outputs (positive logic)
- (b) Source outputs (negative logic)

## TM218LDA40DR4PHN Analog Output

### Overview

The TM218LDA40DR4PHN controller is equipped with 2 analog outputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

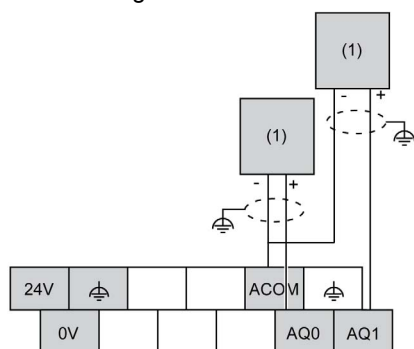
### Analog Output Characteristics

The table below describes the characteristics of the Modicon M218 Logic Controller analog outputs:

| Characteristic                                                         |                                                                        | Voltage output                                                                                                                                                                                             | Current output          |
|------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Maximum number of outputs                                              |                                                                        | 2                                                                                                                                                                                                          |                         |
| Output range                                                           |                                                                        | -10... +10 Vdc/0...+10 Vdc                                                                                                                                                                                 | 0...20 mA / 4...20 mA   |
| Connectable I/O terminals                                              |                                                                        | Removable terminals                                                                                                                                                                                        |                         |
| Load impedance                                                         |                                                                        | > 2 kΩ                                                                                                                                                                                                     | > 300 Ω                 |
| Application load type                                                  |                                                                        | Resistive load                                                                                                                                                                                             |                         |
| Setting time                                                           |                                                                        | 10 ms                                                                                                                                                                                                      |                         |
| Total output system transfer time                                      |                                                                        | 10 ms + 1 scan time                                                                                                                                                                                        |                         |
| Output tolerance                                                       | Maximum deviation at 25 °C (77 °F) without electromagnetic disturbance | ± 1% of the full scale                                                                                                                                                                                     |                         |
|                                                                        | Maximum deviation                                                      | ± 2.5% of the full scale                                                                                                                                                                                   |                         |
| Digital resolution                                                     |                                                                        | 12 bits, including sign                                                                                                                                                                                    |                         |
| Temperature drift                                                      |                                                                        | ± 0.06% of the full scale                                                                                                                                                                                  |                         |
| Output ripple                                                          |                                                                        | ±50 mV                                                                                                                                                                                                     |                         |
| Cross talk                                                             |                                                                        | 60 db                                                                                                                                                                                                      |                         |
| Non-linearity                                                          |                                                                        | ± 0.5% of the full scale                                                                                                                                                                                   |                         |
| Output value of LSB                                                    |                                                                        | 6 mV                                                                                                                                                                                                       | 10 μA                   |
| Protection type                                                        |                                                                        | Photo coupler between input and internal circuit                                                                                                                                                           |                         |
| Output protection                                                      |                                                                        | short-circuit protection                                                                                                                                                                                   | Open circuit protection |
| Output behavior if input power supply is less than the power threshold |                                                                        | Set to 0                                                                                                                                                                                                   |                         |
| Cable                                                                  | Type                                                                   | Shielded                                                                                                                                                                                                   |                         |
|                                                                        | Length                                                                 | 3 m (9.84 ft)<br><b>NOTE:</b> Compliance to electromagnetic immunity standards is limited to a 3 m (9.84 ft) cable length. In all cases, a maximum cable length of 10 m (32.80 ft) should not be exceeded. |                         |

## Wiring Diagram

The following illustration shows the wiring diagram of the Modicon M218 Logic Controller analog outputs:



(1) Voltage/Current preactuator

## ⚠ 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.

For more information, refer to the TM218 System Wiring Rules and Recommendation (*see page 34*).

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert, you may damage the analog circuit.

## NOTICE

### INOPERABLE EQUIPMENT

Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel.

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

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# Chapter 16

## TM218LDA60DRN

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### Overview

This chapter describes the TM218LDA60DRN controller.

### What Is in This Chapter?

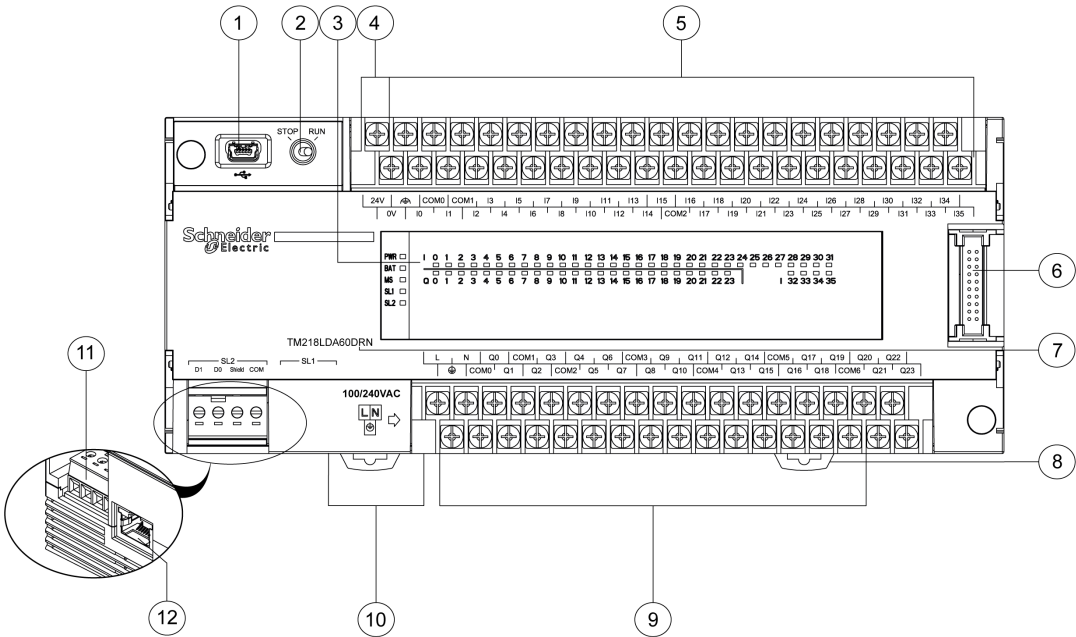
This chapter contains the following topics:

| Topic                       | Page |
|-----------------------------|------|
| TM218LDA60DRN Presentation  | 196  |
| TM218LDA60DRN Digital Input | 199  |
| TM218LDA60DRN Fast Input    | 202  |
| TM218LDA60DRN Relay Outputs | 203  |

TM218LDA60DRN Presentation

Overview

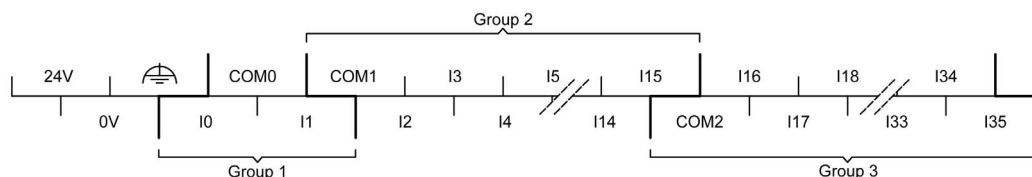
The following illustration shows the different components of the TM218LDA60DRN:



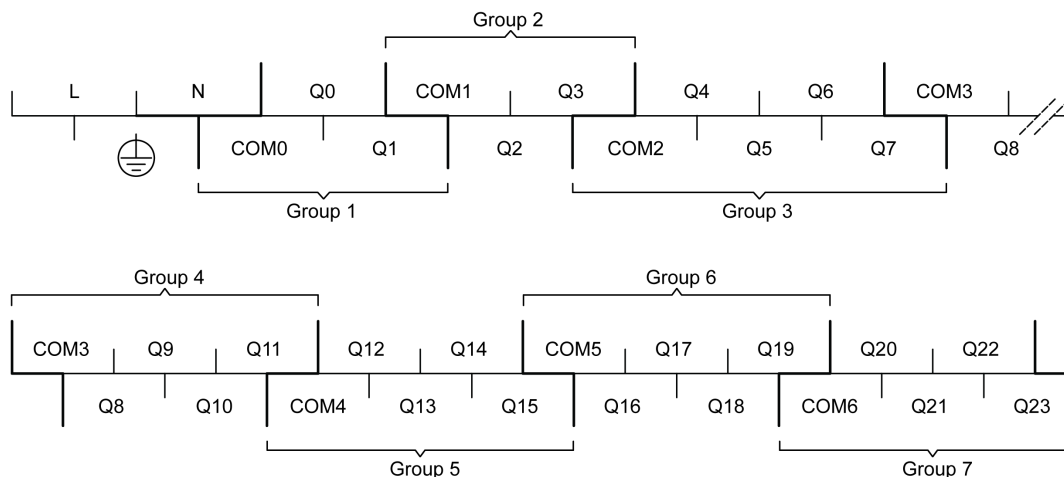
| N° | Description                                          |
|----|------------------------------------------------------|
| 1  | USB programming port ( <i>see page 224</i> )         |
| 2  | Run/Stop switch ( <i>see page 50</i> )               |
| 3  | System and I/O LEDs ( <i>see page 48</i> )           |
| 4  | 24 V sensor power supply terminal block              |
| 5  | Input terminal block ( <i>see page 197</i> )         |
| 6  | Ribbon cable connector                               |
| 7  | Reference number                                     |
| 8  | DIN rail clip                                        |
| 9  | Output terminal block ( <i>see page 197</i> )        |
| 10 | 100...220 Vac power supply terminal block and label  |
| 11 | Serial link 2/terminal block ( <i>see page 227</i> ) |
| 12 | Serial link 1/type RJ45 ( <i>see page 225</i> )      |

## Terminal Blocks

The illustration below shows the pin assignment of the input terminal block:



The illustration below shows the pin assignment of the output terminal block:



- (a) 100...220 Vac power supply terminals are located in the output terminal block. For more information, refer to the topic Power Supply Wiring and Characteristics ([see page 69](#)).

### **⚡ ⚠ DANGER**

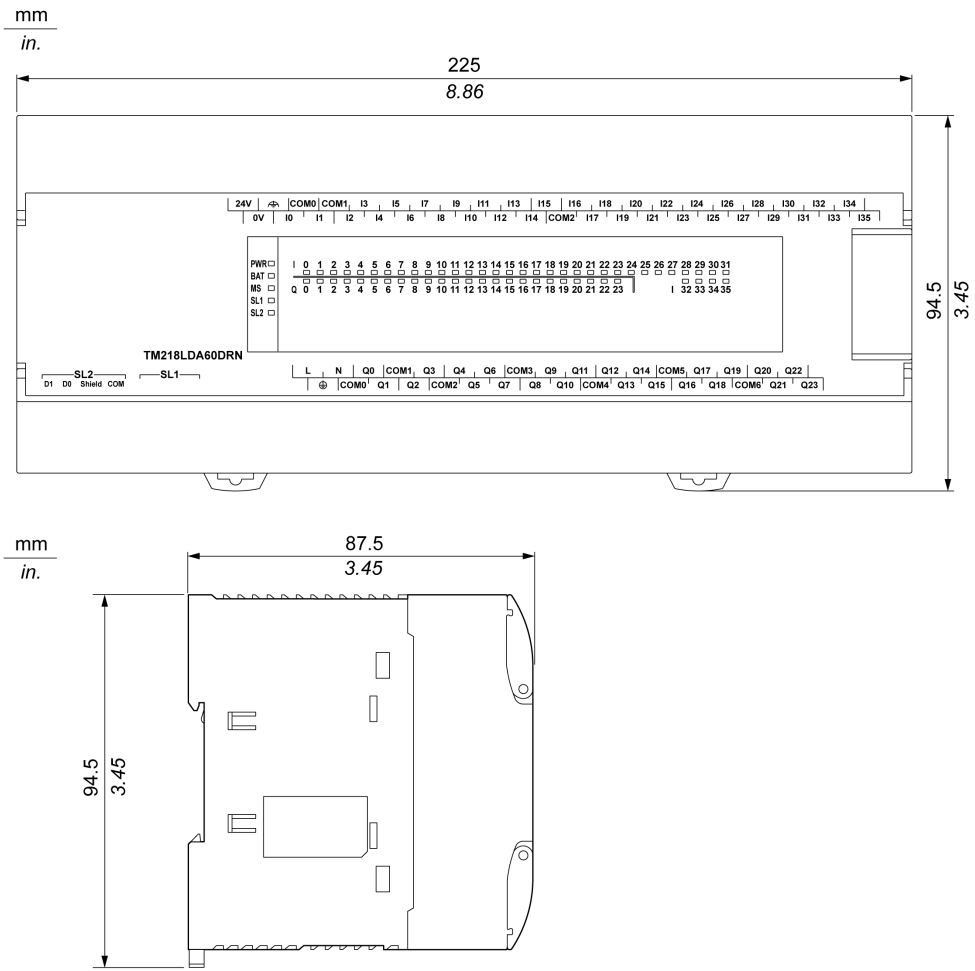
#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

- 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.**

Dimensions

The following illustration shows the external dimensions of the TM218LDA60DRN controller:



## TM218LDA60DRN Digital Input

### Overview

See Input Management ([see page 51](#)) for more information on managing inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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.**

### Input Management Functions Availability

An input is either not configured as a function (regular input), or used for RUN/STOP, for events, by HSC, PTO, PWM, or FG functions.

The table below shows the possible usage of the TM218LDA60DRN controller inputs:

| Function                                                                    |     | Input function |            |        | HSC/PTO/PWM/FG |
|-----------------------------------------------------------------------------|-----|----------------|------------|--------|----------------|
|                                                                             |     | None           | RUN/STOP   | Latch  |                |
| Filter type                                                                 |     | Integrator     | Integrator | Bounce |                |
| <b>Fast Input<sup>1</sup></b>                                               | I0  | X              | X          | –      | HSC            |
|                                                                             | I1  | X              | X          | –      | HSC            |
| <b>Digital Input</b>                                                        | I2  | X              | X          | –      | –              |
|                                                                             | ... | X              | X          | –      | –              |
|                                                                             | I35 | X              | X          | –      | –              |
| <b>X</b> Yes<br><b>–</b> No<br><b>1</b> Can also be used as a regular input |     |                |            |        |                |

You can use filters and functions to manage the controller inputs ([see page 51](#)).

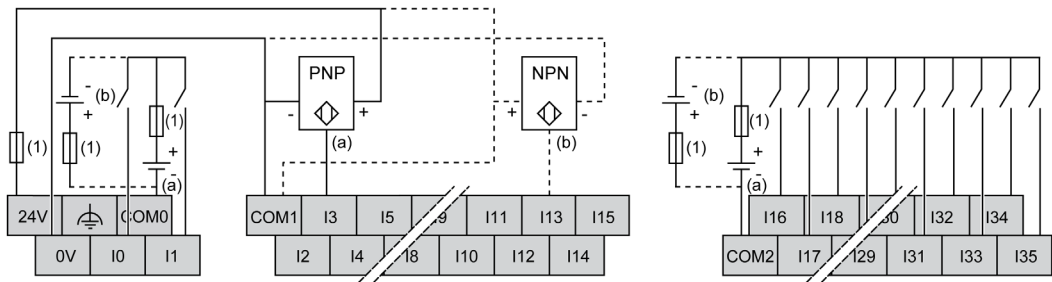
## Digital Input Characteristics

The table below describes the characteristics of the M218 controller digital inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                                                                   |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                                                                                                                                                                                                |                                     | Standard                                                                                                | Enhanced |
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 5 mA                                                                                                    | 7 mA     |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                                                                  | 30 Vdc   |
|                                                                                                                                                                                                                                                                                                | Current                             | 7 mA                                                                                                    | 9 mA     |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 4.7 kΩ                                                                                                  | 3.3 kΩ   |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                                                             |          |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                                                                  |          |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                                                            |          |
| 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                                                                                                |          |
| Isolation (photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                                                                    |          |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                                                                 |          |
| Filtering                                                                                                                                                                                                                                                                                      |                                     | Default: 3 ms<br>Selectable: No filter (1ms), 3 ms and 12 ms                                            |          |
| IEC61131-2 edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                                                                  |          |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>                                                       |          |
| Cable type and length                                                                                                                                                                                                                                                                          |                                     | Shielded: Maximum 100 m (328 ft)<br>Non-shielded: 50 m (164 ft)<br>Use shielded cables for Fast inputs. |          |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                                                                      |          |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                                           |          |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                                                                         |          |

Wiring Diagram

The following illustration describes the wiring diagram of the M218 controller's digital inputs:



- (1) 0.6 A Type T fuse
- (a) Sink inputs (positive logic)
- (b) Source inputs (negative logic)

**⚠ 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.**

**⚠ WARNING**

**UNINTENDED EQUIPMENT OPERATION**

Use the sensor and actuator power supply only for supplying power to sensors or actuators connected to the controller.  
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## TM218LDA60DRN Fast Input

### Overview

The TM218LDA60DRN controller is equipped with 2 Fast digital inputs (*see page 76*) which can be used as 10 kHz HSC inputs.

### DANGER

#### FIRE HAZARD

Use only the correct wire sizes for the current capacity of the power supplies.

**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 Input Characteristics

The table below describes the characteristics of the M218 controller reduced Fast inputs:

| Characteristic                                                                                                                                                                                                                                                                                 |                                     | Value                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------|
| Rated current                                                                                                                                                                                                                                                                                  |                                     | 9 mA                                                          |
| Inrush values                                                                                                                                                                                                                                                                                  | Voltage                             | 30 Vdc                                                        |
|                                                                                                                                                                                                                                                                                                | Current                             | 12 mA                                                         |
| Input impedance                                                                                                                                                                                                                                                                                |                                     | 2.35 kΩ                                                       |
| Input type                                                                                                                                                                                                                                                                                     |                                     | Sink/Source                                                   |
| Rated voltage                                                                                                                                                                                                                                                                                  |                                     | 24 Vdc                                                        |
| Input range                                                                                                                                                                                                                                                                                    |                                     | 0...28.8 Vdc                                                  |
| Input limit values                                                                                                                                                                                                                                                                             | Voltage at state 1                  | > 15 Vdc                                                      |
|                                                                                                                                                                                                                                                                                                | Voltage at state 0                  | < 5 Vdc                                                       |
|                                                                                                                                                                                                                                                                                                | Current at state 1                  | > 5 mA                                                        |
|                                                                                                                                                                                                                                                                                                | Current at state 0                  | < 1.5 mA                                                      |
| Isolation (Photo coupler)                                                                                                                                                                                                                                                                      | Between channels                    | None                                                          |
|                                                                                                                                                                                                                                                                                                | Between channels and internal logic | 500 Vdc                                                       |
| IEC61131-2 Edition 3 type                                                                                                                                                                                                                                                                      |                                     | Type 1                                                        |
| Compatibility                                                                                                                                                                                                                                                                                  |                                     | Supports 2 wire and 3 wire sensors <sup>(1)</sup>             |
| Cable                                                                                                                                                                                                                                                                                          | Type                                | Shielded                                                      |
|                                                                                                                                                                                                                                                                                                | Length                              | Maximum 10 m (33 ft)                                          |
| Protection against over voltage                                                                                                                                                                                                                                                                |                                     | No                                                            |
| Terminal blocks                                                                                                                                                                                                                                                                                |                                     | Type: Screw, 7.62 mm (0.29 in. pitch)<br>2 rows are removable |
| HSC Maximum frequency                                                                                                                                                                                                                                                                          |                                     | 10 kHz (100 μs)<br>Minimum transition duration: 40 μs         |
| HSC type                                                                                                                                                                                                                                                                                       |                                     | Single phase counter                                          |
| <b>1</b> Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply). |                                     |                                                               |

### Wiring Diagram

The wiring diagram for the Fast inputs is same as that of the digital inputs (*see page 201*).

## TM218LDA60DRN Relay Outputs

### Overview

See Output Management ([see page 53](#)) for more information on managing outputs.

### 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 (4 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.

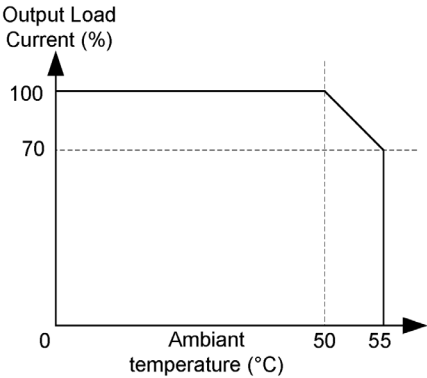
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Relay Output Characteristics

The table below describes the characteristics of the M218 controller relay outputs:

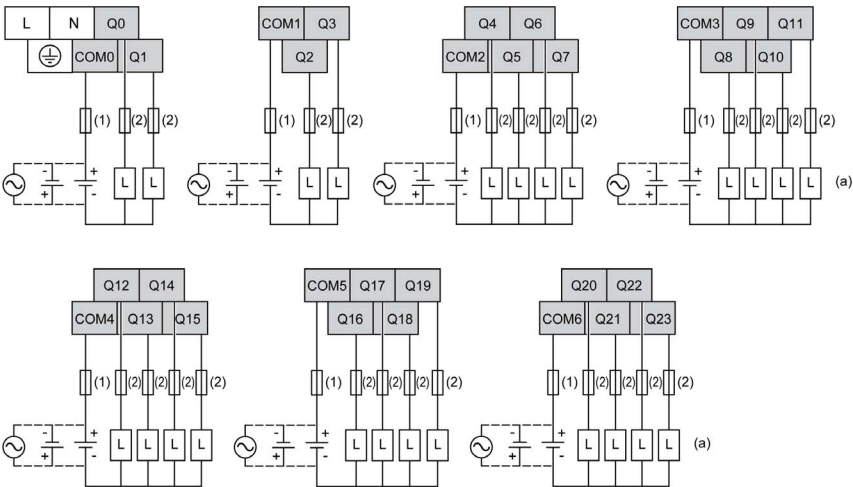
| Characteristic                                                                                                                                |                           | Value                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------|
| Rated voltage                                                                                                                                 |                           | 24 Vdc, 220 Vac                                                                       |
| Input range                                                                                                                                   |                           | 5...30 Vdc, 100...250 Vac                                                             |
| Rated current                                                                                                                                 |                           | Maximum 2 A for each point (see de-rating curve below)                                |
| Current/group (4 points)                                                                                                                      |                           | 4 A                                                                                   |
| Inrush values                                                                                                                                 | Maximum switching voltage | 250 Vac, 30 Vdc                                                                       |
|                                                                                                                                               | Current/point             | 5 A (see de-rating curve below)                                                       |
| Isolation                                                                                                                                     |                           | Relay coil                                                                            |
| Maximum output frequency                                                                                                                      | with maximum load         | 0.1 Hz                                                                                |
|                                                                                                                                               | without load              | 5 Hz                                                                                  |
| Resistive load                                                                                                                                |                           | 2 A/point for 24 Vdc/220 Vac                                                          |
| Mechanical life                                                                                                                               |                           | 20 million operation minimum at 25 °C (77 °F) for maximum current and voltage ratings |
| Cable length                                                                                                                                  |                           | Non-shielded: 150 m (492 ft)                                                          |
| Protection against short circuit                                                                                                              |                           | No                                                                                    |
| Terminal blocks                                                                                                                               |                           | Type: Screw, 7.62 mm (0.29 in.) pitch<br>2 rows are removable                         |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                           |                                                                                       |

The following illustration shows the Relay Output De-rating curve:



**NOTE:** 70% de-rating when all the relay outputs are used at 55 °C (131 °F).

Wiring Diagram



- (1) 4 A Type T fuse
- (2) 2 A Type T fuse

- (a) To improve the lifetime of the contacts, and to protect from potential inductive load damage, it is recommended to connect:
- a free wheeling diode in parallel to each inductive DC load
  - a RC snubber in parallel of each inductive AC load

**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.

**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.**

---

# Chapter 17

## TM3RDM••R

---

### Overview

This chapter describes the TM3RDM••R expansion module.

### What Is in This Chapter?

This chapter contains the following sections:

| Section | Topic     | Page |
|---------|-----------|------|
| 17.1    | TM3RDM16R | 206  |
| 17.2    | TM3RDM32R | 213  |

## Section 17.1

### TM3RDM16R

---

#### Overview

This section presents TM3RDM16R expansion module used in Modicon M218 Logic Controller.

#### What Is in This Section?

This section contains the following topics:

| Topic                     | Page |
|---------------------------|------|
| TM3RDM16R Characteristics | 207  |
| TM3RDM16R Wiring Diagram  | 212  |

# TM3RDM16R Characteristics

## Introduction

This section describes the general characteristics of the TM3RDM16R expansion module.  
 See also Environmental Characteristics (*see Modicon TM3, Digital I/O Modules, Hardware Guide*).

**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 (4 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.

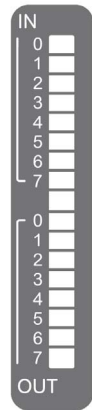
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Overview

- TM3RDM16R digital expansion module:
- 8 channel 24 Vdc sink/source inputs
  - 1 common line for inputs
  - 8 channel 2 A relay outputs
  - 2 common lines for outputs
  - Removable screw terminal block

## Status LEDs

The following figure shows the status LEDs:

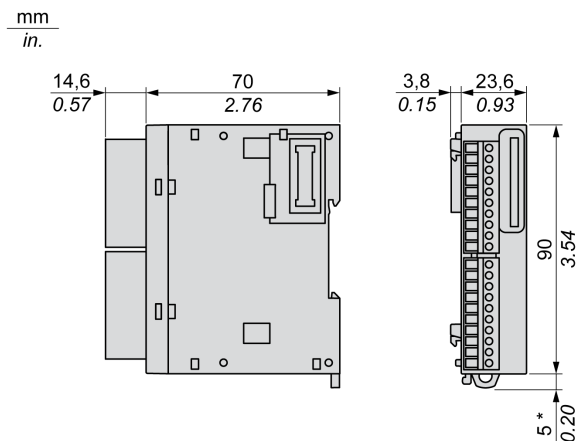


This table describes the status LEDs:

| LED   | Color | Status | Type   | Description                |
|-------|-------|--------|--------|----------------------------|
| 0...7 | Green | On     | Input  | The channel is activated   |
|       |       | Off    |        | The channel is deactivated |
| 0...7 | Green | On     | Output | The channel is activated   |
|       |       | Off    |        | The channel is deactivated |

## Dimensions

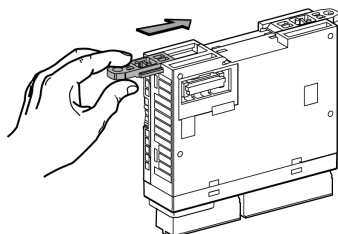
The following diagrams show the external dimensions for the TM3RDM16R expansion modules:



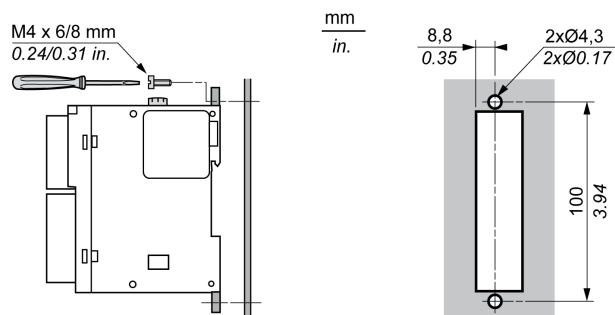
**NOTE:** \* 8.5 mm (0.33 in.) when the clamp is pulled out.

## Panel Mounting

Insert the mounting strip into the slot at the top of the module:



The following diagram shows the mounting holes layout for the TM3RDM16R expansion module:



## Main Characteristics

| Characteristic                    |        | Value                                                    |
|-----------------------------------|--------|----------------------------------------------------------|
| <b>Input</b>                      |        |                                                          |
| Number of input channels          |        | 8 inputs                                                 |
| Input type                        |        | Type 1 (IEC/EN 61131-2)                                  |
| Input Logic type                  |        | Sink/source                                              |
| Rated input voltage               |        | 24 Vdc                                                   |
| <b>Output</b>                     |        |                                                          |
| Number of output channels         |        | 8 outputs                                                |
| Output type                       |        | Relay                                                    |
| Contact type                      |        | NO (Normally Open)                                       |
| Rated output voltage              |        | 24 Vdc / 240 Vac                                         |
| Rated output current              |        | 2 A                                                      |
| <b>Connection and cable types</b> |        |                                                          |
| Connection type                   |        | Removable screw terminal block                           |
| Cable type and length             | Type   | Unshielded                                               |
|                                   | Length | Input: max. 50 m (164 ft)<br>Output: max. 150 m (492 ft) |
| Weight                            |        | 118 g (4.16 oz)                                          |

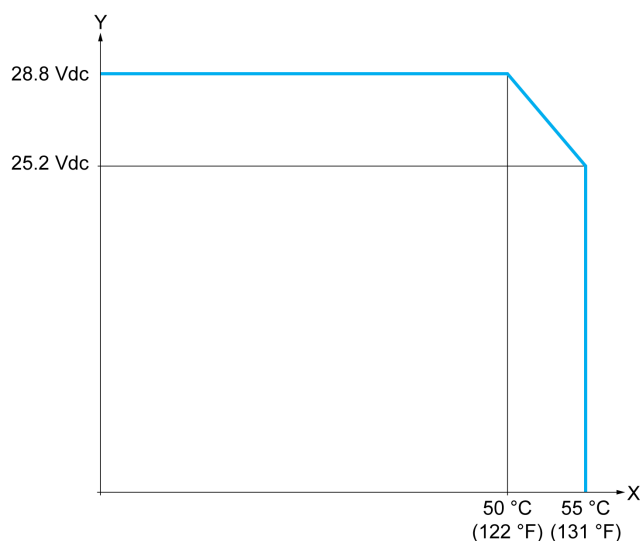
## Input Characteristics

The table below describes the input characteristics of the TM3RDM16R:

| Characteristic                         |                                      | Value                                                |
|----------------------------------------|--------------------------------------|------------------------------------------------------|
| Number of input channels               |                                      | 8 inputs                                             |
| Number of channels groups              |                                      | 1 common line for 8 channels                         |
| Input type                             |                                      | Type 1 (IEC/EN 61131-2)                              |
| Logic type                             |                                      | Sink/source                                          |
| Rated input voltage                    |                                      | 24 Vdc                                               |
| Input voltage range                    |                                      | 0...28.8 Vdc                                         |
| Rated input current                    |                                      | 5 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                   | < 1.5 mA                                             |
| Turn on time                           |                                      | 4 ms                                                 |
| Turn off time                          |                                      | 4 ms                                                 |
| De-rating                              | 0...55 °C<br>(32...131 °F)           | See Input de-rating ( <a href="#">see page 210</a> ) |
| Isolation                              | Between input and internal logic     | 500 Vac / 800 Vdc                                    |
|                                        | Between input group and output group | 1500 Vac / 2500 Vdc                                  |
|                                        | Between input groups                 | N/A                                                  |
| Connection type                        |                                      | Removable screw terminal block                       |
| Connector insertion/removal durability |                                      | Over 100 times                                       |
| Current draw on 5 Vdc internal bus     |                                      | 70 mA                                                |
| Current draw on 24 Vdc internal bus    |                                      | 40 mA                                                |

## Input De-rating

When using TM3RDM16R:



**X** Ambient temperature (°C / °F)

**Y** Input voltage (V)

At an ambient temperature of 55 °C (131 °F) in the horizontal mounting direction, limit the inputs and outputs, respectively, which turn on simultaneously as indicated by the X axis.

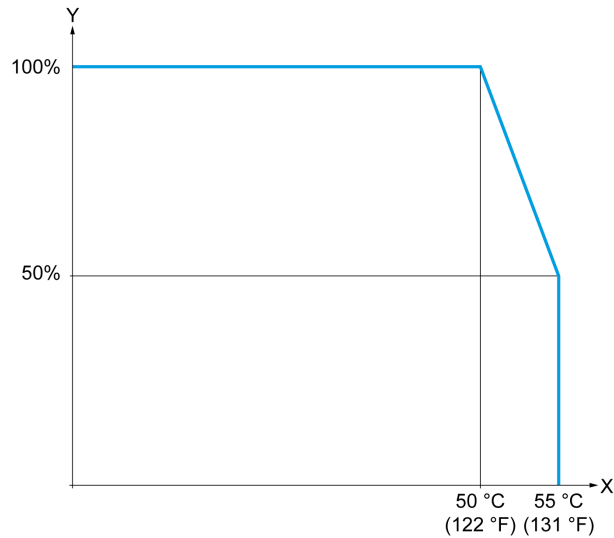
## Output Characteristics

The table below describes the outputs characteristics of the TM3RDM16R:

| Characteristic                                                                                                                                |                                      | Value                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------|
| Number of output channels                                                                                                                     |                                      | 8 outputs                                             |
| Number of channel groups                                                                                                                      |                                      | 2 common lines for 8 channels                         |
| Output type                                                                                                                                   |                                      | Relay                                                 |
| Contact type                                                                                                                                  |                                      | NO (Normally Open)                                    |
| Rated output voltage                                                                                                                          |                                      | 24 Vdc, 220 Vac                                       |
| Maximum voltage                                                                                                                               |                                      | 30 Vdc, 250 Vac                                       |
| Rated output current                                                                                                                          |                                      | 2 A per output                                        |
| Maximum output current                                                                                                                        |                                      | 2 A per output<br>4 A per common                      |
| Maximum output frequency                                                                                                                      | With max. load                       | 0.1 Hz                                                |
|                                                                                                                                               | Without load                         | 5 Hz                                                  |
| Turn on time                                                                                                                                  |                                      | Max. 10 ms                                            |
| Turn off time                                                                                                                                 |                                      | Max. 10 ms                                            |
| De-rating                                                                                                                                     | 0...55 °C<br>(32...131 °F)           | See Output de-rating ( <a href="#">see page 211</a> ) |
| Mechanical life                                                                                                                               |                                      | 20 million operations                                 |
| Electrical life under resistive load 2 A                                                                                                      |                                      | 100,000 switching cycles at 45 °C (113 °F)            |
| Protection against short circuit                                                                                                              |                                      | No                                                    |
| Isolation                                                                                                                                     | Between output and internal logic    | 1500 Vac / 2500 Vdc                                   |
|                                                                                                                                               | Between input group and output group | 1500 Vac / 2500 Vdc                                   |
|                                                                                                                                               | Between output groups                | 1500 Vac / 2500 Vdc                                   |
| Connection type                                                                                                                               |                                      | Removable screw terminal block                        |
| Connector insertion/removal durability                                                                                                        |                                      | Over 100 times                                        |
| Current draw on 5 Vdc internal bus                                                                                                            |                                      | 70 mA                                                 |
| Current draw on 24 Vdc internal bus                                                                                                           |                                      | 40 mA                                                 |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                      |                                                       |

## Output De-rating

When using TM3RDM16R:



- X Ambient temperature (°C / °F)  
Y Output load current (%)

## Power Limitation

This table describes the power limitation of the TM3RDM16R expansion module depending on the voltage, the type of load, and the number of operations required.

These expansion modules 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   |

TM3RDM16R Wiring Diagram

Introduction

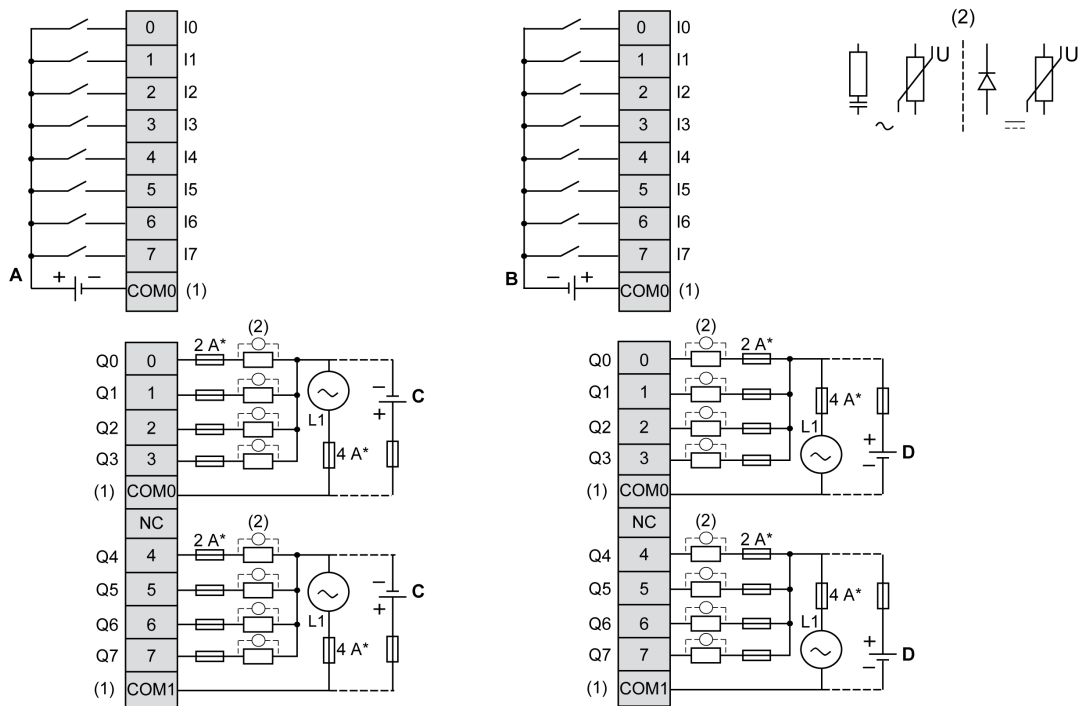
These expansion modules have a built-in removable screw terminal block for the connection of inputs, outputs, and power supply.

Wiring Rules

See Wiring Best Practices (see page 34).

Wiring Diagram

The following figure illustrates the connections between the inputs and outputs, the sensors and actuators, and their commons:



- \* Type T Fuse
- (1) The inputs COM0, outputs COM0 and COM1 terminals are **not** connected internally.
- (2) To improve the life time of the contacts, and to protect from potential inductive load damage, connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load.
- A Sink wiring (positive logic)
- B Source wiring (negative logic)
- C Source wiring (positive logic)
- D Sink wiring (negative logic)

For information about 24 Vdc power supply, refer to DC Power Supply Characteristics (see Modicon TM3, Digital I/O Modules, Hardware Guide).

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.

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## Section 17.2

### TM3RDM32R

---

#### Overview

This section presents TM3RDM32R expansion module used in Modicon M218 Logic Controller.

#### What Is in This Section?

This section contains the following topics:

| Topic                     | Page |
|---------------------------|------|
| TM3RDM32R Characteristics | 214  |
| TM3RDM32R Wiring Diagram  | 219  |

TM3RDM32R Characteristics

Introduction

This section provides a description of the electrical and input/output characteristics of the TM3RDM32R expansion modules.

See also Environmental Characteristics (*see Modicon TM3, Digital I/O Modules, Hardware Guide*).

⚠ 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 (4 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.**

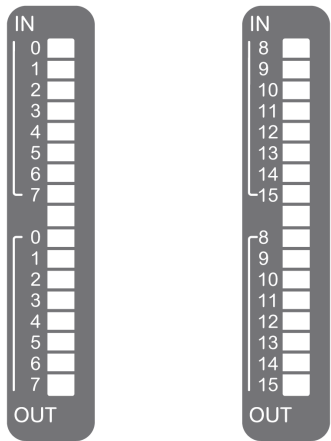
Overview

TM3RDM32R digital expansion module:

- 16 channel 24 Vdc sink/source inputs
- 2 common lines for inputs
- 16 channel 2 A relay outputs
- 4 common lines for outputs
- Removable screw terminal block

Status LEDs

The following figure shows the status LEDs:

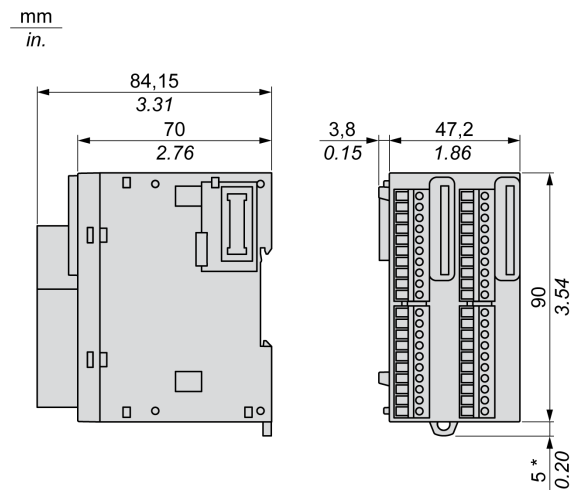


This table describes the status LEDs:

| LED    | Color | Status | Type   | Description                |
|--------|-------|--------|--------|----------------------------|
| 0...15 | Green | On     | Input  | The channel is activated   |
|        |       | Off    |        | The channel is deactivated |
| 0...15 | Green | On     | Output | The channel is activated   |
|        |       | Off    |        | The channel is deactivated |

## Dimensions

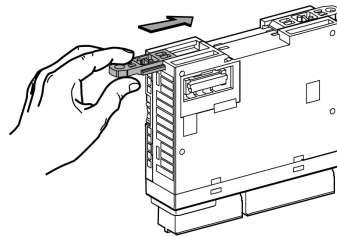
The following diagrams show the external dimensions for the TM3RDM32R expansion modules:



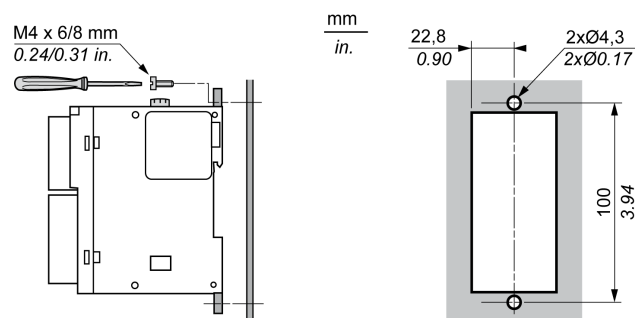
**NOTE:** \* 8.5 mm (0.33 in) when the clamp is pulled out.

## Panel Mounting

Insert the mounting strip into the slot at the top of the module:



The following diagram shows the mounting holes layout for the TM3RDM32R expansion module:



## Main Characteristics

| Characteristic                    |        | Value                                                    |
|-----------------------------------|--------|----------------------------------------------------------|
| <b>Input</b>                      |        |                                                          |
| Number of input channels          |        | 16 inputs                                                |
| Input type                        |        | Type 1 (IEC/EN 61131-2)                                  |
| Input Logic type                  |        | Sink/Source                                              |
| Rated input voltage               |        | 24 Vdc                                                   |
| <b>Output</b>                     |        |                                                          |
| Number of output channels         |        | 16 outputs                                               |
| Contact type                      |        | NO (Normally Open)                                       |
| Rated output voltage              |        | 24 Vdc / 220 Vdc                                         |
| Rated output current              |        | 2 A                                                      |
| <b>Connection and cable types</b> |        |                                                          |
| Connection type                   |        | Removable screw terminal blocks                          |
| Cable type and length             | Type   | Unshielded                                               |
|                                   | Length | Input: max. 50 m (164 ft)<br>Output: max. 150 m (490 ft) |
| Weight                            |        | 208 g (7.34 oz)                                          |

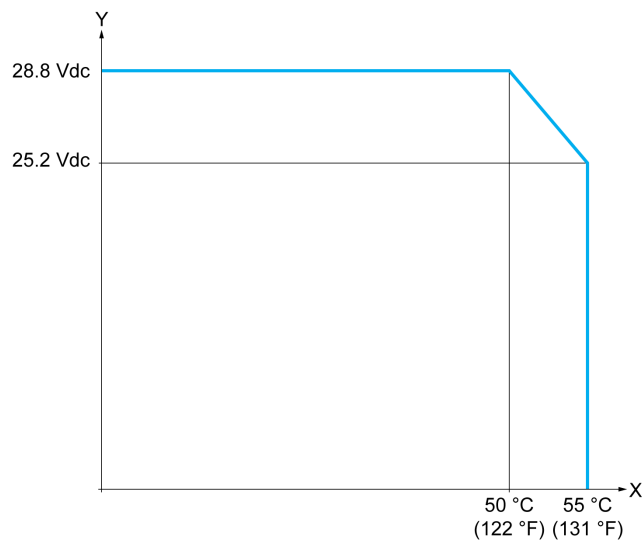
## Input Characteristics

The table below describes the input characteristics of the TM3RDM32R:

| Characteristic                         |                                      | Value                                                |
|----------------------------------------|--------------------------------------|------------------------------------------------------|
| Number of input channels               |                                      | 16 inputs                                            |
| Number of channels groups              |                                      | 2 common lines for 16 channels                       |
| Input type                             |                                      | Type 1 (IEC/EN 61131-2)                              |
| Logic type                             |                                      | Sink/source                                          |
| Rated input voltage                    |                                      | 24 Vdc                                               |
| Input voltage range                    |                                      | 0...28.8 Vdc                                         |
| Rated input current                    |                                      | 5 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                   | < 1.5 mA                                             |
| Turn on time                           |                                      | 4 ms                                                 |
| Turn off time                          |                                      | 4 ms                                                 |
| De-rating                              | 0...55 °C<br>(32...131 °F)           | See Input de-rating ( <a href="#">see page 217</a> ) |
| Isolation                              | Between input and internal logic     | 500 Vac / 800 Vdc                                    |
|                                        | Between input group and output group | 1500 Vac / 2500 Vdc                                  |
|                                        | Between input groups                 | 500 Vac / 800 Vdc                                    |
| Connection type                        |                                      | Removable screw terminal block                       |
| Connector insertion/removal durability |                                      | Over 100 times                                       |
| Current draw on 5 Vdc internal bus     |                                      | 95 mA                                                |
| Current draw on 24 Vdc internal bus    |                                      | 80 mA                                                |

## Input De-rating

When using TM3RDM32R:



X Ambient temperature (°C / °F)

Y Input voltage

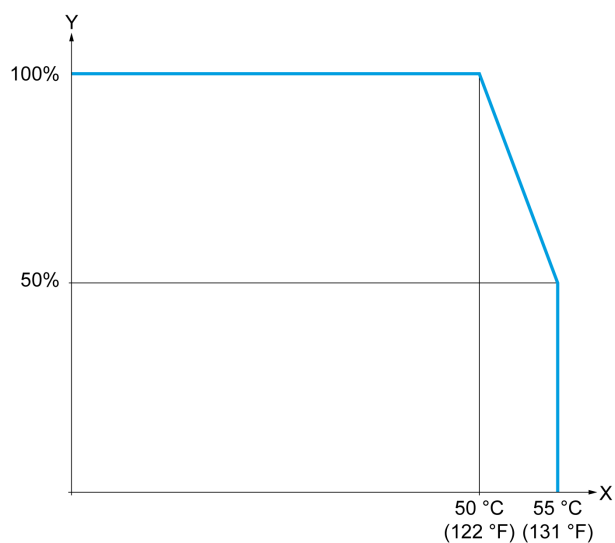
## Output Characteristics

The table below describes the output characteristics of the TM3RDM32R

| Characteristic                                                                                                                                |                                      | Value                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------|
| Number of output channels                                                                                                                     |                                      | 16                                                    |
| Number of channel groups                                                                                                                      |                                      | 4 common line for 16 channels                         |
| Output type                                                                                                                                   |                                      | Relay                                                 |
| Contact type                                                                                                                                  |                                      | NO (Normally Open)                                    |
| Rated output current                                                                                                                          |                                      | 2 A per output                                        |
| Maximum output current                                                                                                                        |                                      | 2 A per output<br>4 A per common                      |
| Maximum output frequency                                                                                                                      | With max. load                       | 0.1 Hz                                                |
|                                                                                                                                               | Without load                         | 5 Hz                                                  |
| Turn on time                                                                                                                                  |                                      | Max. 10 ms                                            |
| Turn off time                                                                                                                                 |                                      | Max. 10 ms                                            |
| De-rating                                                                                                                                     | 0...55 °C<br>(32...131 °F)           | See Output de-rating ( <a href="#">see page 218</a> ) |
| Mechanical life                                                                                                                               |                                      | 20 million operations                                 |
| Electrical life under resistive load 2 A                                                                                                      |                                      | 100,000 switching cycles at 45 °C (113 °F)            |
| Protection against short circuit                                                                                                              |                                      | No                                                    |
| Isolation                                                                                                                                     | Between output and internal logic    | 1500 Vac / 2500 Vdc                                   |
|                                                                                                                                               | Between input group and output group | 1500 Vac / 2500 Vdc                                   |
|                                                                                                                                               | Between output groups                | 1500 Vac / 2500 Vdc                                   |
| Connection type                                                                                                                               |                                      | Removable screw terminal block                        |
| Connector insertion/removal durability                                                                                                        |                                      | Over 100 times                                        |
| Current draw on 5 Vdc internal bus                                                                                                            |                                      | 95 mA                                                 |
| Current draw on 24 Vdc internal bus                                                                                                           |                                      | 80 mA                                                 |
| <b>NOTE:</b> Refer to Protecting Outputs from Inductive Load Damage ( <a href="#">see page 36</a> ) for additional information on this topic. |                                      |                                                       |

## Output De-rating

When using TM3RDM32R:



- X Ambient temperature (°C / °F)  
Y Output load current (%)

## Power Limitation

This table describes the power limitation of the TM3RDM32R expansion modules depending on the voltage, the type of load, and the number of operations required.

These expansion modules 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   |

# TM3RDM32R Wiring Diagram

## Introduction

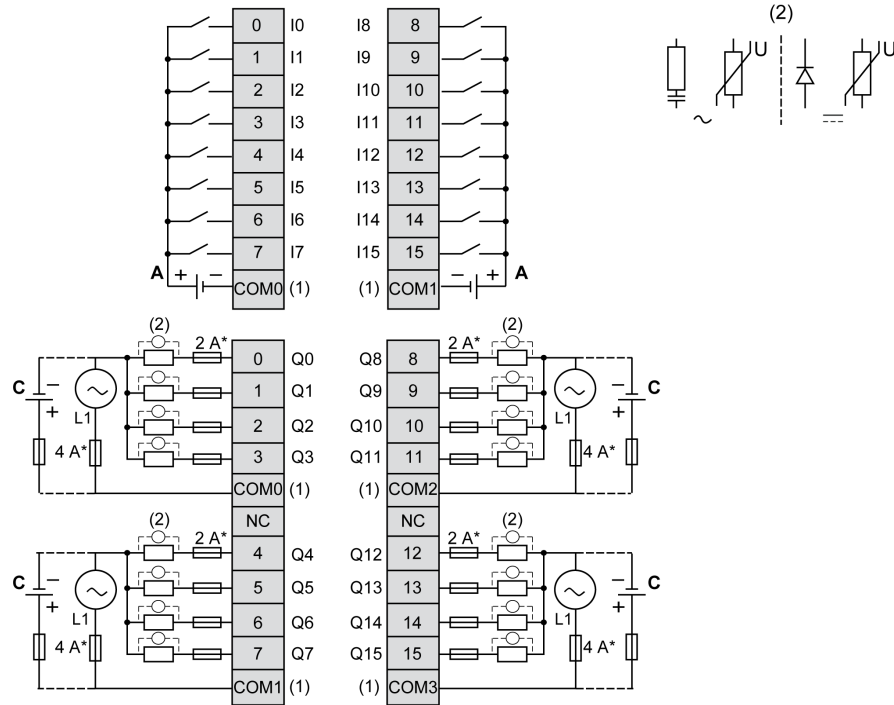
These expansion modules have a built-in removable screw terminal block for the connection of inputs, outputs, and power supply.

## Wiring Rules

See Wiring Best Practices (*see page 34*).

## Wiring Diagram

The following figure illustrates the connections between the inputs and outputs, the sensors and actuators, and their commons for a positive logic:

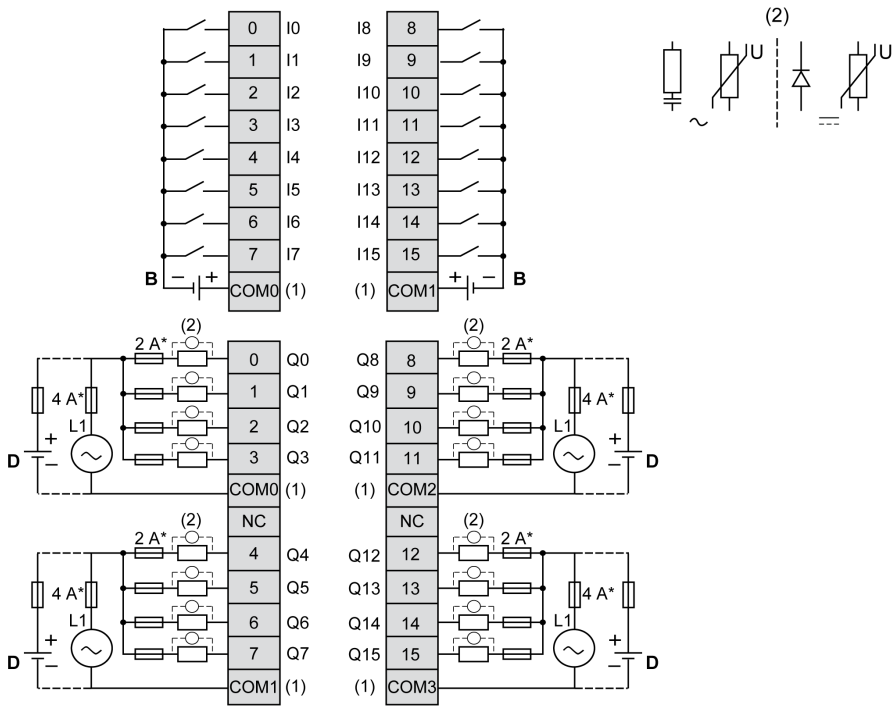


\* Type T Fuse

- (1) The inputs COM0, COM1, outputs COM0, COM1, COM2, and COM3 terminals are **not** connected internally.
- (2) To improve the life time of the contacts, and to protect from potential inductive load damage, connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load.

- A Sink wiring (positive logic)  
C Source wiring (positive logic)

The following figure illustrates the connections between the inputs and outputs, the sensors and actuators, and their commons for a negative logic:



- \* Type T Fuse
- (1) The inputs COM0, COM1 and outputs COM0, COM1, COM2, and COM3 terminals are **not** connected internally.
- (2) To improve the life time of the contacts, and to protect from potential inductive load damage, connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load.
- B Source wiring (negative logic)
- D Sink wiring (negative logic)

For information about 24 Vdc power supply, refer to DC Power Supply Characteristics (*see Modicon TM3, Digital I/O Modules, Hardware Guide*).

## ⚠ 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.**

---

# Chapter 18

## Integrated Communication Ports

---

### What Is in This Chapter?

This chapter contains the following topics:

| Topic                | Page |
|----------------------|------|
| Ethernet Port        | 222  |
| USB Programming Port | 224  |
| Serial Link Port 1   | 225  |
| Serial Link Port 2   | 227  |

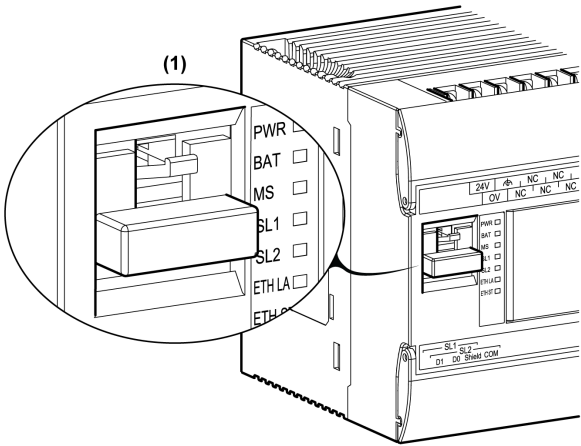
Ethernet Port

Overview

The following controllers are equipped with an Ethernet communications port:

- TM218LDAE24DRHN
- TM218LDAE40DRPHN

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



(1) Ethernet port with dust plug

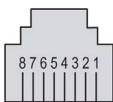
Characteristics

The table below describes the different Ethernet characteristics:

| Characteristic                 | Description                                                                                                                          |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Function                       | Modbus TCP/IP<br>EcoStruxure Machine Expert Protocol                                                                                 |
| Connector type                 | RJ45                                                                                                                                 |
| Driver                         | <ul style="list-style-type: none"><li>• 10 M half duplex (auto negotiation)</li><li>• 100 M full duplex (auto negotiation)</li></ul> |
| Cable type                     | Shielded                                                                                                                             |
| Automatic cross-over detection | Yes                                                                                                                                  |

Pin Assignment

The following illustration shows the RJ45 Ethernet connector pin assignment:

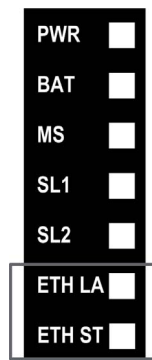


The table below describes the RJ45 Ethernet connector pins:

| 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).

## Status LEDs



The table below describes the **ETH LA** and **ETH ST** Ethernet status LEDs:

| Label  | Description       | LED          |                 |                                                                   |
|--------|-------------------|--------------|-----------------|-------------------------------------------------------------------|
|        |                   | Color        | Status          | Description                                                       |
| ETH LA | Ethernet Activity | Green/Yellow | Off             | No link                                                           |
|        |                   |              | Green on        | Link at 100 Mbps                                                  |
|        |                   |              | Yellow on       | Link at 10 Mbps                                                   |
|        |                   |              | Green flash     | Activity at 100 Mbps                                              |
|        |                   |              | Yellow flash    | Activity at 10 Mbps                                               |
| ETH ST | Ethernet Status   | Green        | Off             | Physical connections are unplugged and no IP address is obtained. |
|        |                   |              | Green on        | Minimum one port is connected and an IP address is obtained       |
|        |                   |              | 3 green flashes | All the ports are unplugged, but the card has an IP address.      |
|        |                   |              | 4 green flashes | Duplicated IP address is detected.                                |
|        |                   |              | 5 green flashes | The card is performing a BOOTP or DHCP sequence.                  |
|        |                   |              | 6 green flashes | The configured IP is invalid using default IP.                    |

## USB 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 EcoStruxure Machine Expert 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

#### UNINTENDED EQUIPMENT OPERATION OR INOPERABLE EQUIPMENT

- 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 or bus coupler at a time using USB connections.
- Do not use the USB port(s), if so equipped, unless the location is known to be non-hazardous.

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

### Characteristics

The table below describes the characteristics of the USB programming port:

| Parameter      |                | USB Programming Port    |
|----------------|----------------|-------------------------|
| Function       |                | Compatible with USB 2.0 |
| Connector type |                | Mini-B                  |
| Isolation      |                | None                    |
| Cable          | Type           | Shielded                |
|                | Maximum length | < 3 m (9.9 ft)          |

## Serial Link Port 1

### Overview

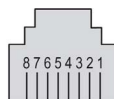
The serial link port 1 is used to communicate with devices supporting the Modbus protocol as either a master or slave, ASCII Protocol (printer, modem...), and EcoStruxure Machine Expert Protocol (HMI,...).

### Characteristics

| Characteristic               |                | Description                                                                                                             |
|------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------|
| Function                     |                | Modbus Master/Slave<br><b>NOTE:</b> Slave mode needs 120 $\Omega$ resistor for external line termination.               |
| Connector type               |                | RJ45                                                                                                                    |
| Isolation                    |                | Non-isolated                                                                                                            |
| Maximum baud rate            |                | 115,200 bps                                                                                                             |
| Cable                        | Type           | Shielded                                                                                                                |
|                              | Maximum length | 15 m (49 ft)                                                                                                            |
| Polarization                 |                | Software configuration is used to connect when the node is configured as a Master. 560 $\Omega$ resistors are optional. |
| 5 Vdc power supply for RS485 |                | No                                                                                                                      |

### Pin Assignment

The following illustration shows the pins of the RJ45 connector:



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

| Pin | RS485  |
|-----|--------|
| 1   | N.C.   |
| 2   | N.C.   |
| 3   | N.C.   |
| 4   | D1     |
| 5   | D0     |
| 6   | N.C.   |
| 7   | N.C.   |
| 8   | Common |

N.C.: Not Connected

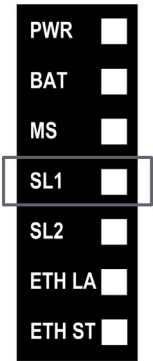
### **⚠ WARNING**

#### **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 table below describes the serial link port 1 status LED:

| Label | Description   | LED    |        |                                             |
|-------|---------------|--------|--------|---------------------------------------------|
|       |               | Color  | Status | Description                                 |
| SL1   | Serial Link 1 | Yellow | On     | Indicates the activity of the serial link 1 |
|       |               |        | Off    | Indicates no serial communication           |

## Serial Link Port 2

### Overview

The serial link port 2:

- is used to communicate with devices supporting the Modbus protocol as either a master or slave and ASCII Protocol (printer, modem...).
- supports RS485 and terminal block.

### Characteristics

| Characteristic               |                | Description                                                                                                             |
|------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------|
| Function                     |                | Modbus Master/Slave<br><b>NOTE:</b> Slave mode needs 120 $\Omega$ resistor for external line termination.               |
| Connector type               |                | Terminal block                                                                                                          |
| Isolation                    |                | Non-isolated                                                                                                            |
| Maximum baud rate            |                | 38,400 bps                                                                                                              |
| Cable                        | Type           | Shielded                                                                                                                |
|                              | Maximum length | 200 m (656 ft) for RS485                                                                                                |
| Polarization                 |                | Software configuration is used to connect when the node is configured as a Master. 560 $\Omega$ resistors are optional. |
| 5 Vdc power supply for RS485 |                | No                                                                                                                      |

### Pin Assignment

The table below describes the pin assignment for RS485 and terminal block:

| Pin | Terminal block/RS485 |
|-----|----------------------|
| 1   | D1                   |
| 2   | D0                   |
| 3   | Shield               |
| 4   | Common               |

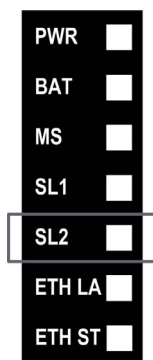
### WARNING

#### 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 table below describes the serial link 2 status LED:

| Label | Description   | LED    |        |                                             |
|-------|---------------|--------|--------|---------------------------------------------|
|       |               | Color  | Status | Description                                 |
| SL2   | Serial Link 2 | Yellow | On     | Indicates the activity of the serial link 2 |
|       |               |        | Off    | Indicates no serial communication           |

# Chapter 19

## Connecting the Modicon M218 Logic Controller to a PC

### Connecting the Controller to a PC

#### Overview

To transfer, run, and monitor the applications, use a USB cable to connect the controller to a computer that has EcoStruxure Machine Expert installed.

#### **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 Mini-B Port Connection

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

**BMXXCAUSBH045:** 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 EcoStruxure Machine Expert 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 EcoStruxure Machine Expert 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**

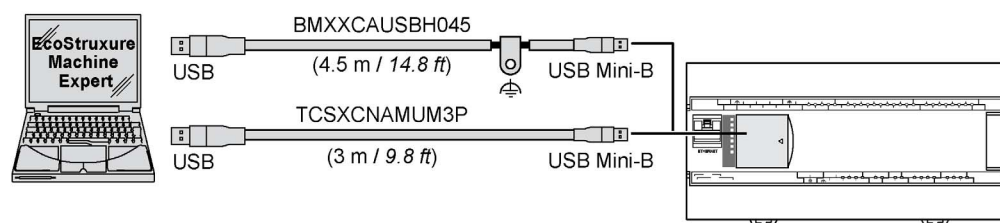
##### **UNINTENDED EQUIPMENT OPERATION OR INOPERABLE EQUIPMENT**

- 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 or bus coupler at a time using USB connections.
- Do not use the USB port(s), if so equipped, unless the location is known to be non-hazardous.

**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.

The following illustration shows the USB connection to a PC:

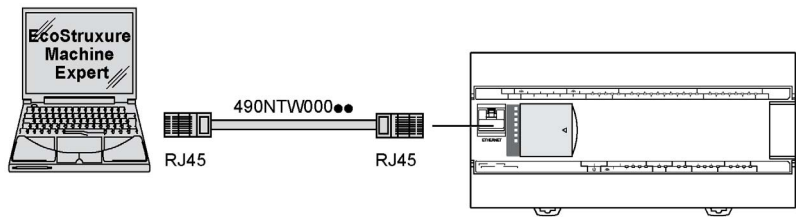


To connect the USB cable to your controller, follow the steps below:

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <b>1a</b> If making a long-term connection using the cable BMXXCAUSBH045, 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.<br><b>1b</b> If making a short-term connection using the cable TCSXCNAMUM3P or other non-grounded USB cable, proceed to step 2. |
| 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 the Ethernet cable to the PC.                              |
| 2    | Connect the Ethernet cable to the Ethernet port on the controller. |



## !

%

According to the IEC standard, % is a prefix that identifies internal memory addresses in the logic controller to store the value of program variables, constants, I/O, and so on.

## A

**analog input**

Converts received voltage or current levels into numerical values. You can store and process these values within the logic controller.

**analog output**

Converts numerical values within the logic controller and sends out proportional voltage or current levels.

**application**

A program including configuration data, symbols, and documentation.

## B

**BOOTP**

(*bootstrap protocol*) A UDP network protocol that can be used by a network client to automatically obtain an IP address (and possibly other data) from a server. The client identifies itself to the server using the client MAC address. The server, which maintains a pre-configured table of client device MAC addresses and associated IP addresses, sends the client its pre-configured IP address. BOOTP was originally used as a method that enabled diskless hosts to be remotely booted over a network. The BOOTP process assigns an infinite lease of an IP address. The BOOTP service utilizes UDP ports 67 and 68.

**bps**

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

## C

**calibration**

The process of setting or maintaining the accuracy of a measuring device by comparing its value to a known and correct standard.

**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.

**configuration**

The arrangement and interconnection of hardware components within a system and the hardware and software parameters that determine the operating characteristics of the system.

**continuous function chart language**

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 inputs of other blocks to create complex expressions.

**control network**

A network containing logic controllers, SCADA systems, PCs, HMI, switches, ...

Two kinds of topologies are supported:

- flat: all modules and devices in this network belong to same subnet.
- 2 levels: the network is split into an operation network and an inter-controller network.

These two networks can be physically independent, but are generally linked by a routing device.

**D****DHCP**

(*dynamic host configuration protocol*) An advanced extension of BOOTP. DHCP is more advanced, but both DHCP and BOOTP are common. (DHCP can handle BOOTP client requests.)

**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.

**electronic module**

In a programmable controller system, most electronic modules directly interface to the sensors, actuators, and external devices of the machine/process. This electronic module is the component that mounts in a bus base and provides electrical connections between the controller and the field devices. Electronic modules are offered in a variety of signal levels and capacities. (Some electronic modules are not I/O interfaces, including power distribution modules and transmitter/receiver modules.)

**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*).

**equipment**

A part of a machine including sub-assemblies such as conveyors, turntables, and so on.

**Ethernet**

A physical and data link layer technology for LANs, also known as IEEE 802.3.

**F****FAST I/O**

*FAST input/output* Specific I/O modules with some electrical features (for example, response time) while the treatment of these channels are done directly by the controller

**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.

**FG**

(*frequency generator*) A function that generates a square wave signal with programmable frequency.

**function**

A programming unit that has 1 input and returns 1 immediate result. However, unlike FBs, it is directly called with its name (as opposed to through an instance), has no persistent state from one call to the next and can be used as an operand in other programming expressions.

Examples: boolean (AND) operators, calculations, conversions (BYTE\_TO\_INT)

**H****HE10**

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

**HMI**

(*human machine interface*) An operator interface (usually graphical) for human control over industrial equipment.

**HSC**

(*high-speed counter*) A function that counts pulses on the controller or on expansion module inputs.

**I****I/O**

(*input/output*)

**I/O terminal**

(*input/output terminal*) A collection of connection points between the field wiring and the I/O modules or those integrated into the controller.

**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).

**input terminal**

A collection of connection points between the field wiring and the I/O modules or those integrated into the controller.

**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**

(*Internet protocol*) Part of the TCP/IP protocol family that tracks the Internet addresses of devices, routes outgoing messages, and recognizes incoming messages.

**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).

|                               |                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LD</b>                     | <i>(ladder diagram)</i> 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).                                                                                                                                                                          |
| <b>LED</b>                    | <i>(light emitting diode)</i> An indicator that illuminates under a low-level electrical charge.                                                                                                                                                                                                                                                                                                        |
| <b>M</b>                      |                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>machine</b>                | Consists of several <i>functions</i> and/or <i>equipment</i> .                                                                                                                                                                                                                                                                                                                                          |
| <b>master/slave</b>           | The single direction of control in a network that implements the master/slave mode.                                                                                                                                                                                                                                                                                                                     |
| <b>Modbus</b>                 | The protocol that allows communications between many devices connected to the same network.                                                                                                                                                                                                                                                                                                             |
| <b>ms</b>                     | <i>(millisecond)</i>                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>N</b>                      |                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>N/O</b>                    | <i>(normally open)</i> A contact pair that opens when the actuator is de-energized (no power is applied) and closes when the actuator is energized (power is applied).                                                                                                                                                                                                                                  |
| <b>NEMA</b>                   | <i>(national electrical manufacturers association)</i> 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.                                                 |
| <b>network</b>                | A system of interconnected devices that share a common data path and protocol for communications.                                                                                                                                                                                                                                                                                                       |
| <b>node</b>                   | An addressable device on a communication network.                                                                                                                                                                                                                                                                                                                                                       |
| <b>O</b>                      |                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>output terminal</b>        | A collection of connection points between the field wiring and the I/O modules or those integrated into the controller.                                                                                                                                                                                                                                                                                 |
| <b>P</b>                      |                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>PE</b>                     | <i>(Protective Earth)</i> 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 <i>protective ground</i> in North America or as an equipment grounding conductor in the US national electrical code). |
| <b>power supply terminals</b> | The power supply is connected to these terminals to provide power to the controller.                                                                                                                                                                                                                                                                                                                    |
| <b>program</b>                | The component of an application that consists of compiled source code capable of being installed in the memory of a logic controller.                                                                                                                                                                                                                                                                   |
| <b>protocol</b>               | A convention or standard definition that controls or enables the connection, communication, and data transfer between 2 computing system and devices.                                                                                                                                                                                                                                                   |
| <b>PWM</b>                    | <i>(pulse width modulation)</i> A fast output that oscillates between off and on in an adjustable duty cycle, producing a rectangular wave form (though you can adjust it to produce a square wave).                                                                                                                                                                                                    |

## R

### reflex output

Among the outputs of HSC are the reflex outputs associated to a threshold value that is compared to the counter value depending on the configuration of the HSC. The reflex outputs switch to either on or off depending on the configured relationship with the threshold.

### RJ45

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

### RS-485

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

### RTC

(*real-time clock*) A battery-backed time-of-day and calendar clock that operates continuously, even when the controller is not powered for the life of the battery.

### run

A command that causes the controller to scan the application program, read the physical inputs, and write to the physical outputs according to solution of the logic of the program.

## S

### scan

A function that includes:

- reading inputs and placing the values in memory
- executing the application program 1 instruction at a time and storing the results in memory
- using the results to update outputs

### 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.

### STOP

A command that causes the controller to stop running an application program.

## T

### task

A group of sections and subroutines, executed cyclically or periodically for the master task, or periodically for the periodic task.

A task possesses a priority level and is linked to the I/Os of the logic controller. These I/Os are refreshed in consequence.

A logic controller can have several tasks.

### TCP

(*transmission control protocol*) A connection-based transport layer protocol that provides a simultaneous bi-directional transmission of data. TCP is part of the TCP/IP protocol suite.

### terminal block

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





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