Modicon M218 Logic Controller

Hardware Guide

04/2014

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

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

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

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

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

Table of Contents

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, 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 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 an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

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

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can 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.

About the Book

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 SoMachine 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 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 SoMachine V4.1.

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

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

Related Documents

Title of Documentation	Reference Number
Modicon M218 Logic Controller Programming Guide	EIO0000000827 (eng), EIO0000000830 (chs)
Modicon TM2 Digital I/O Module Hardware Guide	EIO0000000450 (eng), EIO0000000451 (fre), EIO0000000452 (ger), EIO0000000453 (spa), EIO0000000454 (ita), EIO0000000455 (chs)
TM2...N I/O Expansion Module Hardware Guide	EIO0000001033 (eng); EIO0000001034 (chs)

Title of Documentation	Reference Number
Modicon TM2 Analog I/O Module Hardware Guide	EIO0000000444 (eng), EIO0000000445 (fre), EIO0000000446 (ger), EIO0000000447 (spa), EIO0000000448 (ita), EIO0000000449 (chs)
Modicon M218 Logic Controller Instruction Sheet	S1A63573

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Product Related Information

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

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

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

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

⚠ DANGER

POTENTIAL FOR EXPLOSION

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

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

⚠ 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.[1]
- 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.

[1] 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.

Chapter 1
Basics of the TM218 System

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:

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:

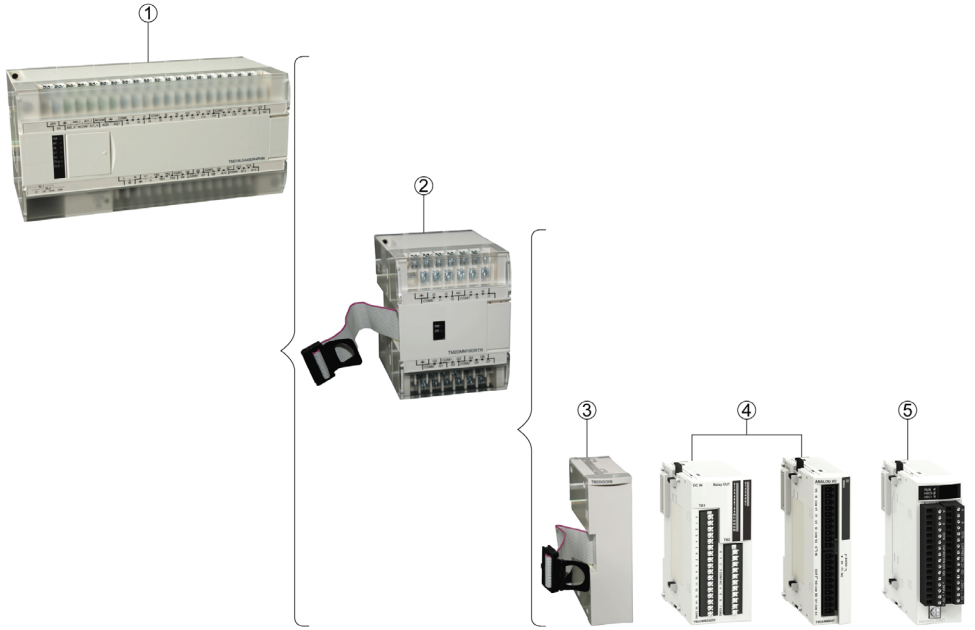
M218 System Architecture

Optimized configurations and flexibility are provided by the association of:

- M218 Logic Controllers
- TM2...N I/O expansion modules *(see page 18)*
- TM2 I/O expansion modules *(see page 19)*
- An accessory TM2DOCKN adaptor module *(see ModiconTM2...N Expansion Modules, Hardware Guide)* to connect TM2 I/O expansion modules

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 TM2 high speed counter (HSC) or TWDPTO220DT pulse train output (PTO) expansion modules

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

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 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 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 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 digital and analog expansion I/O modules
- TM2DOCKN adaptor module for TM2 expansion modules
- TM2 digital and analog expansion I/O modules
- TM2 high speed counter expansion modules (HSC)
- TWDPTO220DT pulse train output expansion module (PTO)

TM2...N Expansion Modules

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

The table below lists the different types of TM2...N expansion modules *(see ModiconTM2...N Expansion Modules, Hardware Guide)*, which are available to create expansion I/O slices:

Reference	Description
TM2DMM16DRTN *(see ModiconTM2...N Expansion Modules, Hardware Guide)*	8 regular inputs, 8 relay outputs
TM2AMI2HTN *(see ModiconTM2...N Expansion Modules, Hardware Guide)*	2 analog inputs
TM2AMI4HTN *(see ModiconTM2...N Expansion Modules, Hardware Guide)*	4 analog inputs
TM2AMO2HTN *(see ModiconTM2...N Expansion Modules, Hardware Guide)*	2 analog outputs

TM2DOCKN Adaptor Module

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

Reference	Description
TM2DOCKN *(see ModiconTM2...N Expansion Modules, Hardware Guide)*	Adaptor module for TM2 expansion modules

TM2 Expansion Modules

TM2 expansion modules are connected to your M218 controller with the use of the TM2DOCKN adaptor module.

This table shows the compatible TM2 digital I/O expansion modules *(see Modicon TM2, Digital I/O Modules, Hardware Guide)* with the corresponding number of channels and channel type:

Reference	Channels	Channel Type
Input Modules		
TM2DAI8DT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	8	Inputs
TM2DDI8DT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	8	Inputs
TM2DDI16DT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	16	Inputs
TM2DDI16DK *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	16	Inputs
TM2DDI32DK *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	32	Inputs
Output Modules		
TM2DRA8RT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	8	Outputs Relay
TM2DRA16RT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	16	Outputs Relay
TM2DDO8UT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	8	Outputs Transistor sink
TM2DDO8TT *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	8	Outputs Transistor source
TM2DDO16UK	16	Outputs Transistor sink
TM2DDO16TK *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	16	Outputs Transistor source
TM2DDO32UK *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	32	Outputs Transistor sink
TM2DDO32TK *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	32	Outputs Transistor source
Mixed Modules		
TM2DMM8DRT	4 4	Inputs Outputs Relay
TM2DMM24DRF *(see Modicon TM2, Digital I/O Modules, Hardware Guide)*	16 8	Inputs Outputs Relay

This table shows the compatible TM2 analog I/O expansion modules *(see Modicon TM2, Analog I/O Modules, Hardware Guide)* with the corresponding number of channels and channel type:

Reference	Channels	Channel Type
Input Modules		
TM2AMI2HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*	2	High-level inputs
TM2AMI2LT	2	Low-level inputs
TM2AMI4LT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*	4	Inputs
TM2AMI8HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*	8	Inputs
TM2ARI8HT	8	Inputs
TM2ARI8LRJ *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*	8	Inputs
TM2ARI8LT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*	8	Inputs
Output Modules		
TM2AMO1HT	1	Output
TM2AVO2HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*	2	Outputs
Mixed Modules		
TM2AMM3HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*	2 1	Inputs Output
TM2AMM6HT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*	2 1	Inputs Output
TM2ALM3LT *(see Modicon TM2, Analog I/O Modules, Hardware Guide)*	2 1	Low-level inputs Output

This table shows the compatible TM200HSC206D• modules *(see Modicon TM2, High Speed Counter Modules, Hardware Guide)* with the corresponding number of counter channels and I/Os per channel:

Reference	Counter Channels	I/Os per Channel
TM200HSC206DT *(see Modicon TM2, High Speed Counter Modules, Hardware Guide)*	2	6 inputs
		2 outputs
TM200HSC206DF *(see Modicon TM2, High Speed Counter Modules, Hardware Guide)*	2	6 inputs
		2 outputs

TWDPTO220DT PTO Expansion Module

The TWDPTO220DT PTO expansion module *(see Modicon M218, Pulse Train Output, TWDPTO220DT Expansion Module Hardware Guide)* connects to your M218 controller with the use of the TM2DOCKN adaptor module.

This table shows the compatible TWDPTO220DT PTO expansion module with the corresponding number of channels and I/Os per channel:

Reference	PTO Channels
TWDPTO220DT *(see Modicon M218, Pulse Train Output, TWDPTO220DT Expansion Module Hardware Guide)*	2

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	Maximum Number of I/O Points	Maximum Number of Relay Outputs
TM218LDA16DRN	4	144	42
TM218LDA24DRN TM218LDA24DRHN TM218LDD24DUPHN TM218LDAE24DRHN	4	152	42
TM218LDA40DRN TM218LDA40DRPHN TM218LDD40DUPHNB TM218LDAE40DRPHN TM218LDA40DR2HN TM218LDA40DR4PHN	7	248	90
TM218LDA60DRN	7	268	120

Chapter 2
TM218 System General Rules for Implementing

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:

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.
- 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.
- 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.
- 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.
- 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.

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. 		
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 9.8 m/s^2 (1 g_n) fixed acceleration from 8.4...150 Hz
	Mounted on a panel	10 mm (0.394 in.) fixed amplitude from 5...8.6 Hz 29.4 m/s^2 (3 g_n) fixed acceleration from 8.6...150 Hz
Mechanical shock resistance	Mounted on a DIN rail	147 m/s^2 (15 g_n) for a duration of 11 ms
	Mounted on a panel	294 m/s^2 (30 g_n) for a duration of 11 ms
Connection type		Removable screw terminal block
Connector insertion/removal cycles		50
Controller RTC Battery Type		Lithium thionyl chloride, TSX PLP1 (replaceable)

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

⚠ WARNING

FIRE OR EXPLOSION

Replace battery with identical type: Lithium thionyl chloride type, TSX PLP1.

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

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) 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 Relay Outputs: 2 kV Inputs and Static Outputs (DC): 1.5 kV Ethernet line: 1.5 kV Com1 and Com2 line: 1.5 kV
Surge immunity	IEC/EN 61000-4-5	Power Supply: CM: 2.2kV /; DM: 1.1 kV AC IO: CM: 2.2kV; DM: 1.1 kV DC IO: CM: 1.1kV; DM: 0.5 kV Shielded cable: 1.1 kV CM = Common Drive DM = Differential Drive
Immunity to conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6	3 V_{eff} (0.15...80 MHz)
Conducted emission	EN 55011 (IEC/CISPR11)	150...500 kHz, quasi peak 79 dBµV
		500 kHz...30 MHz, quasi peak 73 dBµV
Radiated emission	EN 55011 (IEC/CISPR11)	30...230 MHz, 10 m@40 dBµV/m quasi peak
		230 MHz...1 GHz, 10 m@47 dBµV/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.[1]
- 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.

[1] 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 37)*.

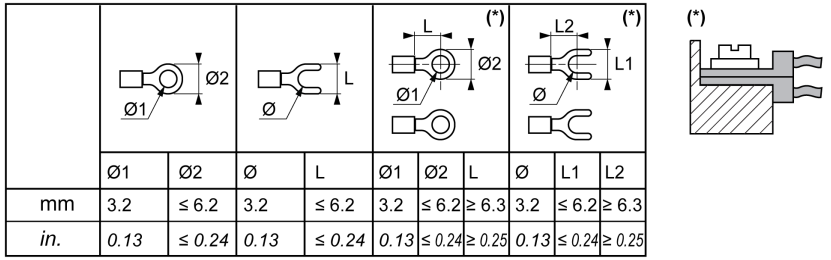
Rules for Removable Screw Terminal Block

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

mm / in. 6 / 0.24						
mm^2	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*

Ø 3,5 mm (*0.14 in.*)	C	N•m	0.5
		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 recommended wire sizes for the current capacity of the I/O channels and power supplies.

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.

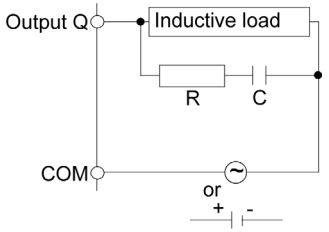
⚠ WARNING

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.

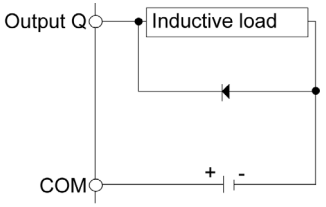
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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 µF.
- R represents a resistor of approximately the same resistance value as the load.

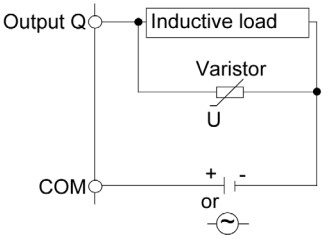
Protective circuit B: this protection circuit can be used for DC load power circuits.



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[1].
- Route communications and I/O cables separately from power cables.

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

[1]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 33)*.

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

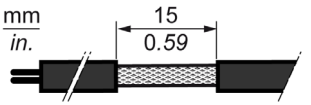
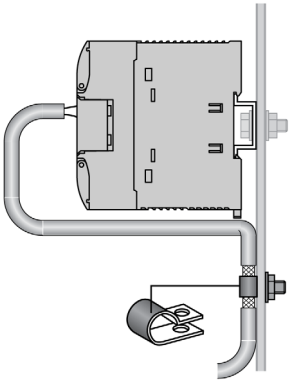
ELECTRIC SHOCK

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

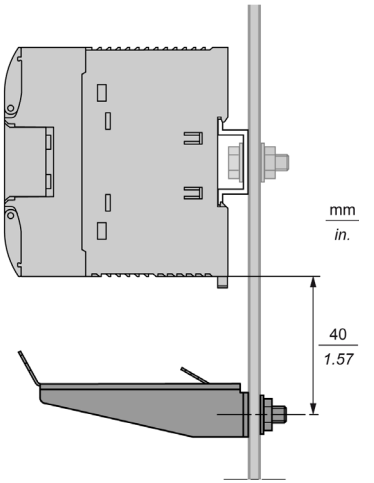
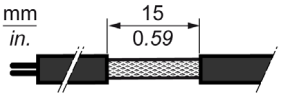
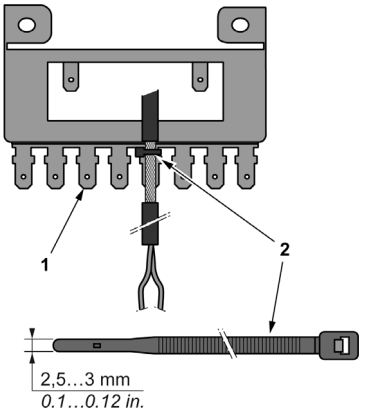
To ground the shield of a cable through a grounding clamp:

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: Schneider Electric recommends the use of the TM2 XMTGB Grounding Bar for Functional Ground (FE) connections.

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 3.1
M218 Controller Features

What Is in This Section?

This section contains the following topics:

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 SoMachine software, and is described in the SoMachine Programming Guide.

Key Features

Programming languages

The Modicon M218 Logic Controller is supported and programmed with the SoMachine 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

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

Power Supply *(see page 76)*

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 46)*

The Modicon M218 Logic Controller includes a Real Time Clock (RTC) system *(see page 46)*.

Run/Stop Switch *(see page 54)*

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:
- 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 265)*.

Modicon M218 Logic Controller Range

Reference	Digital Input	Digital Output	Analog Input	Analog Output
TM218LDA16DRN *(see page 81)*	7 regular inputs and 2 fast inputs (HSC)(1)	7 relay outputs	No	No
TM218LDA24DRN *(see page 95)*	12 regular inputs and 2 fast inputs (HSC)(1)	10 relay outputs	No	No
TM218LDA24DRHN *(see page 109)*	10 regular inputs and 4 fast inputs (HSC) (2)	10 relay outputs	No	No
TM218LDD24DUPHN *(see page 123)*	10 regular inputs and 4 fast inputs (HSC)(2)	6 regular outputs and 4 fast outputs (PTO/PWM/FG)(3)	No	No
TM218LDAE24DRHN *(see page 139)*	10 regular inputs and 4 fast inputs (HSC)(2)	10 relay outputs	No	No

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

Reference	Digital Input	Digital Output	Analog Input	Analog Output
TM218LDA40DRN *(see page 153)*	22 regular inputs and 2 fast inputs (HSC)(1)	16 relay outputs	No	No
TM218LDA40DRPHN *(see page 167)*	20 regular inputs and 4 fast inputs (HSC)(2)	12 relay outputs and 4 fast outputs (PTO/PWM/FG)(3)	No	No
TM218LDD40DUPHNB *(see page 183)*	20 regular inputs and 4 fast inputs (HSC)(2)	12 regular outputs, and 4 fast outputs (PTO/PWM/FG)(3)	No	No
TM218LDAE40DRPHN *(see page 199)*	20 regular inputs and 4 fast inputs (HSC)(2)	12 relay outputs and 4 fast outputs (PTO/PWM/FG)(3)	No	No
TM218LDA40DR2HN *(see page 215)*	20 regular inputs and 4 fast inputs (HSC)(2)	16 relay outputs	No	2 analog outputs
TM218LDA40DR4PHN *(see page 231)*	20 regular inputs and 4 fast inputs (HSC)(2)	12 relay outputs and 4 fast outputs (PTO/PWM/FG)(3)	2 analog inputs	2 analog outputs
TM218LDA60DRN *(see page 253)*	34 regular inputs and 2 fast inputs (HSC)(1)	24 relay outputs	No	No

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

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:

Use	In the event of a transient power outage, the battery powers the RTC.
Backup Time	At least 1.5 years at 45 °C max (113 °F). At higher temperatures, the time is reduced.
Battery Monitoring Features	Yes
Replaceable	Yes
Controller RTC Battery Type	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.

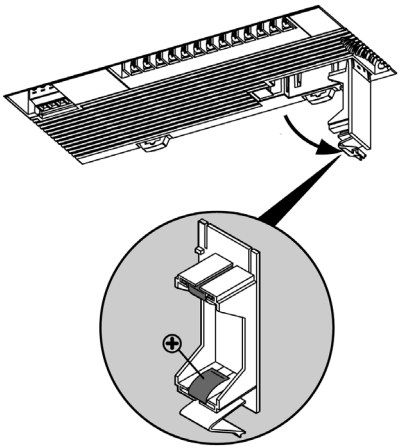
⚠ DANGER

EXPLOSION, FIRE, OR CHEMICAL BURNS

- Replace with identical battery type.
- Follow all battery manufacturer's instructions.
- 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, follow these steps:

Step	Action
1	Power off your controller.
2	Slide out the battery holder of the controller: 
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.

Step	Action
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 Modicon M218 Logic Controller, System Functions and Variables, M218 PLCSystem Library Guide)*.

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

⚠ WARNING

FIRE OR EXPLOSION

Replace battery with identical type: Lithium thionyl chloride type, TSX PLP1.

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

Section 3.2
M218 Controller I/O Management

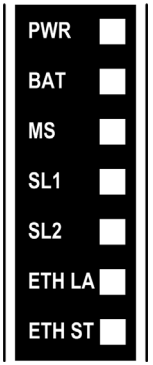
What Is in This Section?

This section contains the following topics:

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[1]	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 *(see page 270)*		
SL2	Serial link 2	-	-	Indicates the status of Serial link 2 *(see page 272)*		
ETH LA	ETH activity	-	-	Indicates the status of Ethernet *(see page 266)*		
ETH ST	ETH status	-	-			

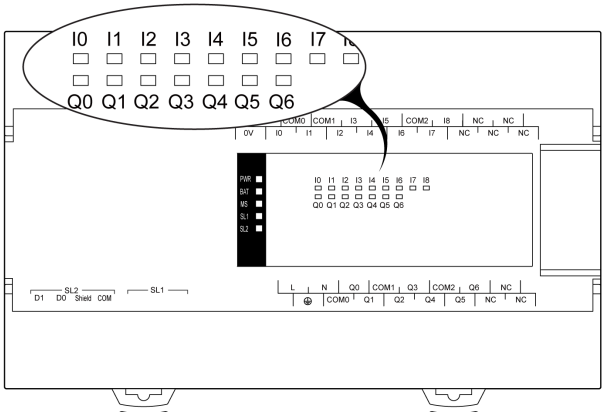
[1] For more information about the controller state description, refer to the programming guide *(see Modicon M218 Logic Controller, Programming Guide)*.

I/O LEDs

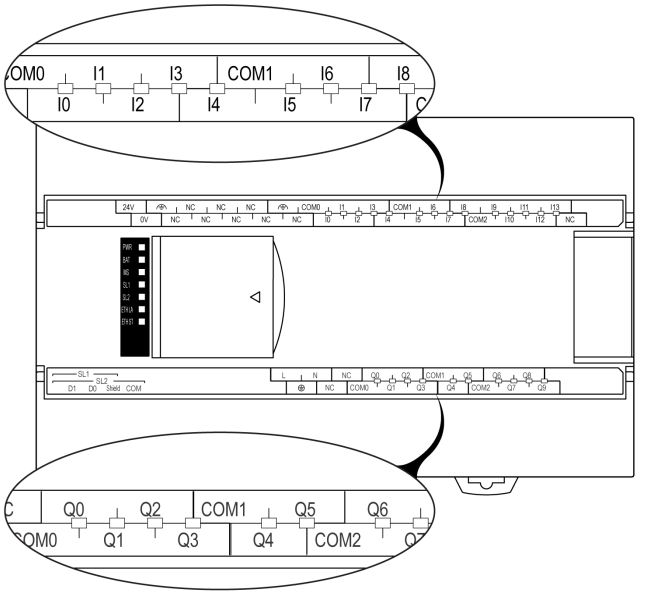
Depending on the M218 controller model, I/O LEDs are located:

- 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 willl 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 SoMachine 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

- Be sure of 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:

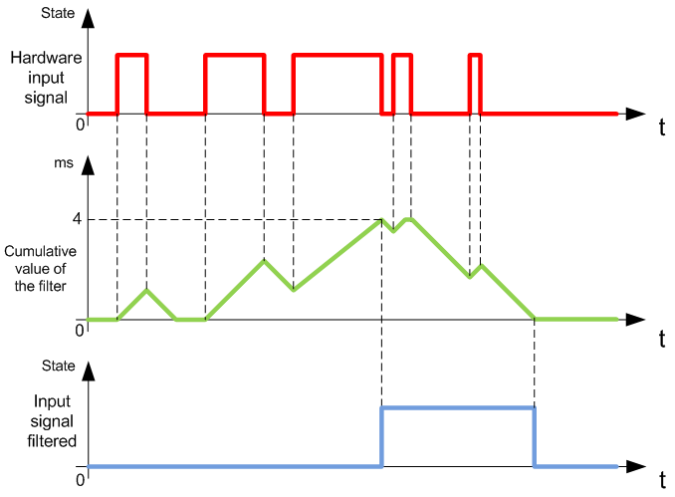
- Filters (depends on the function associated with the input).
- 4 fast inputs can be either latched or used for events (rising edge, falling edge, or both) and thus be linked to an external task.
- Any input can be used for the RUN/STOP function.
- Some of the inputs can be used by HSC, PTO, PWM, and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

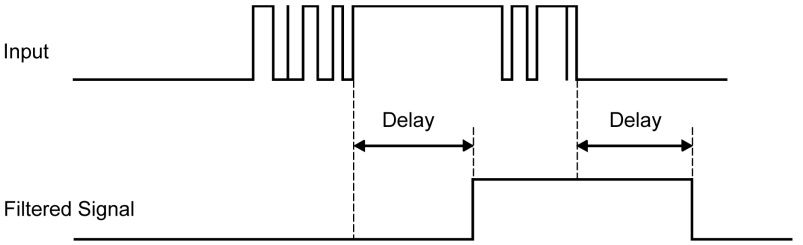


NOTE: The value selected for the filters time parameter specifies the cumulative time in ms that must elapse before the input can be 1.

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

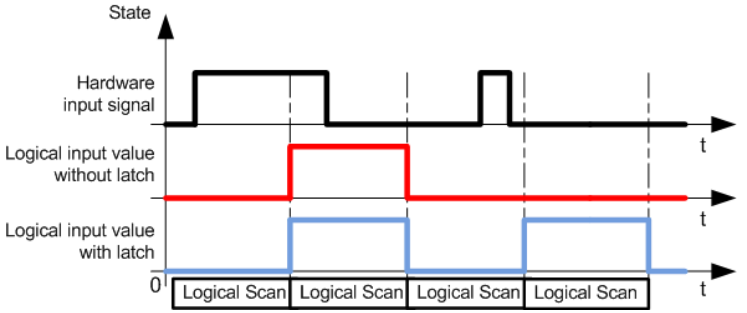
The bounce filter can be used on a fast input when:

- 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 SoMachine.

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 SoMachine (RUN/STOP commands from SoMachine are allowed).

⚠ WARNING

UNINTENDED MACHINE OR PROCESS START-UP

- Be sure 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 **predetermined state (1)**; 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 *(see page 138)*. **(1) Either 0 or 1 depending on the wiring logic (sink or source) of the output group**
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. For more information, refer to regular output wiring diagram *(see page 135)*.
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 **predetermined state (1)**; 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 *(see page 198)*. **(1) Either 0 or 1 depending on the wiring logic (sink or source) of the output group**
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). For more information, refer to regular output wiring diagram *(see page 195)*.
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 34)*.

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

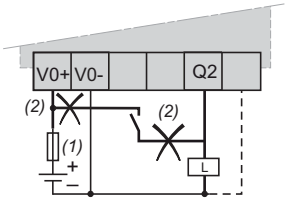
NOTICE

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.

Chapter 4
M218 Installation

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 4.1
M218 Mechanical Requirements

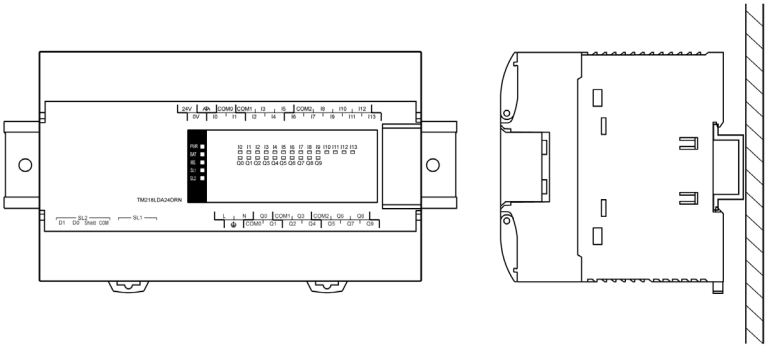
What Is in This Section?

This section contains the following topics:

Mounting Positions

Correct Mounting Position

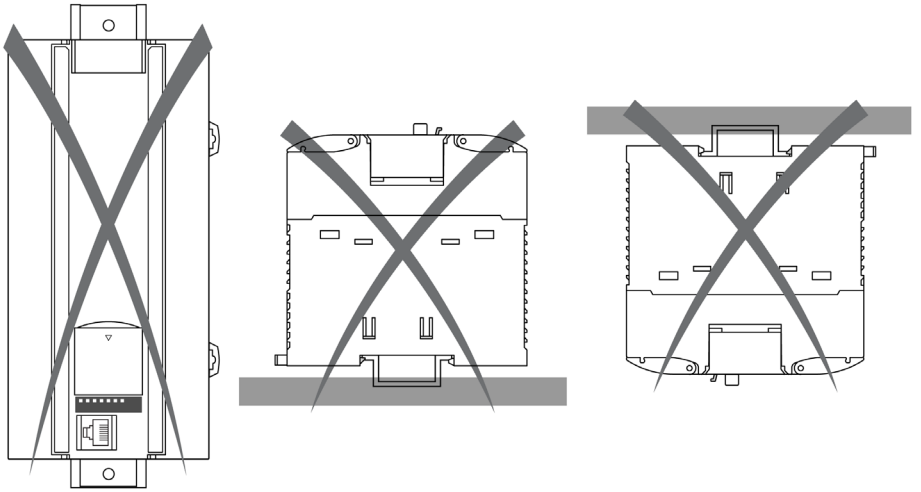
The Modicon M218 Logic Controller must be mounted horizontally on a vertical plane as shown in the illustration below:



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 66)*.

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

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.

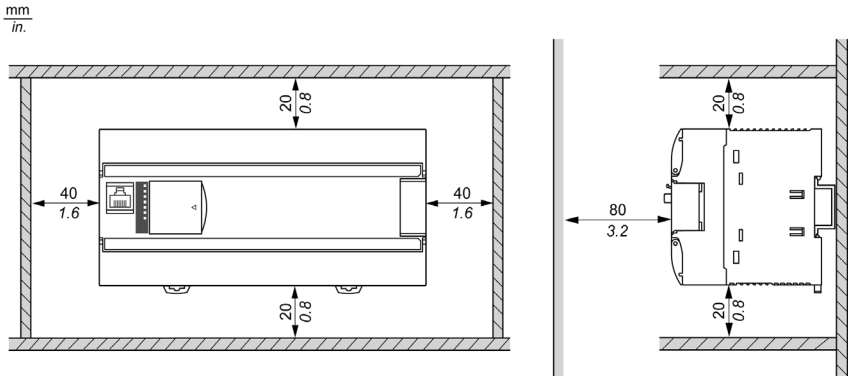
NOTE: Keep adequate spacing for proper ventilation and to maintain an ambient temperature between 0 °C (32 °F) and 55 °C (131 °F).

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:



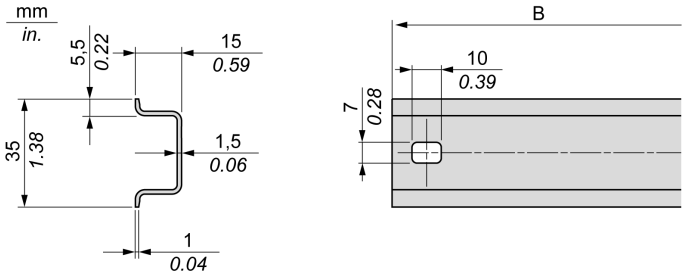
Top Hat Section Rail (DIN rail)

Dimensions of Top Hat Section Rail DIN Rail

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

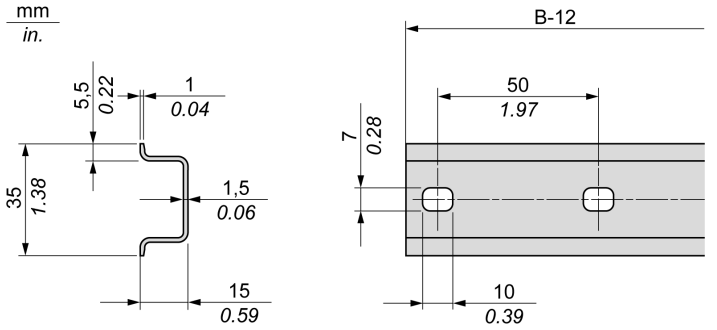
Symmetric Top Hat Section Rails (DIN Rail)

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



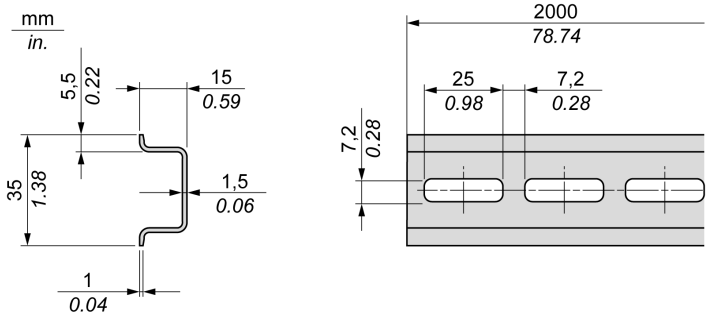
Reference	Type	Rail Length (B)
NSYSDR50A	A	450 mm (17.71 in.)
NSYSDR60A	A	550 mm (21.65 in.)
NSYSDR80A	A	750 mm (29.52 in.)
NSYSDR100A	A	950 mm (37.40 in.)

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



Reference	Type	Rail Length (B-12 mm)
NSYSDR60	A	588 mm (23.15 in.)
NSYSDR80	A	788 mm (31.02 in.)
NSYSDR100	A	988 mm (38.89 in.)
NSYSDR120	A	1188 mm (46.77 in.)

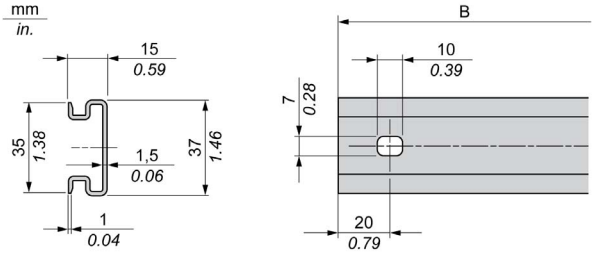
The following illustration and table shows the references of the symmetric top hat section rails (DIN rail) of 2000 mm (78.74 in.):



Reference	Type	Rail Length
NSYSDR200[1]	A	2000 mm (78.74 in.)
NSYSDR200D[2]	A	
1 Unperforated galvanized steel **2** Perforated galvanized steel		

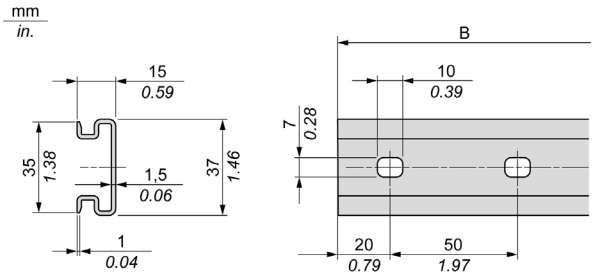
Double-Profile Top Hat Section Rails (DIN rail)

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



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

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



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.)

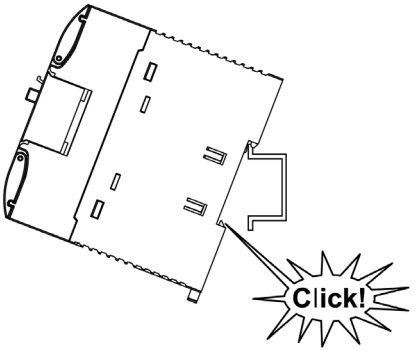
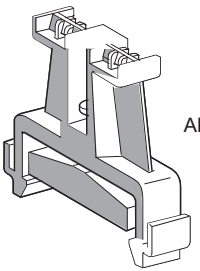
Installing and Removing the Controller with Expansions

Overview

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

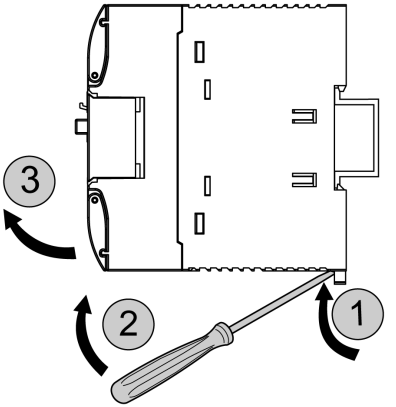
Installing a Controller with its Expansions on a DIN Rail

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	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. 
3	Place 2 terminal block end clamps on both sides of the controller and expansion module assembly.  AB1AB8P35 **NOTE:** 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.

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

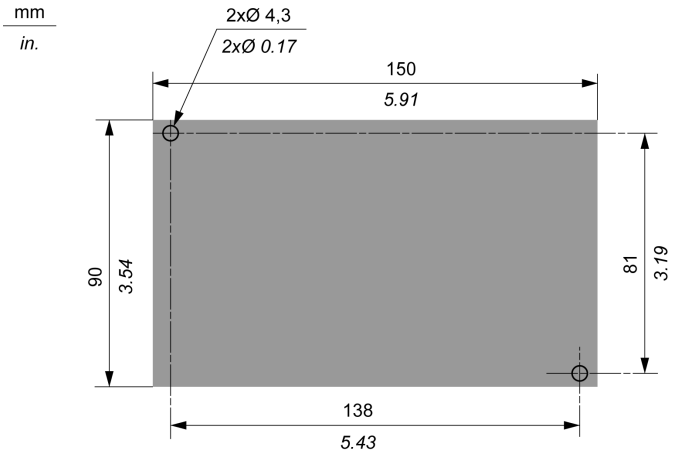
The following procedure describes how to remove a controller with its expansion modules from a top hat section rail (DIN rail):

Step	Action
1	Insert a flat screwdriver into the slot of the top hat section rail (DIN rail) clip. 
2	Pull down the DIN rail clip.
3	Pull the controller and its expansion modules from the top hat section rail (DIN rail) from the bottom.

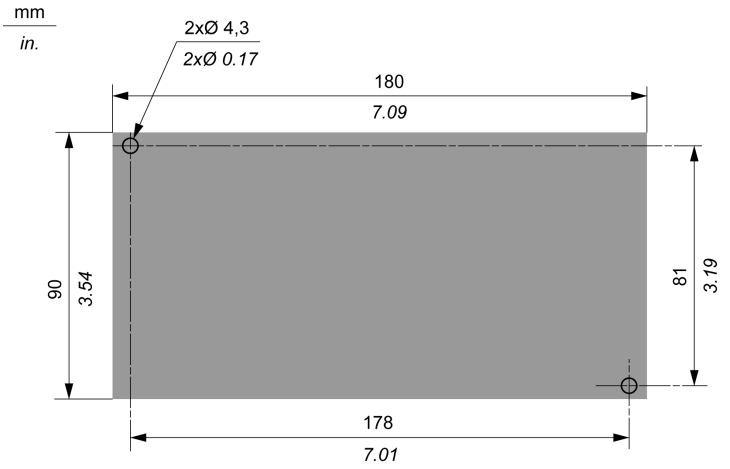
Mounting on a Metallic Panel

Mounting Holes

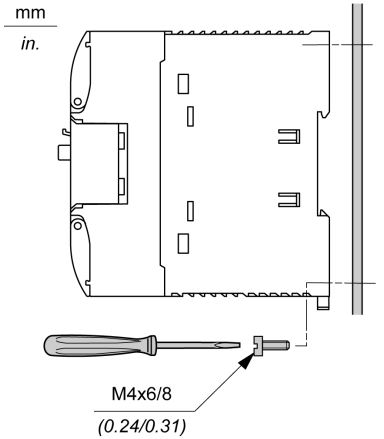
The following illustration shows the mounting holes for the Modicon M218 Logic Controller with 16 and 24 I/Os:



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:

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 32)* 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 recommended wire sizes for the current capacity of the I/O channels and power supplies.

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

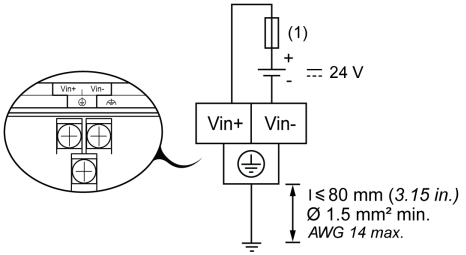
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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 recommended wire sizes for the current capacity of the I/O channels and power supplies.

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

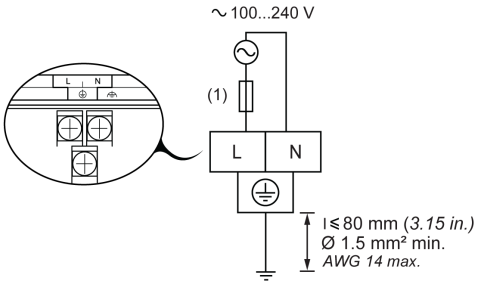
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

AC Power Supply Characteristics

Reference		TM218LDA16DRN TM218LDA24DRN TM218LDA24DRHN TM218LDAE24DRHN	TM218LDA40DRN TM218LDA40DRPHN TM218LDAE40DRPHN TM218LDA40DR2HN TM218LDA40DR4PHN 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 at 240 Vac	30 A 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.

Chapter 5
TM218LDA16DRN

Overview

This chapter describes the TM218LDA16DRN controller.

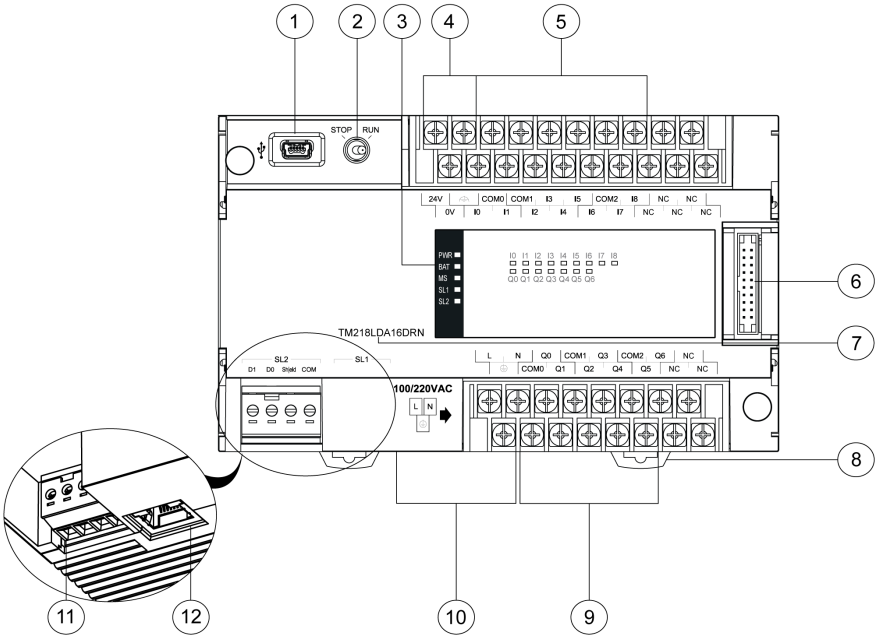
What Is in This Chapter?

This chapter contains the following topics:

TM218LDA16DRN Presentation

Overview

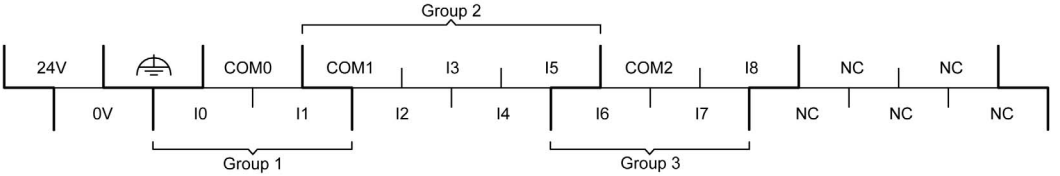
The following illustration shows the different components of the TM218LDA16DRN:



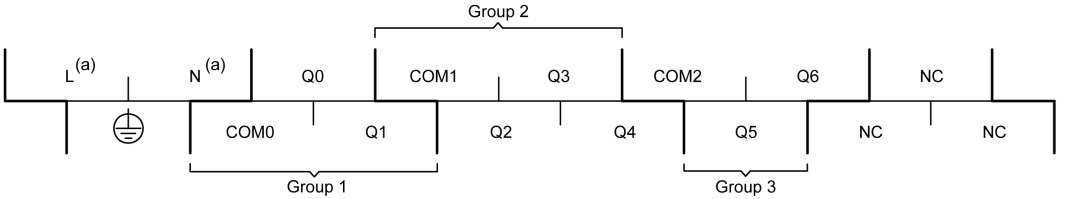
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System and I/O LEDs *(see page 51)*
4	24 V sensor power supply terminal block
5	Input terminal block *(see page 83)*
6	Ribbon cable connector
7	Reference number
8	DIN rail clip
9	Output terminal block *(see page 83)*
10	100...220 Vac power supply terminal block and label
11	Serial link 2/terminal block *(see page 272)*
12	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠⚠ DANGER

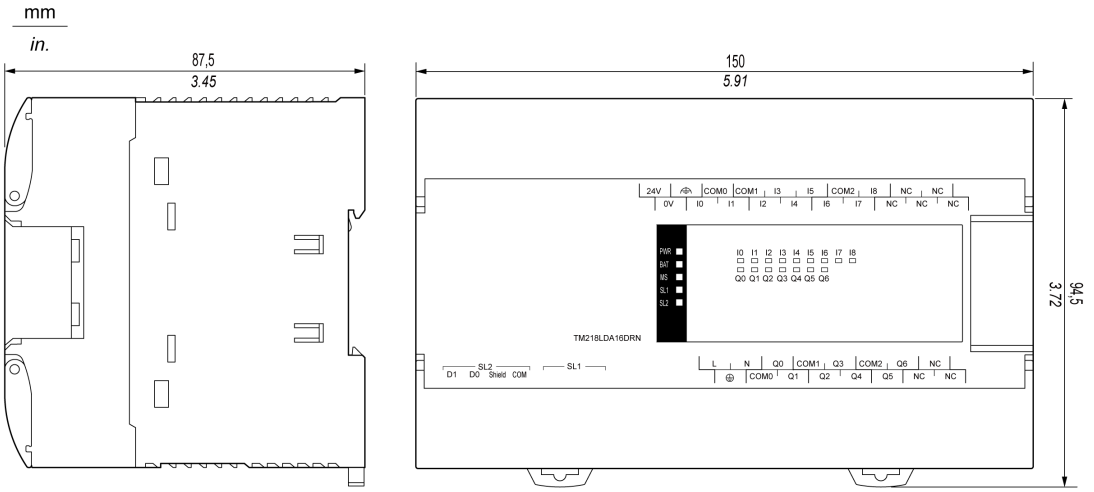
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- 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 55)* for important information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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[1]	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
– No
1 Can also be used as a regular input

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

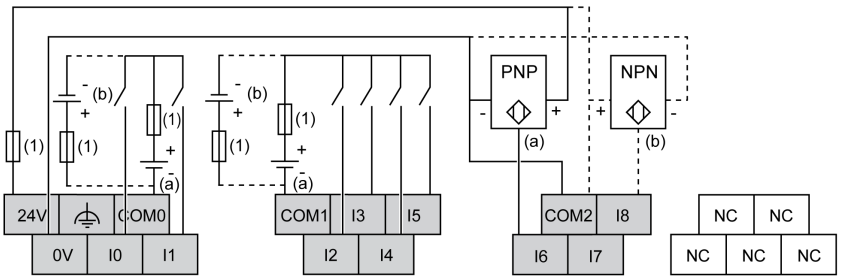
The table below describes the characteristics of the Modicon M218 Logic Controller digital inputs:

Characteristic		Value
Rated current		7 mA
Inrush values	Voltage	30 Vdc
	Current	9 mA
Input impedance		3.3 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

Characteristic		Value
Isolation (photo coupler)	Between channels	None
	Between channels and internal logic	500 Vdc
Filtering		Default: 3 ms 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(1)
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.
Protection against over voltage		No
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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.

TM218LDA16DRN Fast Inputs

Overview

The TM218LDA16DRN controller is equipped with 2 Fast digital inputs *(see page 85)* which can be used as 10 kHz HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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) 2 rows are removable
HSC Maximum frequency		10 kHz (100 µs) Minimum transition duration: 40 µs
HSC type		Single phase counter

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

TM218LDA16DRN Relay Outputs

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

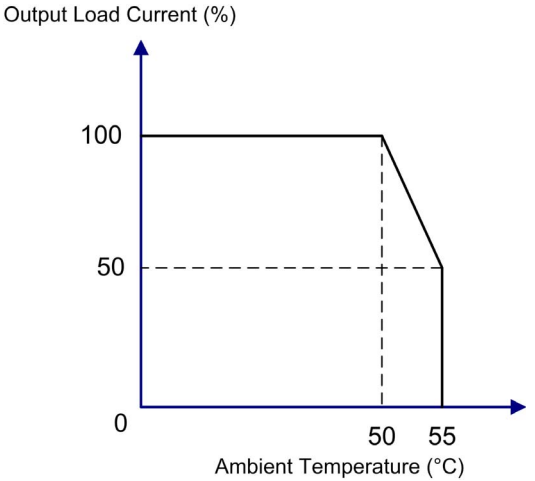
Relay Output Characteristics

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

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

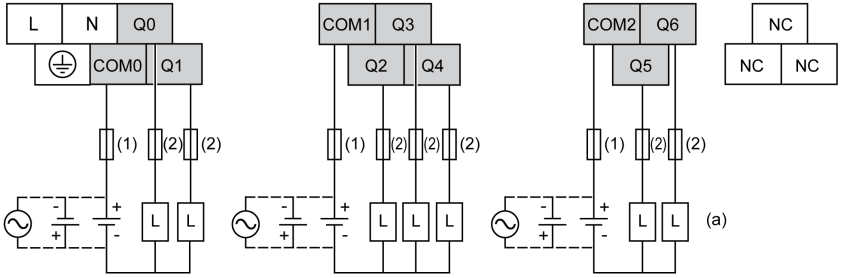
The following illustration shows the Relay Output De-rating curve:



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, 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 6
TM218LDA24DRN

Overview

This chapter describes the TM218LDA24DRN controller.

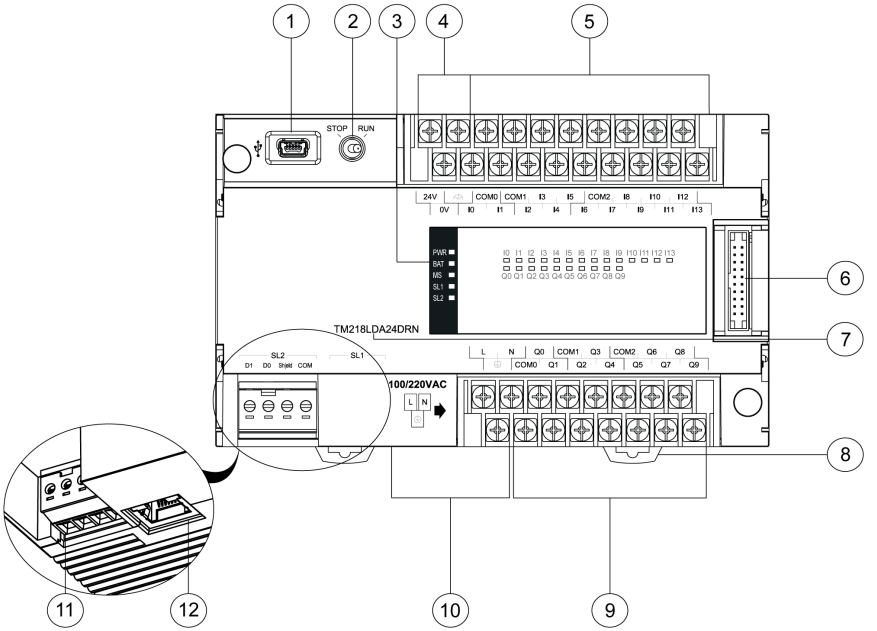
What Is in This Chapter?

This chapter contains the following topics:

TM218LDA24DRN Presentation

Overview

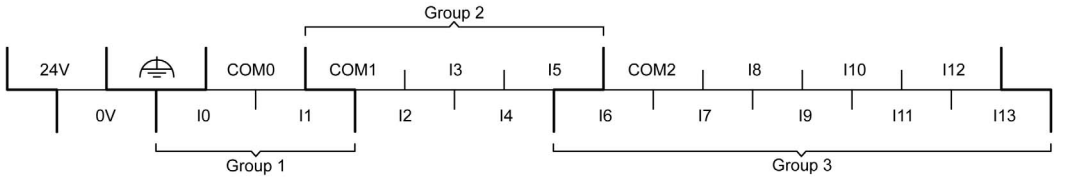
The following illustration shows the different components of the TM218LDA24DRN:



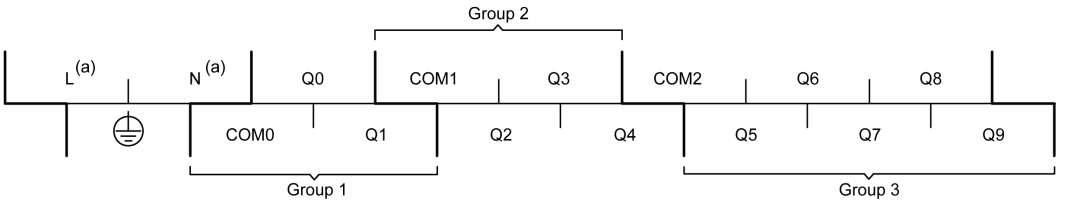
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System and I/O LEDs *(see page 51)*
4	24 V sensor power supply terminal block
5	Input terminal block *(see page 97)*
6	Ribbon cable connector
7	Reference number
8	DIN rail clip
9	Output terminal block *(see page 97)*
10	100...220 Vac power supply terminal block and label
11	Serial link 2/terminal block *(see page 272)*
12	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠⚠ DANGER

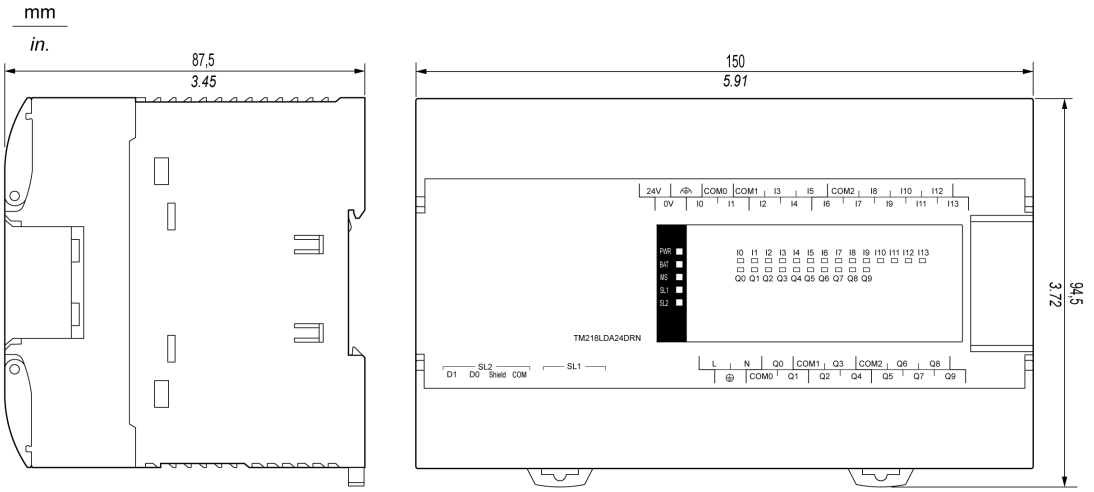
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- 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 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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[1]	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	–	–

X Yes
– No
1 Can also be used as a regular input

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

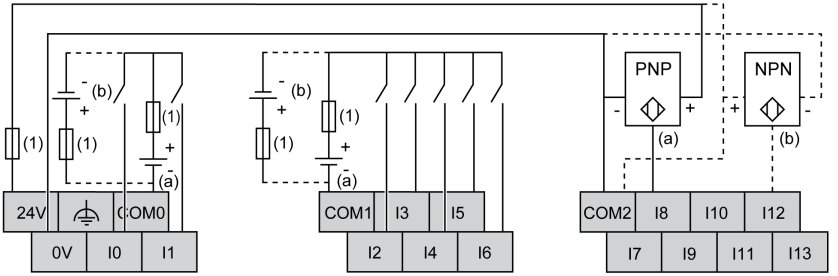
The table below describes the characteristics of the M218 controller digital inputs:

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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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 99)* which can be used as 10 kHz HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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

Characteristic		Value
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(1)
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) 2 rows are removable
HSC Maximum frequency		10 kHz (100 µs) Minimum transition duration: 40 µs
HSC type		Single phase counter
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 wiring diagram for the Fast inputs is same as that of the digital inputs *(see page 102)*.

TM218LDA24DRN Relay Output

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

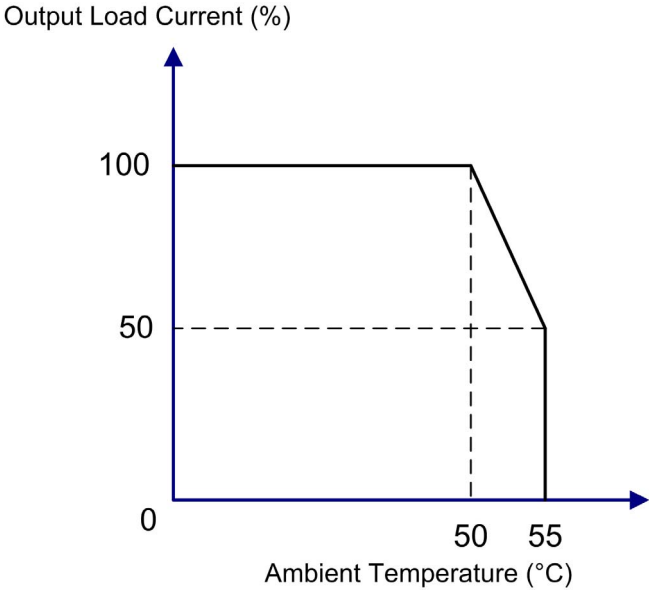
Relay Output Characteristics

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

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

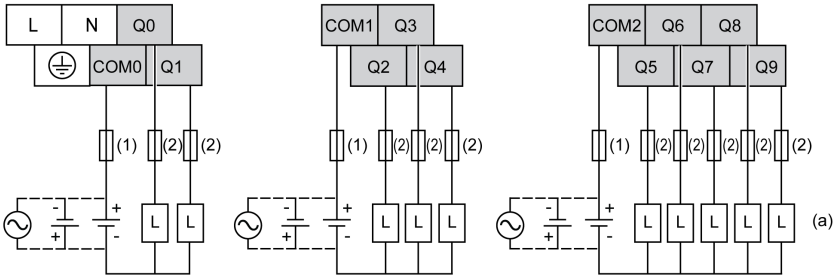
The following illustration shows the Relay Output De-rating curve:



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

(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.

Chapter 7
TM218LDA24DRHN

Overview

This chapter describes the TM218LDA24DRHN controller.

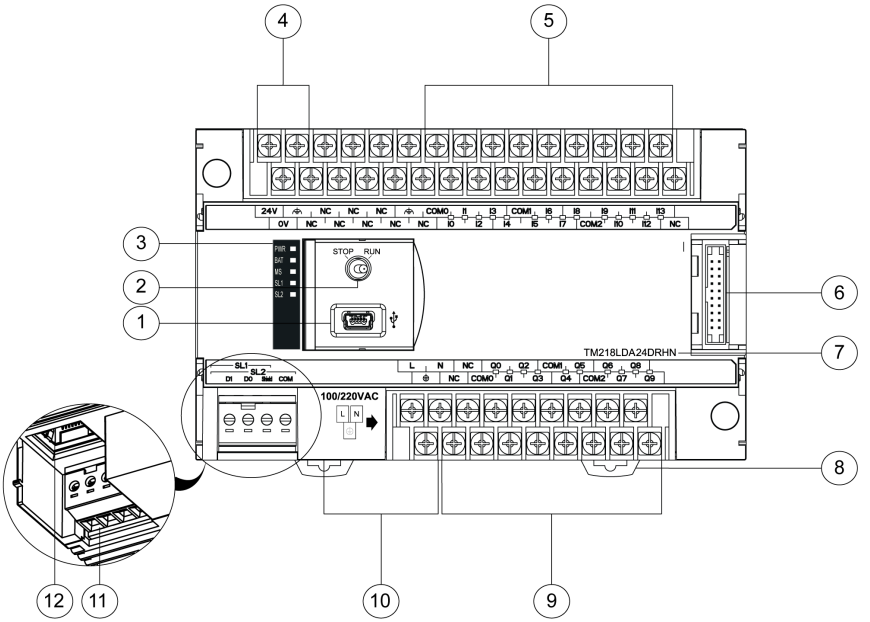
What Is in This Chapter?

This chapter contains the following topics:

TM218LDA24DRHN Presentation

Overview

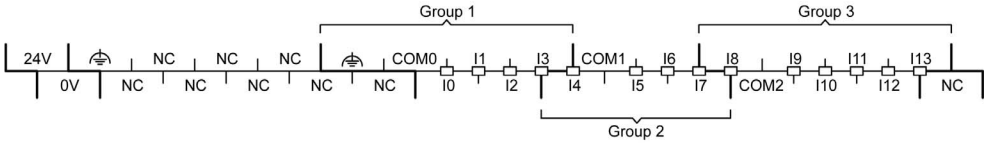
The following illustration shows the different components of the TM218LDA24DRHN controllers:



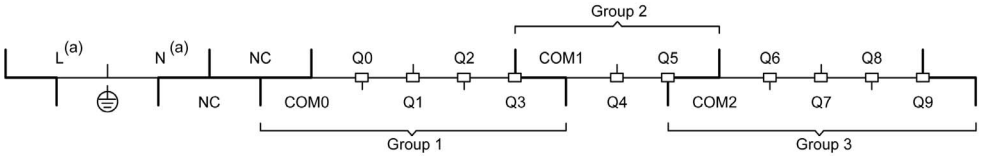
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System LEDs *(see page 51)*
4	24 V sensor power supply terminal block
5	Input terminal block *(see page 111)*
6	Ribbon cable connector
7	Reference number
8	DIN rail clip
9	Output terminal block *(see page 111)*
10	100...220 Vac power supply terminal block and label
11	Serial link 2/terminal block *(see page 272)*
12	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

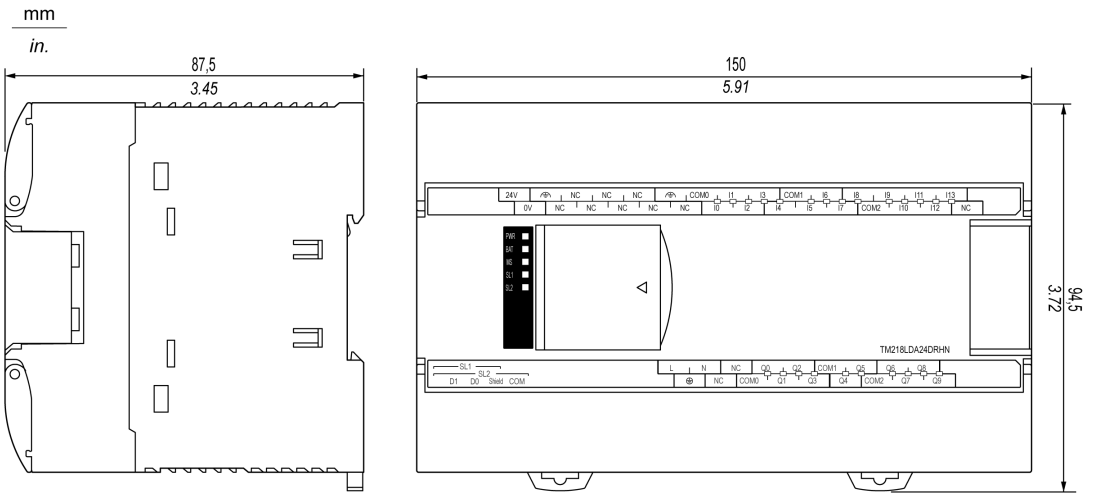
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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 52)* 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 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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 **–** No						

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

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

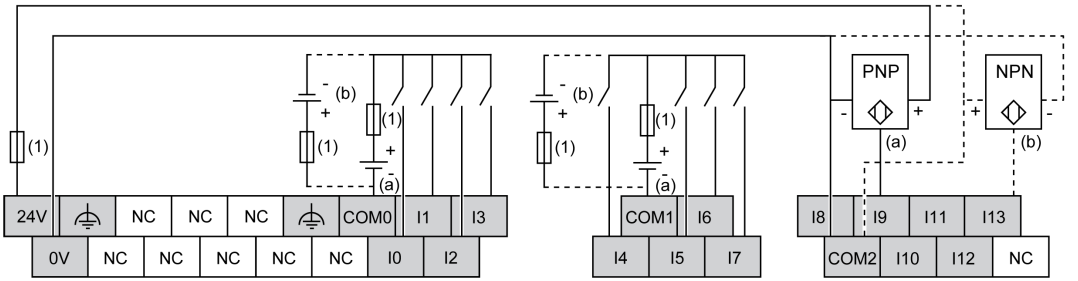
Characteristic		Value	
		Standard	Enhanced
Rated current		5 mA	7 mA
Inrush values	Voltage	30 Vdc	30 Vdc
	Current	7 mA	9 mA
Input impedance		4.7 kΩ	3.3 kΩ
Input type		Sink/Source	

Characteristic		Value	
		Standard	**Enhanced**
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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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.

TM218LDA24DRHN Fast Input

Overview

The TM218LDA24DRHN controller is equipped with 4 Fast digital inputs *(see page 113)* which can be used as HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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 2 rows are removable
HSC Maximum frequency		A/B phase: 50 kHz (20 µs) Single phase: 100 kHz Pulse/Direction: 100 kHz Minimum transition duration: 4 µs
HSC type		• A/B phase counter • Pulse/Direction counter • Single phase counter

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 wiring diagram for the Fast inputs is same as that of the digital inputs *(see page 116)*.

TM218LDA24DRHN Relay Output

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

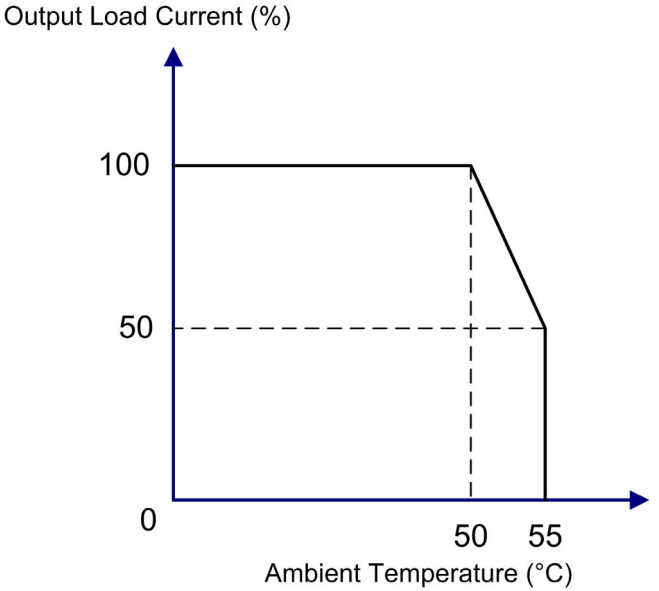
Relay Output Characteristics

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

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

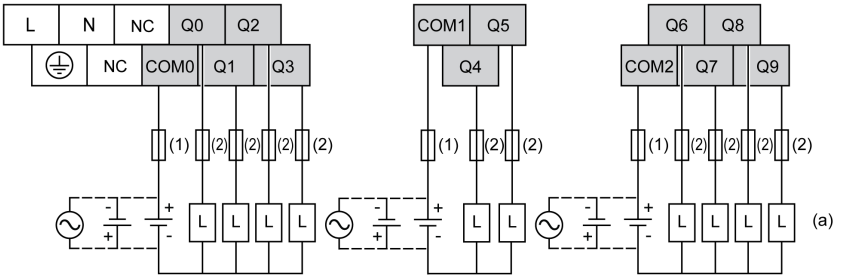
The following illustration shows the relay outputs de-rating curve:



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 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.

Chapter 8
TM218LDD24DUPHN

Overview

This chapter describes the TM218LDD24DUPHN controller.

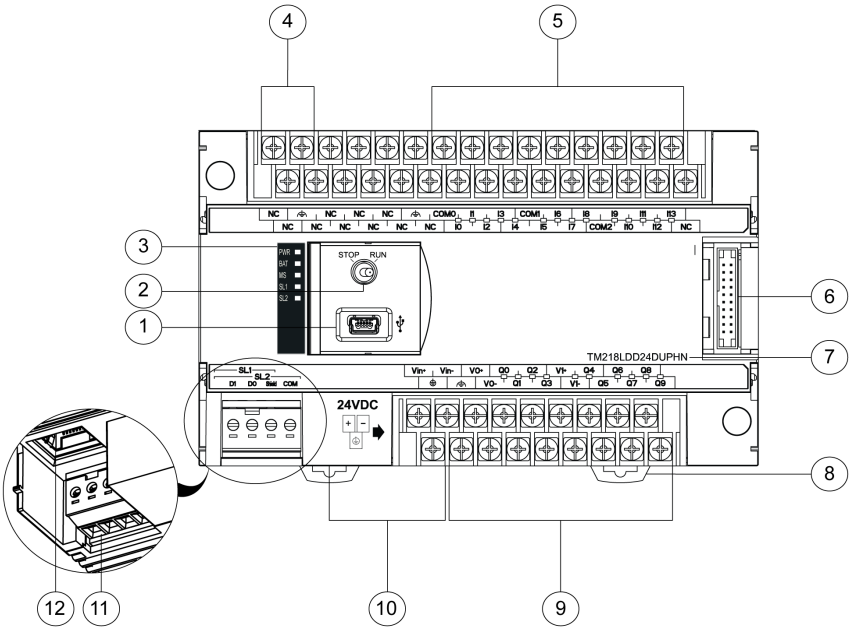
What Is in This Chapter?

This chapter contains the following topics:

TM218LDD24DUPHN Presentation

Overview

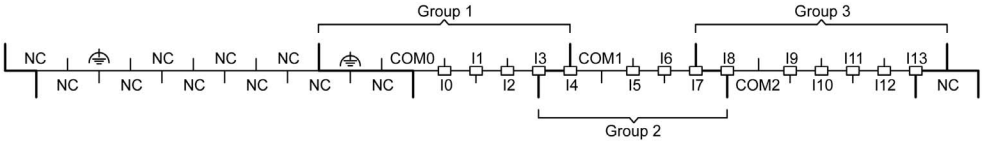
The following illustration shows the different components of the TM218LDD24DUPHN controllers:



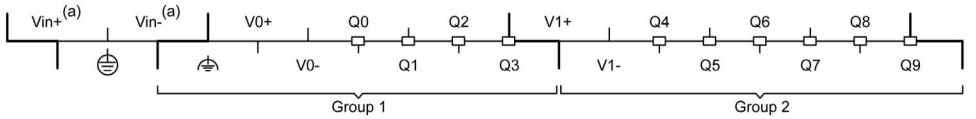
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System LEDs *(see page 51)*
4	Input terminal block *(see page 125)*
5	Ribbon cable connector
6	Reference number
7	DIN rail clip
8	Output terminal block *(see page 125)*
9	24 Vdc power supply terminal block and label
10	Serial link 2/terminal block *(see page 272)*
11	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

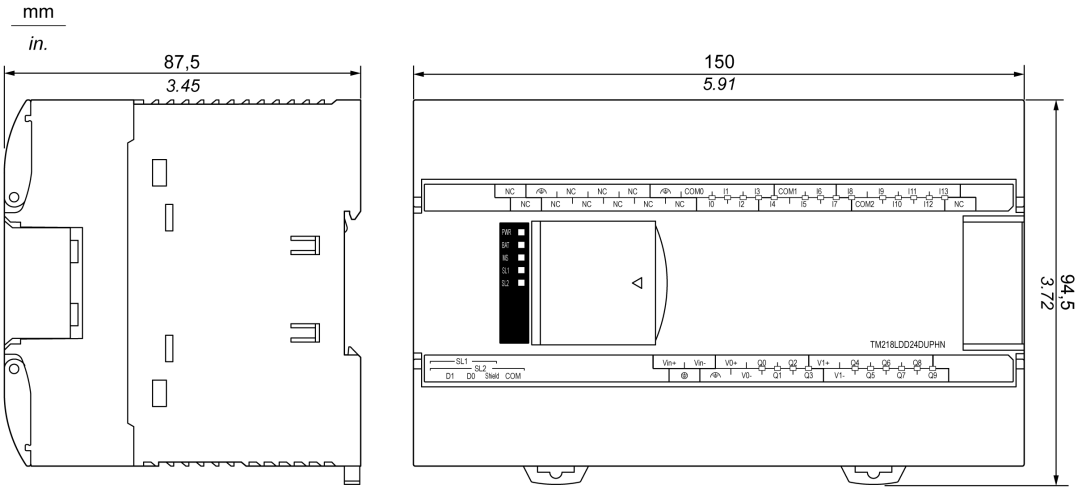
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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 52)* 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 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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
– No

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

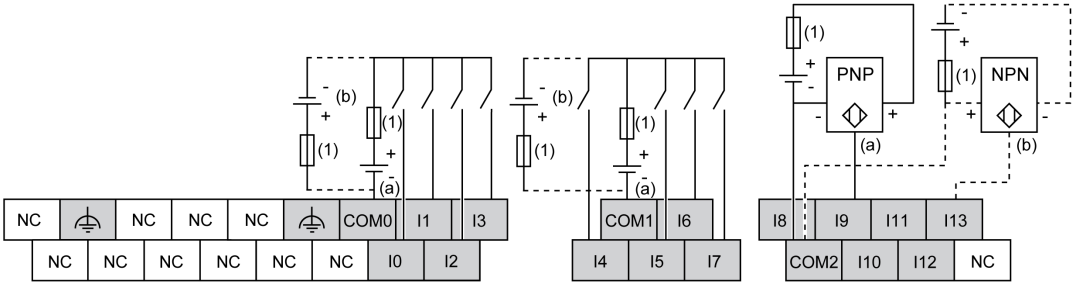
The table below describes the characteristics of the M218 controller digital inputs:

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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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 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 127)* which can be used as HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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 2 rows are removable
HSC Maximum frequency		A/B phase: 50 kHz (20 µs) Single phase: 100 kHz Pulse/Direction: 100 kHz Minimum transition duration: 4 µs
HSC type		• A/B phase counter • Pulse/Direction counter • Single phase counter

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 wiring diagram for the Fast inputs is same as that of the digital inputs *(see page 130)*.

TM218LDD24DUPHN Regular Output

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

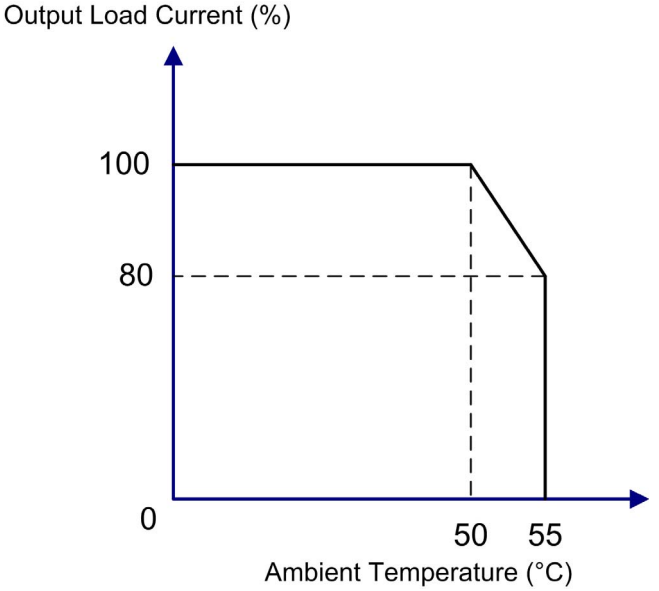
Regular Output Characteristics

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): ● (Q4 to Q7): 30 µs ● (Q8 to Q9): 50 µs On to Off (0.3 A Load): ● (Q4 to Q7): 0.3 ms ● (Q8 to Q9): 1 ms

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

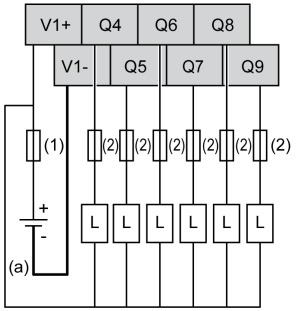
The following illustration shows the Regular Output De-rating curve:



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:



(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 58)*.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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 34)*.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

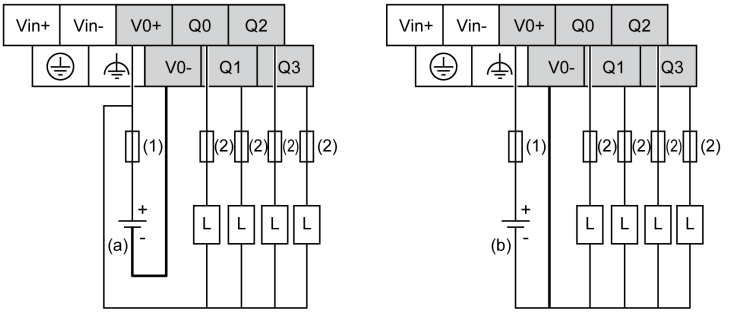
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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 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)

Chapter 9
TM218LDAE24DRHN

Overview

This chapter describes the TM218LDAE24DRHN controller.

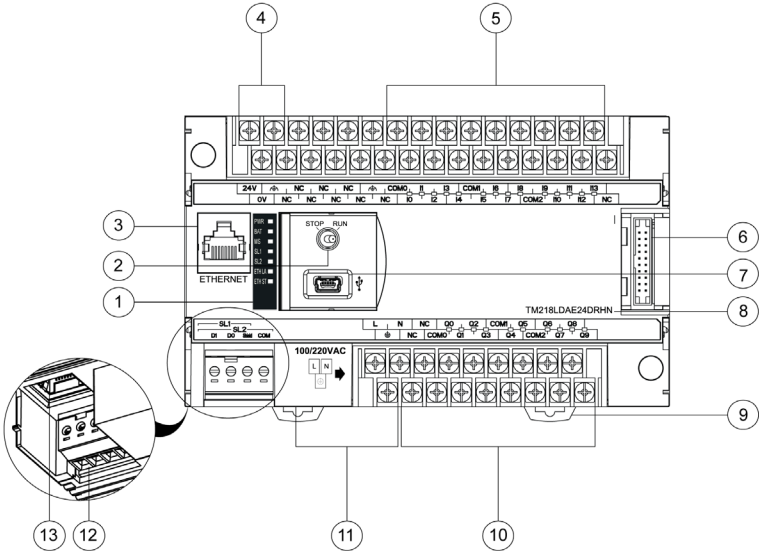
What Is in This Chapter?

This chapter contains the following topics:

TM218LDAE24DRHN Presentation

Overview

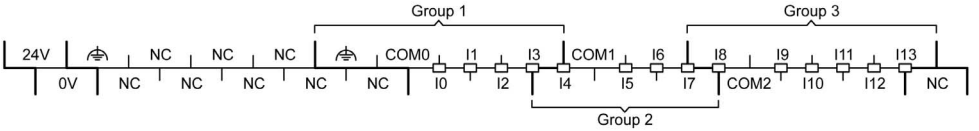
The following illustration shows the different components of TM218LDAE24DRHN controller:



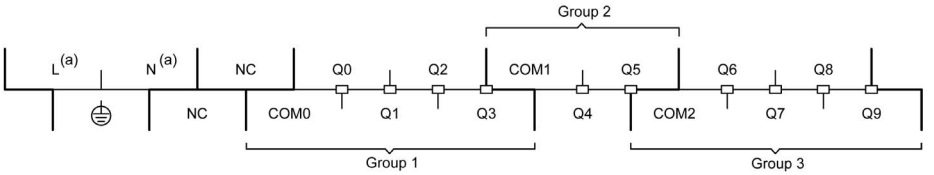
N°	Description
1	System LEDs *(see page 51)*
2	Run/Stop switch *(see page 54)*
3	Ethernet port *(see page 266)*
4	24 V sensor power supply terminal block
5	Input terminal block *(see page 141)*
6	Ribbon cable connector
7	USB programming port *(see page 269)*
8	Reference number
9	DIN rail clip
10	Output terminal block *(see page 141)*
11	100...220 Vac power supply terminal block and label
12	Serial link 2/terminal block *(see page 272)*
13	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

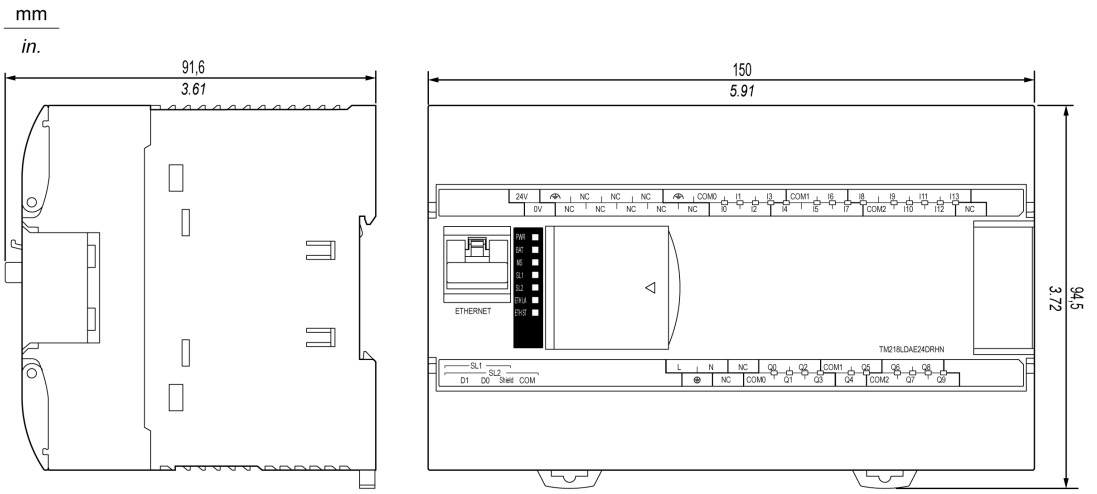
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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 52)* 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 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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
– No

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

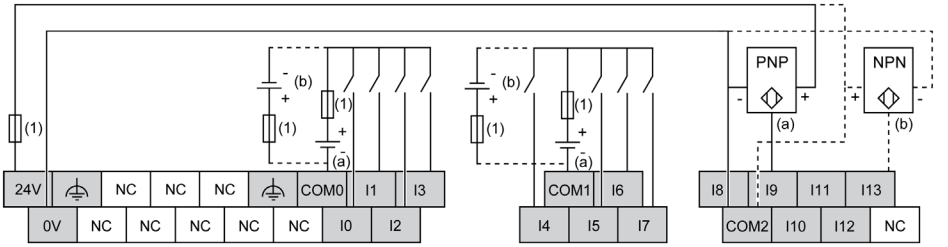
The table below describes the characteristics of the M218 controller digital inputs:

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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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 143)* which can be used as HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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 2 rows are removable
HSC Maximum frequency		A/B phase: 50 kHz (20 µs) Single phase: 100 kHz Pulse/Direction: 100 kHz Minimum transition duration: 4 µs
HSC type		• A/B phase counter • Pulse/Direction counter • Single phase counter

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 wiring diagram for the Fast inputs is same as that of the digital inputs *(see page 146)*.

TM218LDAE24DRHN Relay Output

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

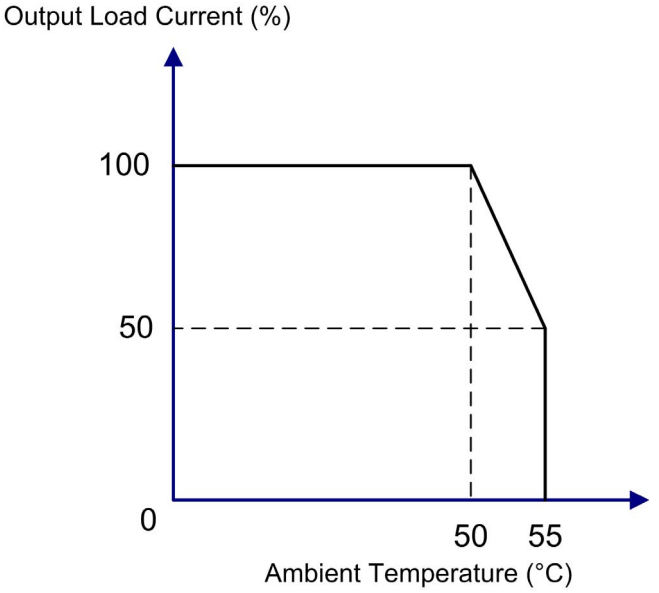
Relay Output Characteristics

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

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

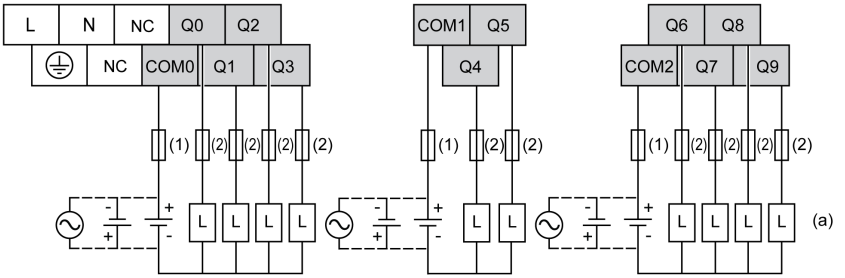
The following illustration shows the relay outputs de-rating curve:



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.

Chapter 10
TM218LDA40DRN

Overview

This chapter describes the TM218LDA40DRN controller.

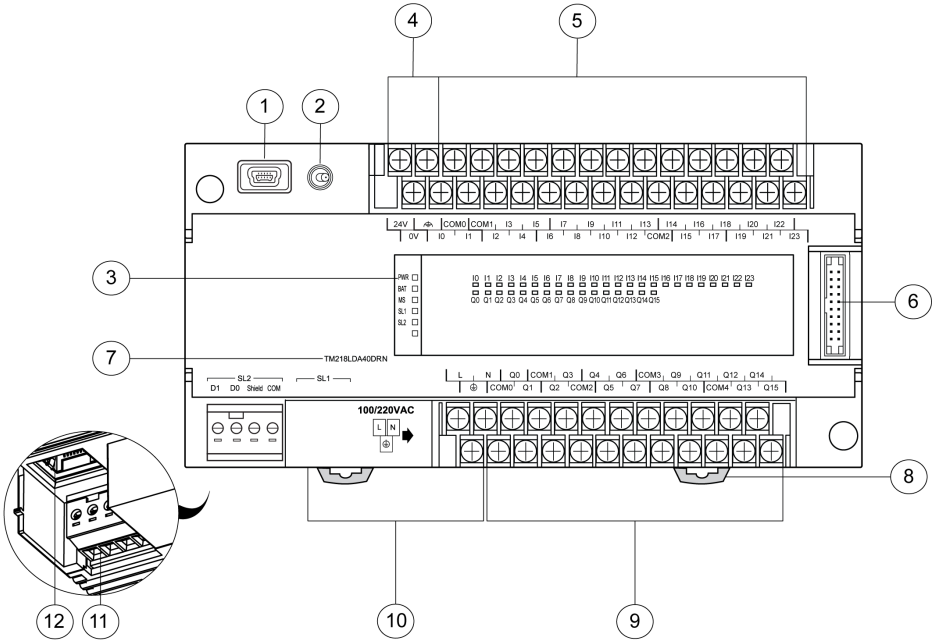
What Is in This Chapter?

This chapter contains the following topics:

TM218LDA40DRN Presentation

Overview

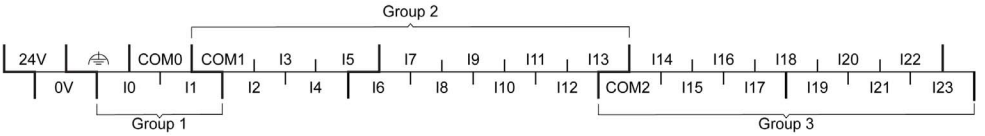
The following illustration shows the different components of the TM218LDA40DRN controller:



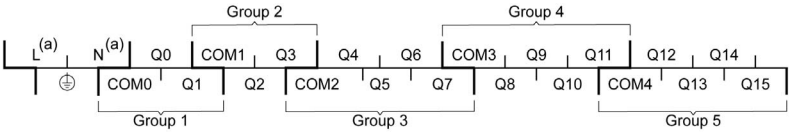
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System and I/O LEDs *(see page 51)*
4	24 V sensor power supply terminal block
5	Input terminal block *(see page 155)*
6	Ribbon cable connector
7	Reference number
8	DIN rail clip
9	Output terminal block *(see page 155)*
10	100...220 Vac power supply terminal block and label
11	Serial link 2/terminal block *(see page 272)*
12	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠ DANGER

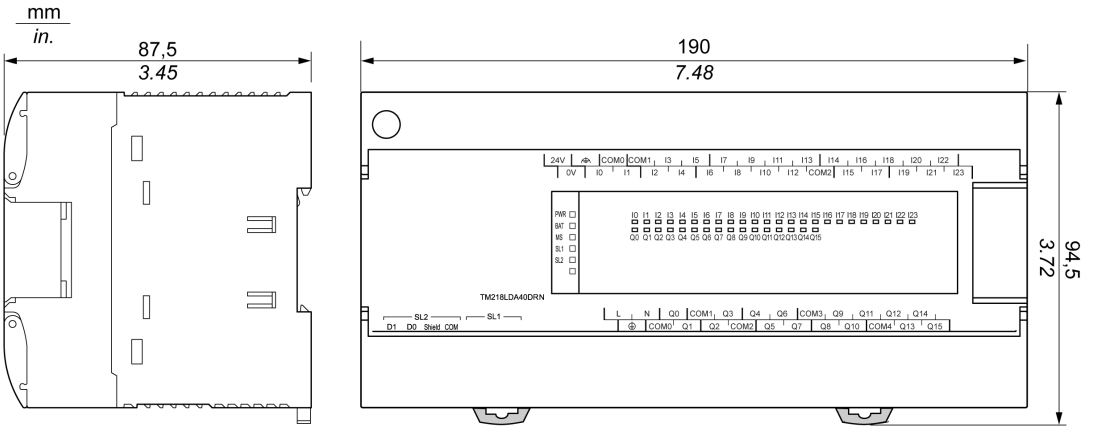
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- 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 TM218LDA40DRN controller:



TM218LDA40DRN Digital Input

Overview

See Input Management *(see page 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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[1]	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
– No
1 Can also be used as a regular input

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

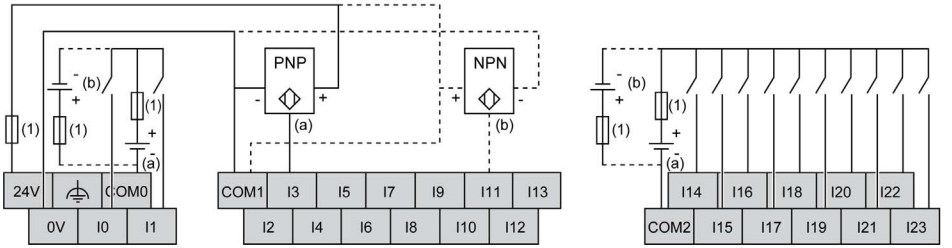
The table below describes the characteristics of the M218 controller digital inputs:

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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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 157)* which can be used as 10 kHz HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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) 2 rows are removable
HSC Maximum frequency		10 kHz (100 µs) Minimum transition duration: 40 µs
HSC type		Single phase counter

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

TM218LDA40DRN Relay Output

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

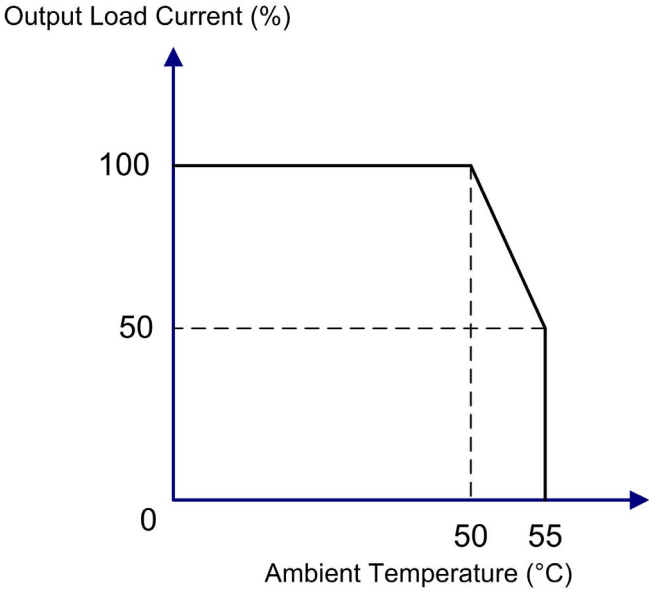
Relay Output Characteristics

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

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

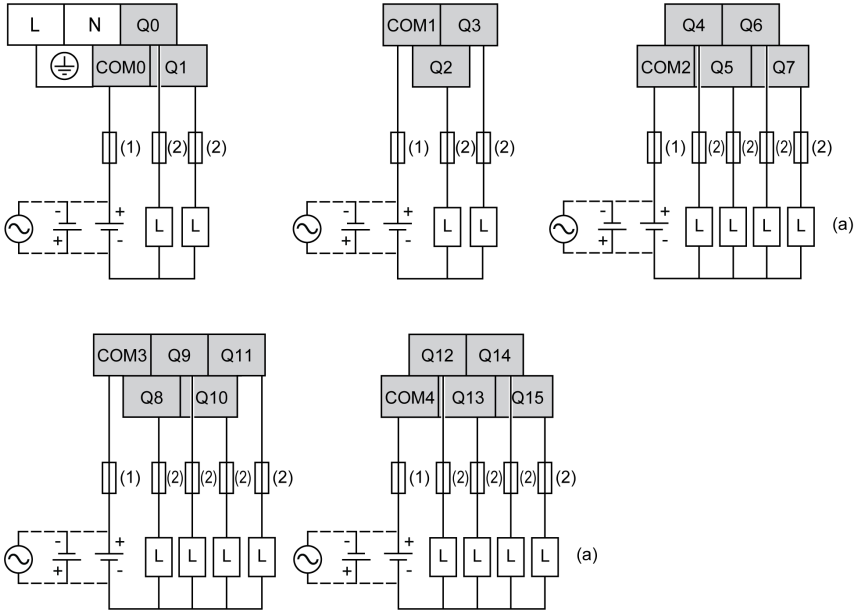
The following illustration shows the relay outputs de-rating curve:



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

(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.

Chapter 11
TM218LDA40DRPHN

Overview

This chapter describes the TM218LDA40DRPHN controller.

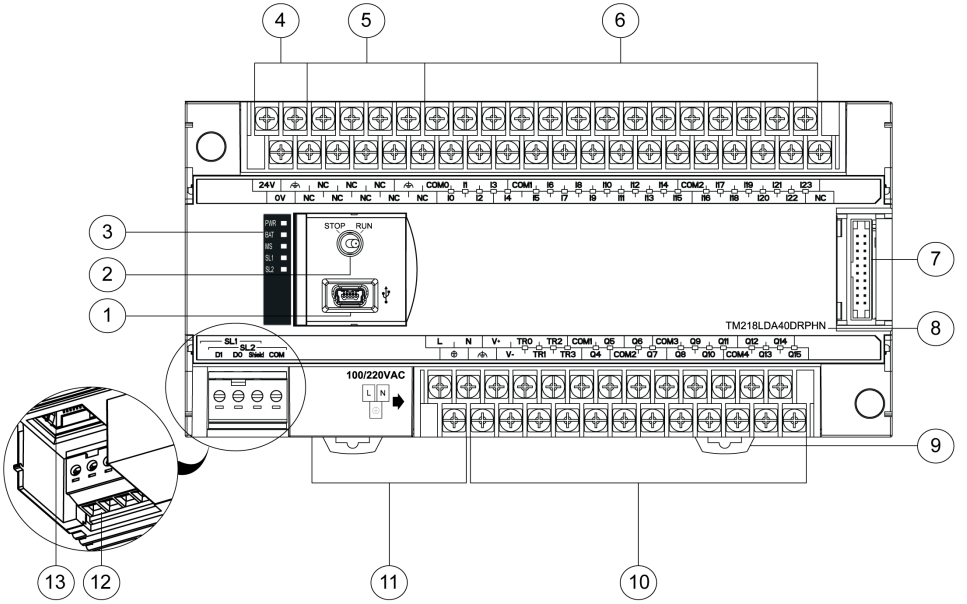
What Is in This Chapter?

This chapter contains the following topics:

TM218LDA40DRPHN Presentation

Overview

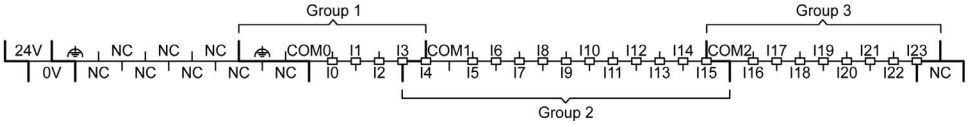
The following illustration shows the different components of TM218LDA40DRPHN controller:



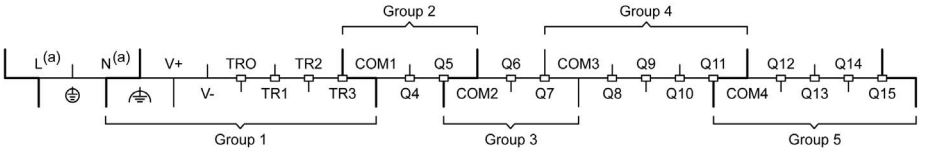
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System LEDs *(see page 51)*
4	24 V sensor power supply terminal block
5	Not used in this controller model
6	Input terminal block *(see page 169)*
7	Ribbon cable connector
8	Reference number
9	DIN rail clip
10	Output terminal block *(see page 169)*
11	100...220 Vac power supply terminal block and label
12	Serial link 2/terminal block *(see page 272)*
13	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

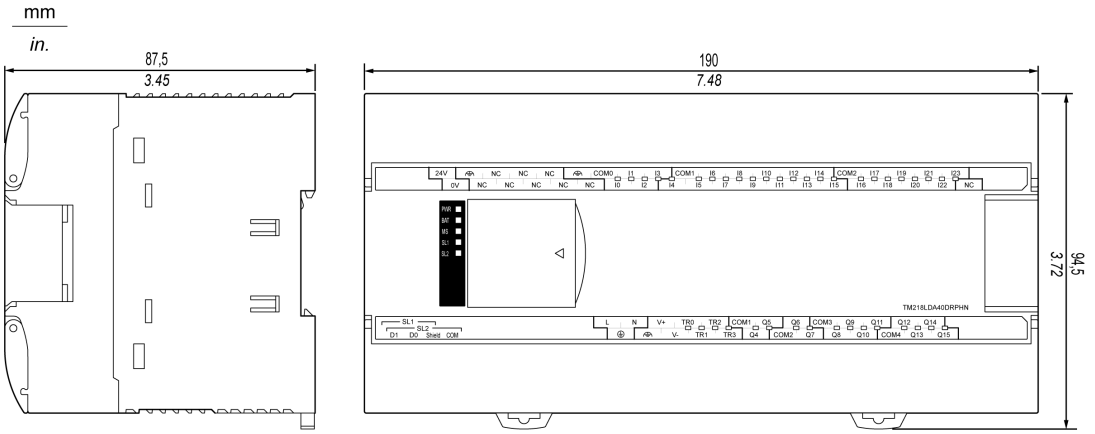
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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 52)* 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 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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
– No

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

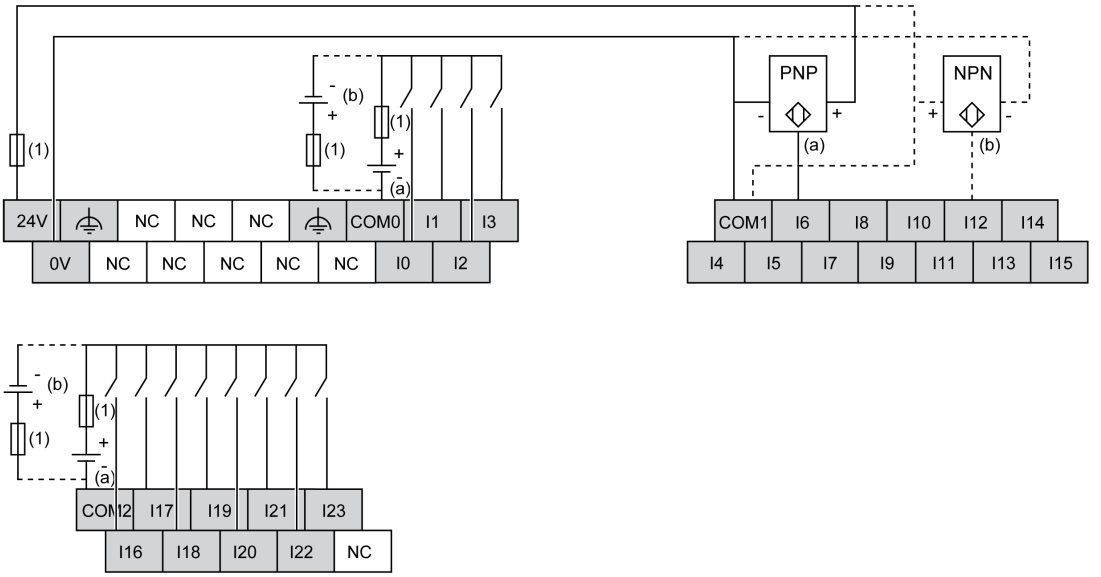
The table below describes the characteristics of the M218 controller digital inputs:

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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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.

TM218LDA40DRPHN Fast Input

Overview

The TM218LDA40DRPHN controller is equipped with 4 Fast digital inputs *(see page 171)* which can be used as HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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 2 rows are removable
HSC Maximum frequency		A/B phase: 50 kHz (20 µs) Single phase: 100 kHz Pulse/Direction: 100 kHz Minimum transition duration: 4 µs
HSC type		• A/B phase counter • Pulse/Direction counter • Single phase counter

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 wiring diagram for the Fast inputs is same as that of the digital inputs *(see page 174)*.

TM218LDA40DRPHN Relay Output

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

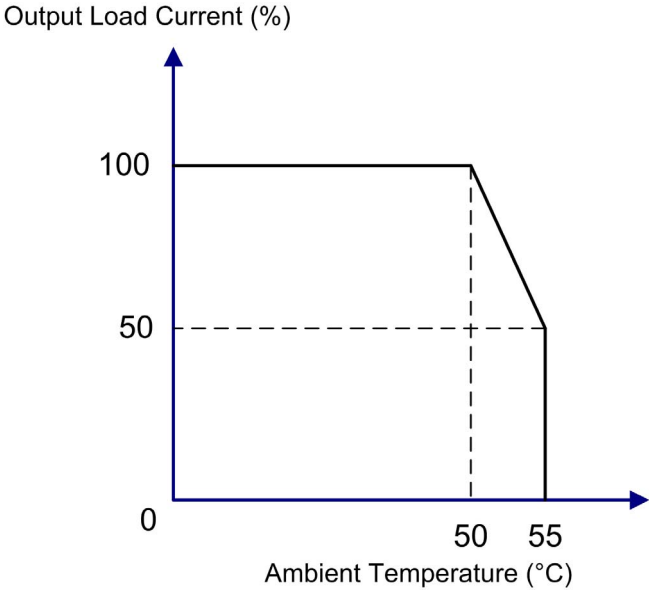
Relay Output Characteristics

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

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

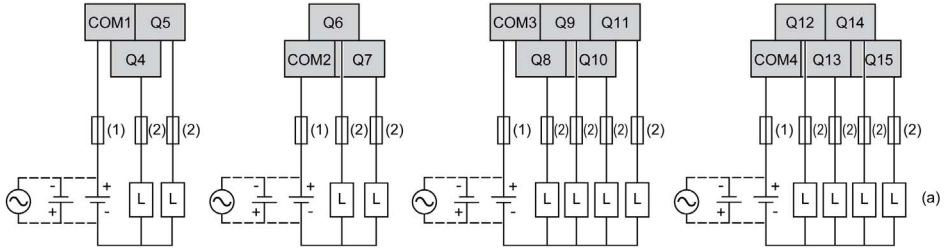
The following illustration shows the Relay Outputs De-rating curve:



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

(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 58)*.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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 34)*.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

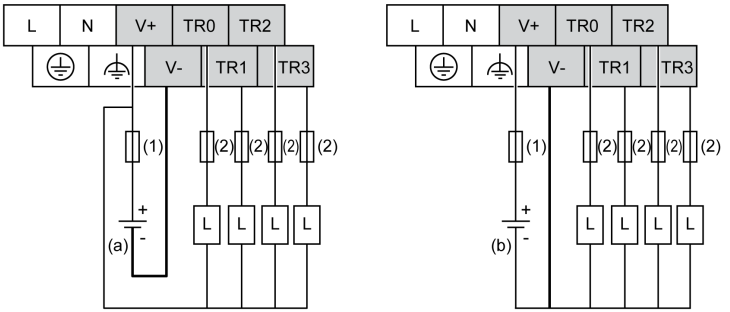
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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 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)

Chapter 12
TM218LDD40DUPHNB

Overview

This chapter describes the TM218LDD40DUPHNB controller.

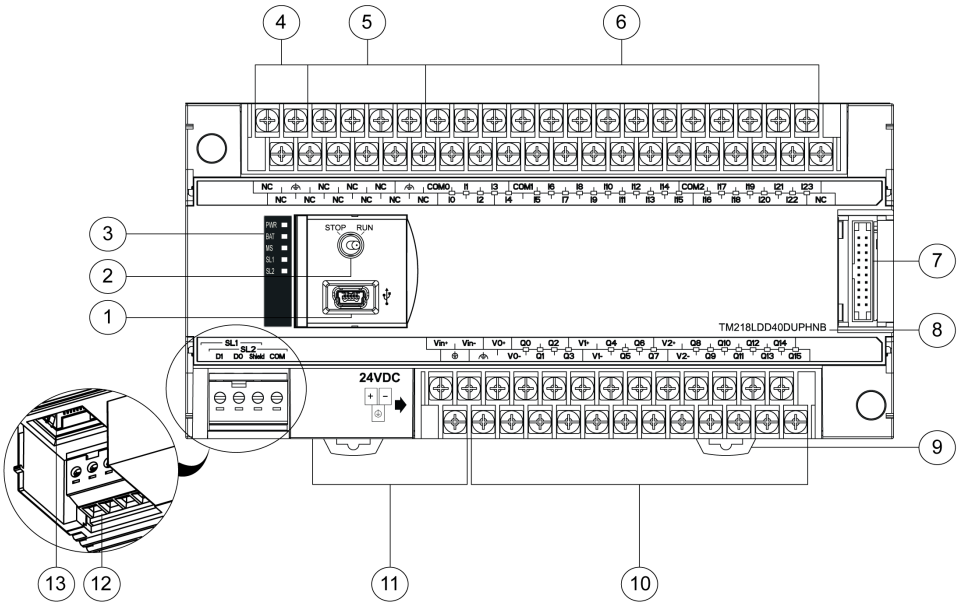
What Is in This Chapter?

This chapter contains the following topics:

TM218LDD40DUPHNB Presentation

Overview

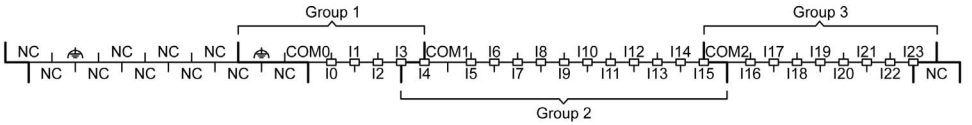
The following illustration shows the different components of TM218LDD40DUPHNB controller:



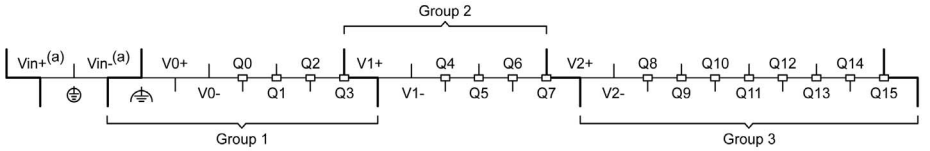
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System LEDs *(see page 51)*
4	Not used in this controller model
5	Not used in this controller model
6	Input terminal block *(see page 185)*
7	Ribbon cable connector
8	Reference number
9	DIN rail clip
10	Output terminal block *(see page 185)*
11	24 Vdc power supply terminal block and label
12	Serial link 2/terminal block *(see page 272)*
13	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

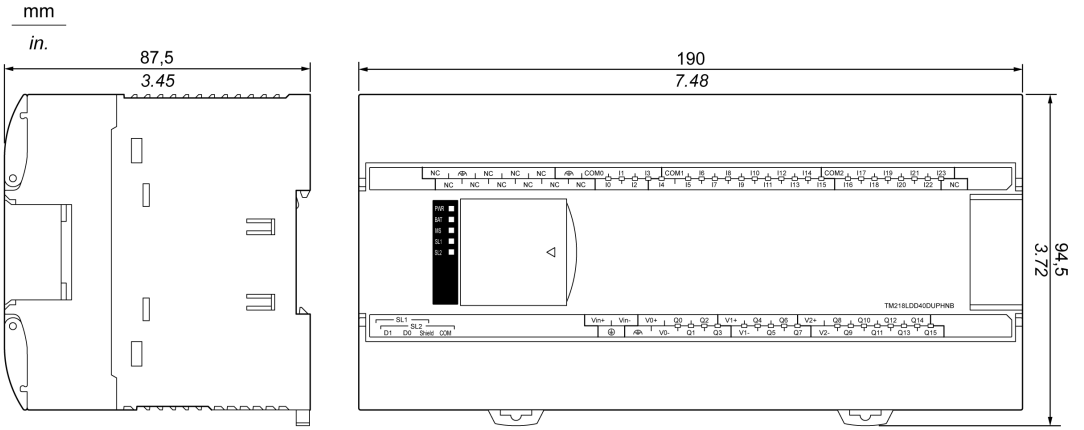
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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 52)* 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 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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
– No

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

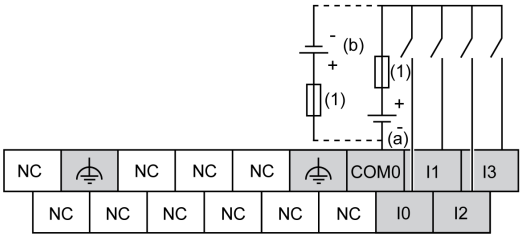
The table below describes the characteristics of the M218 controller digital inputs:

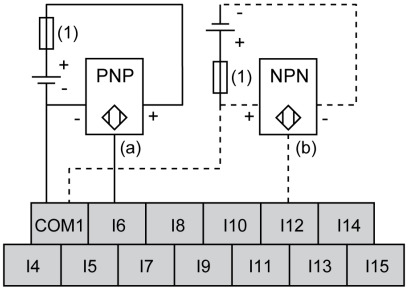
Characteristic		Value	
		Standard	**Enhanced**
Rated current		5 mA	7 mA
Inrush values	Voltage	30 Vdc	30 Vdc
	Current	7 mA	9 mA
Input impedance		4.7 kΩ	3.3 kΩ
Input type		Sink/Source	
Rated voltage		24 Vdc	
Input range		0...28.8 Vdc	
Input limit values	Voltage at state 1	> 15 Vdc (15...28.8 Vdc)	
	Voltage 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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 2 rows are removable	

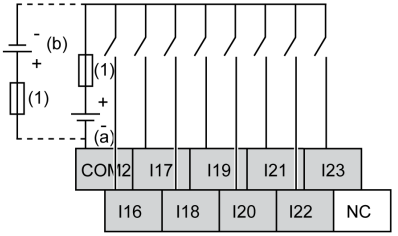
1 Best engineering practices usually require a single wire connected to each terminal, or two wires if an appropriate cable end is used. Connection of more than two wires may require the application of external terminal blocks (verify local codes and regulations that may apply).

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 187)* which can be used as HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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 2 rows are removable
HSC Maximum frequency		A/B phase: 50 kHz (20 µs) Single phase: 100 kHz Pulse/Direction: 100 kHz Minimum transition duration: 4 µs
HSC type		• A/B phase counter • Pulse/Direction counter • Single phase counter

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 wiring diagram for the Fast inputs is same as that of the digital inputs *(see page 190)*.

TM218LDD40DUPHNB Regular Output

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

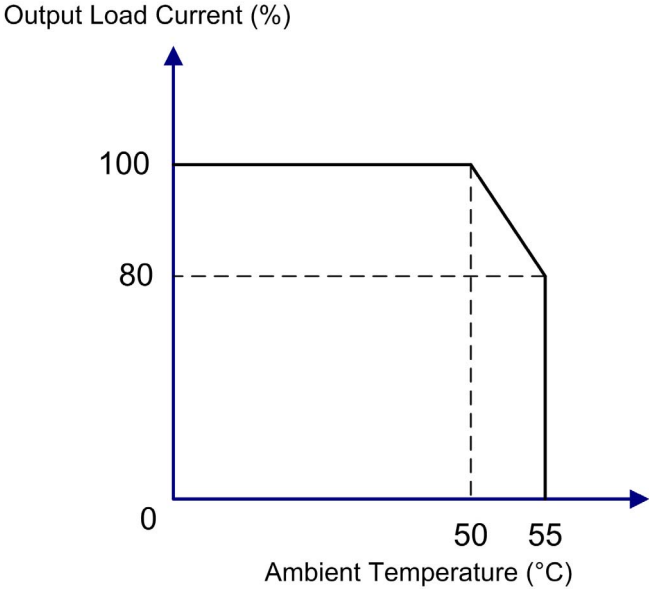
Regular Output Characteristics

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): ● (Q4 to Q7): 30 µs ● (Q8 to Q15): 50 µs On to Off (0.3 A Load): ● (Q4 to Q7): 0.3 ms ● (Q8 to Q15): 1 ms

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

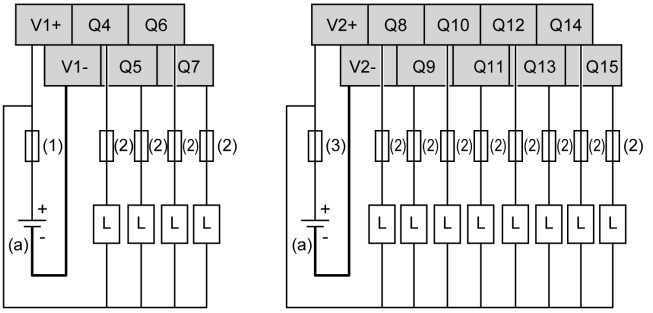
The following illustration shows the regular output de-rating curve:



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:



(1) 1.2 A Type T fuse
(2) 0.3 A Type T fuse
(3) 2.4 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.

TM218LDD40DUPHNB Fast Output

Overview

The TM218LDD40DUPHNB controller is equipped with 2 regular outputs which can be used for Fast outputs *(see page 58)*.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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 34)*.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

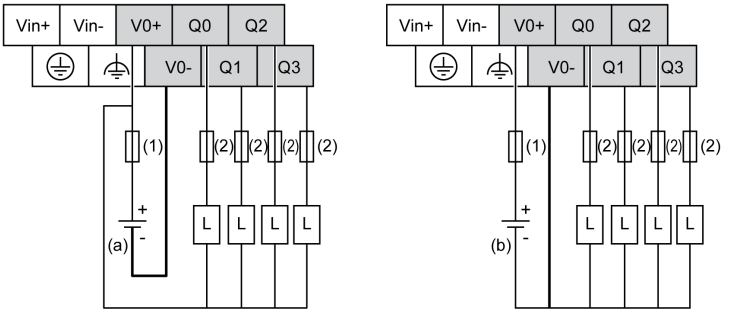
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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 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)

Chapter 13
TM218LDAE40DRPHN

Overview

This chapter describes the TM218LDAE40DRPHN controller.

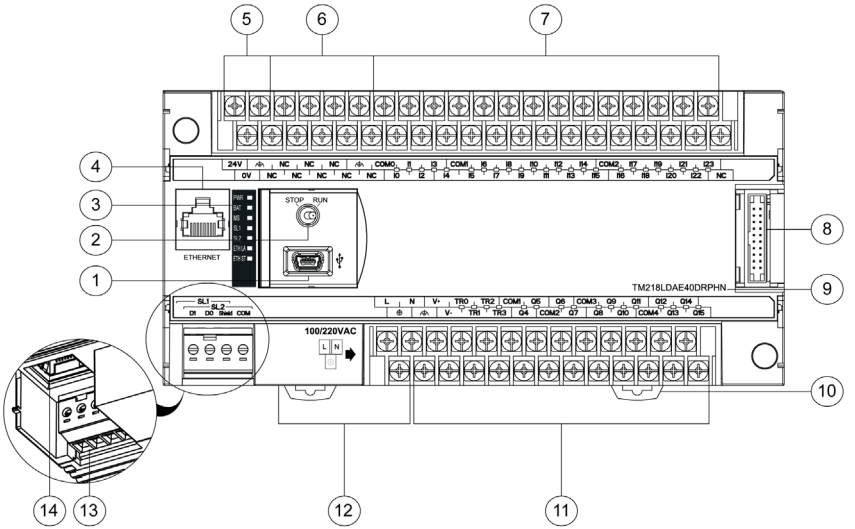
What Is in This Chapter?

This chapter contains the following topics:

TM218LDAE40DRPHN Presentation

Overview

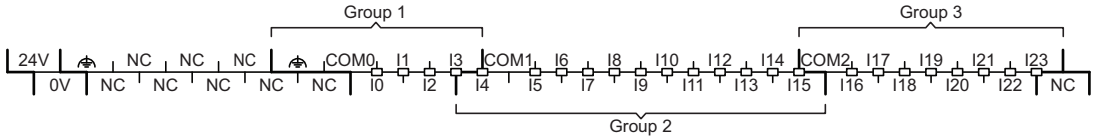
The following illustration shows the different components of the TM218LDAE40DRPHN controller:



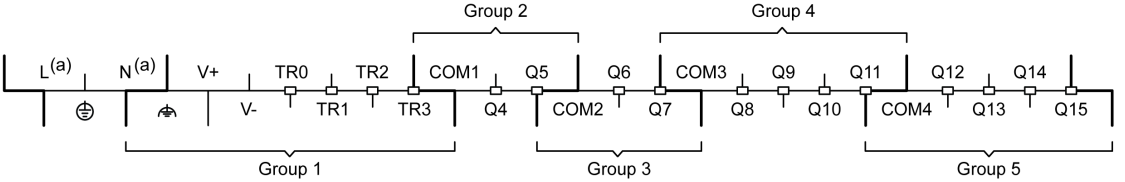
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System LEDs *(see page 51)*
4	Ethernet port *(see page 266)*
5	24 V sensor power supply terminal block
6	Not used in this controller model
7	Input terminal block *(see page 201)*
8	Ribbon cable connector
9	Reference number
10	DIN rail clip
11	Output terminal block *(see page 201)*
12	100...220 Vac power supply terminal block and label
13	Serial link 2/terminal block *(see page 272)*
14	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

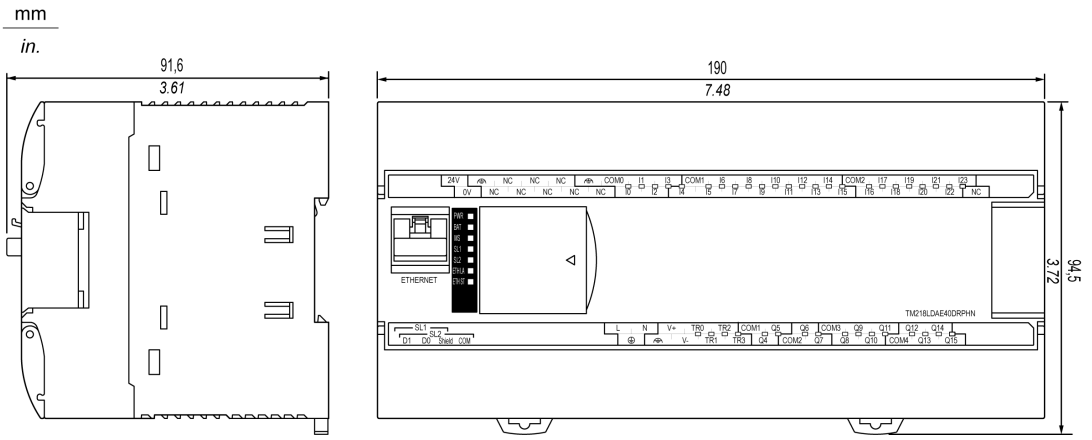
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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 52)* 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 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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
– No

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

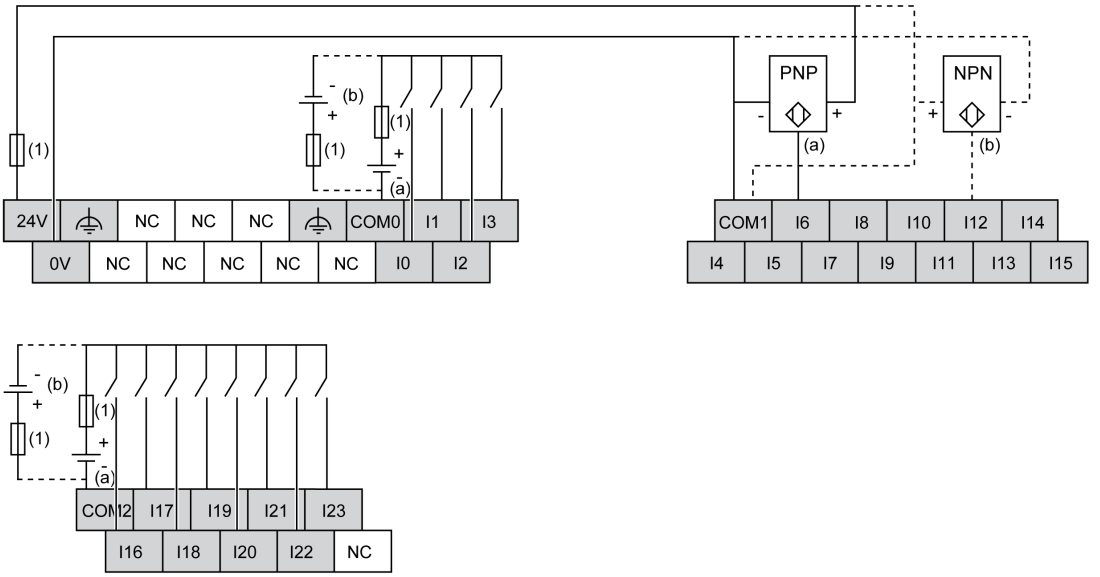
The table below describes the characteristics of the M218 controller digital inputs:

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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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.

TM218LDAE40DRPHN Fast Input

Overview

The TM218LDAE40DRPHN controller is equipped with 4 Fast digital inputs *(see page 203)* which can be used as HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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 2 rows are removable
HSC Maximum frequency		A/B phase: 50 kHz (20 µs) Single phase: 100 kHz Pulse/Direction: 100 kHz Minimum transition duration: 4 µs
HSC type		• A/B phase counter • Pulse/Direction counter • Single phase counter

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 wiring diagram for the Fast inputs is same as that of the digital inputs *(see page 206)*.

TM218LDAE40DRPHN Relay Output

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

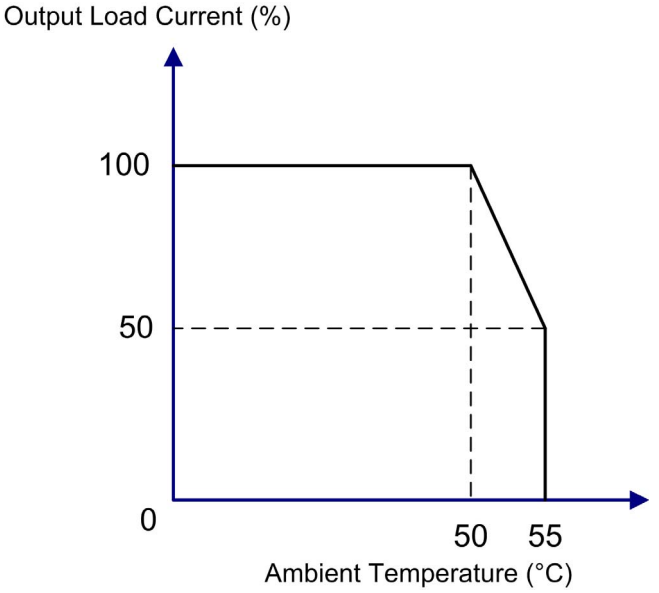
Relay Output Characteristics

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

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

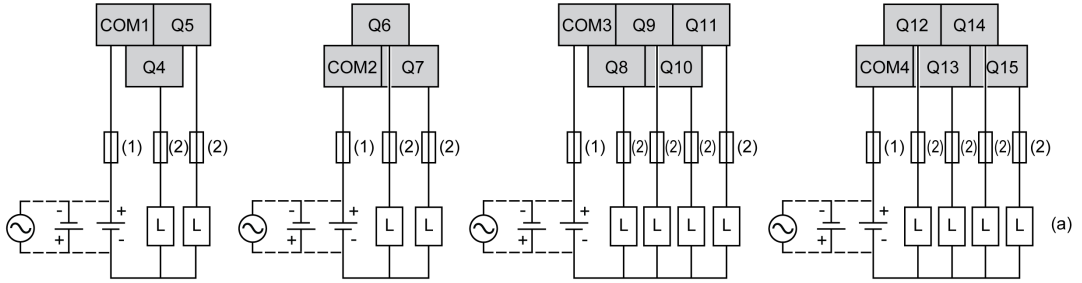
The following illustration shows the Relay Outputs De-rating curve:



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.

TM218LDAE40DRPHN Fast Output

Overview

The TM218LDAE40DRPHN controller is equipped with 4 digital outputs which can be used for Fast outputs *(see page 58)*.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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 34)*.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

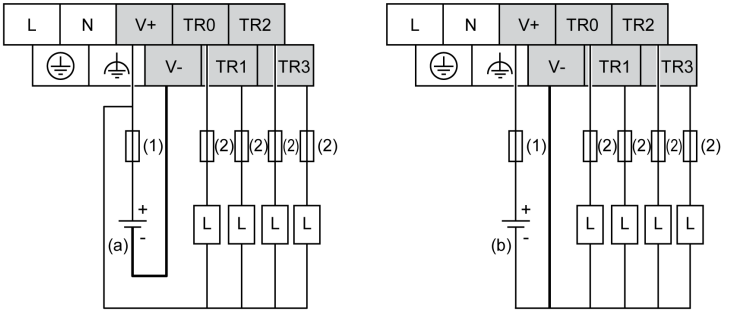
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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 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)

Chapter 14
TM218LDA40DR2HN

Overview

This chapter describes the TM218LDA40DR2HN controller.

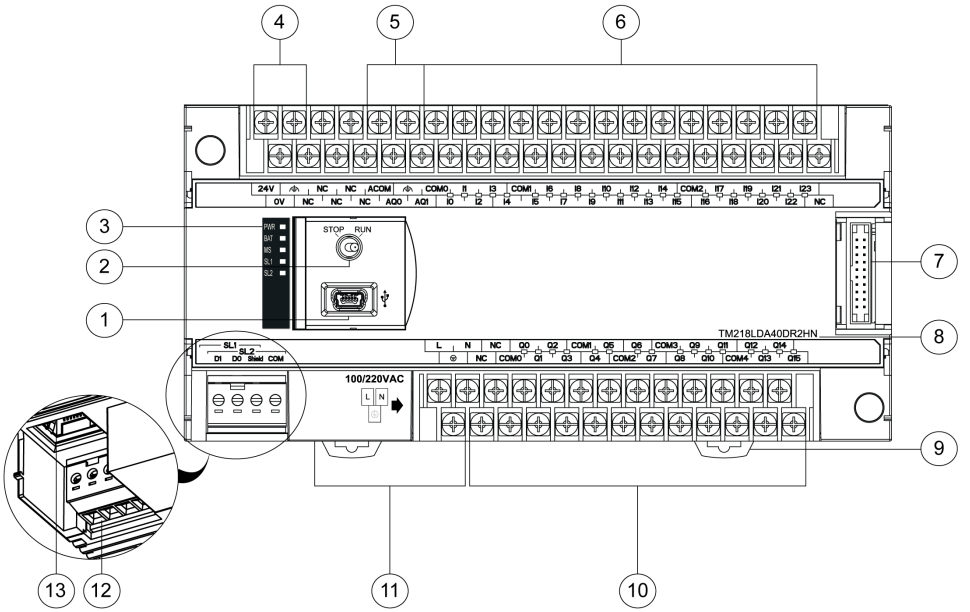
What Is in This Chapter?

This chapter contains the following topics:

TM218LDA40DR2HN Presentation

Overview

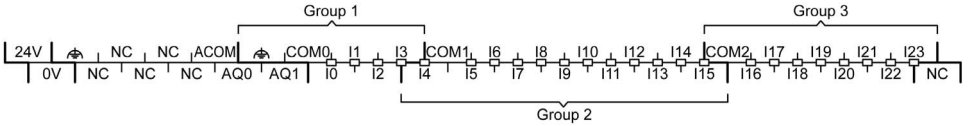
The following illustration shows the different components of the TM218LDA40DR2HN controller:



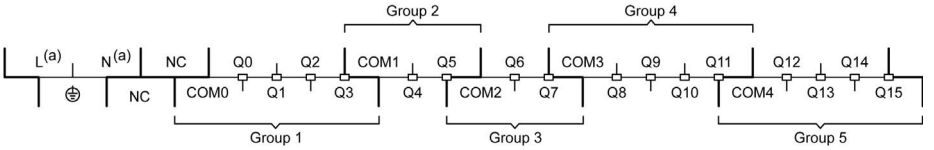
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System LEDs *(see page 51)*
4	24 V sensor power supply terminal block
5	Analog output terminal block *(see page 217)*
6	Input terminal block *(see page 217)*
7	Ribbon cable connector
8	Reference number
9	DIN rail clip
10	Output terminal block *(see page 217)*
11	100...220 Vac power supply terminal block and label
12	Serial link 2/terminal block *(see page 272)*
13	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

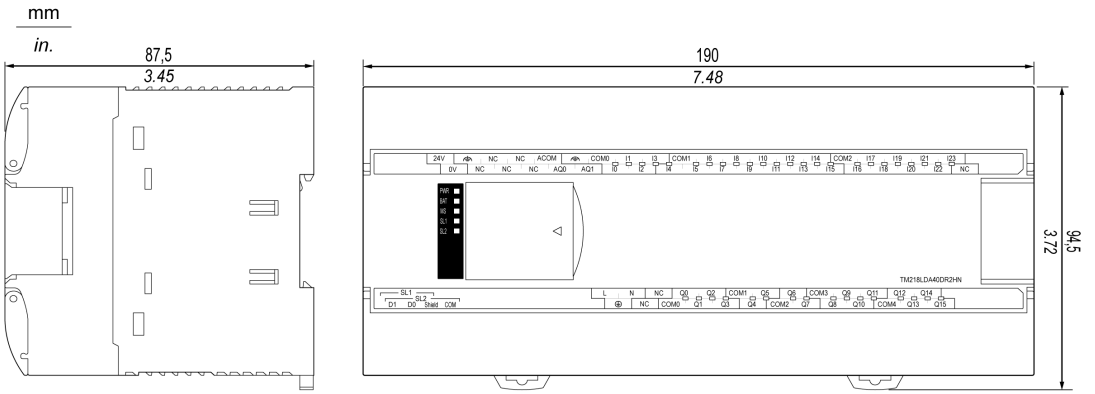
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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 52)* 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 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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
– No

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

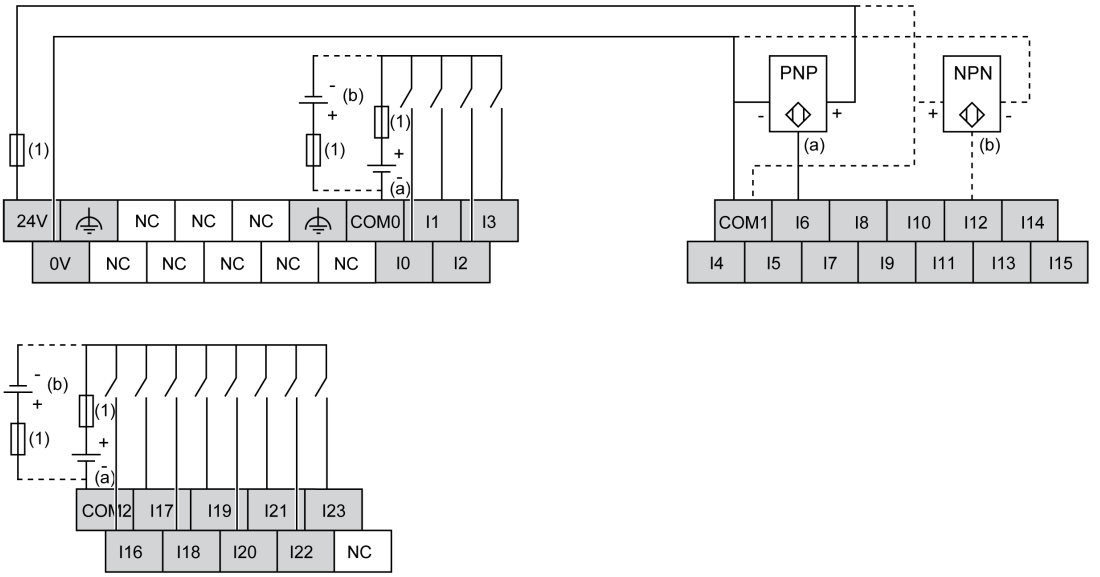
The table below describes the characteristics of the M218 controller digital inputs:

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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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 219)* which can be used as HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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 2 rows are removable
HSC Maximum frequency		A/B phase: 50 kHz (20 µs) Single phase: 100 kHz Pulse/Direction: 100 kHz Minimum transition duration: 4 µs
HSC type		• A/B phase counter • Pulse/Direction counter • Single phase counter

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 wiring diagram for the Fast inputs is same as that of the digital inputs *(see page 222)*.

TM218LDA40DR2HN Relay Output

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

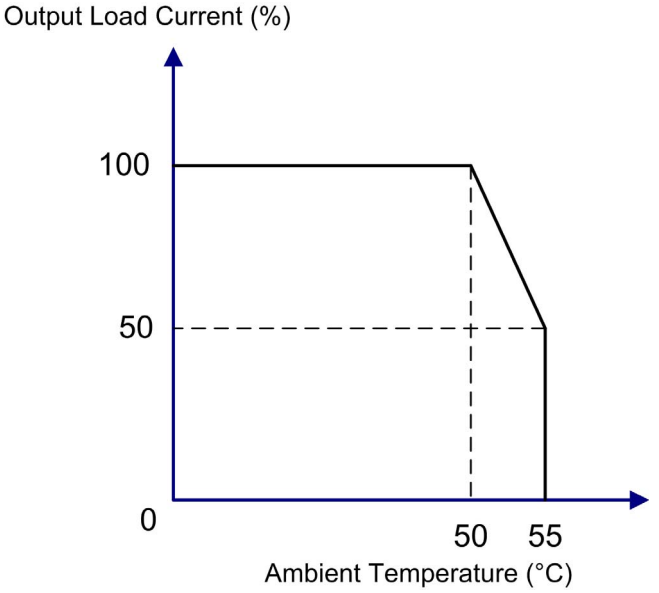
Relay Output Characteristics

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

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

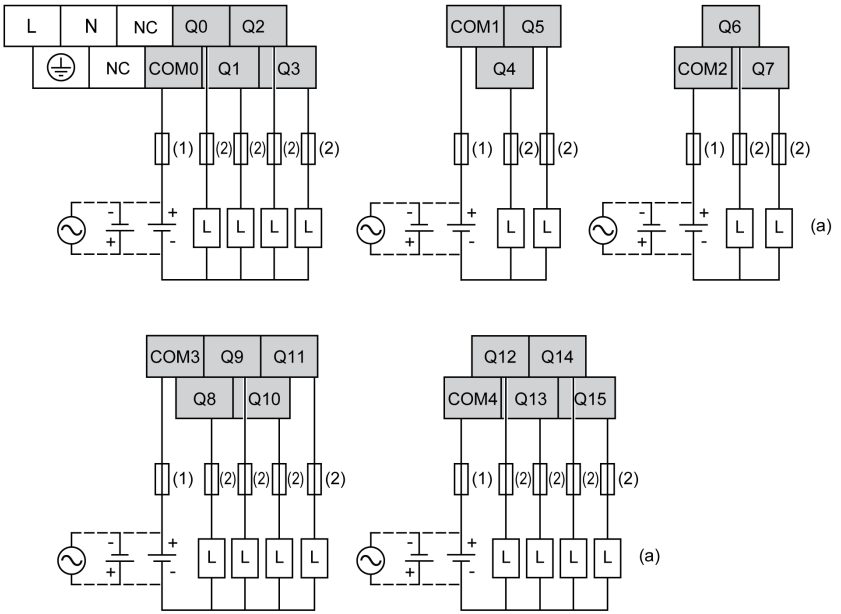
The following illustration shows the relay outputs de-rating curve:



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 recommended wire sizes for the current capacity of the I/O channels and 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

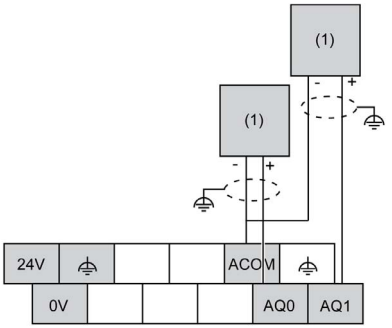
The table below describes the characteristics of the Modicon M218 Logic Controller analog outputs:

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	

Characteristic		Voltage output	Current output
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) **NOTE:** 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[1].
- Route communications and I/O cables separately from power cables.

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

[1]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 32)*.

If you have physically wired, for example, your analog module channel for a voltage signal, and you configure the channel for a current signal in SoMachine, you may damage the analog output module.

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.

Chapter 15
TM218LDA40DR4PHN

Overview

This chapter describes the TM218LDA40DR4PHN controller.

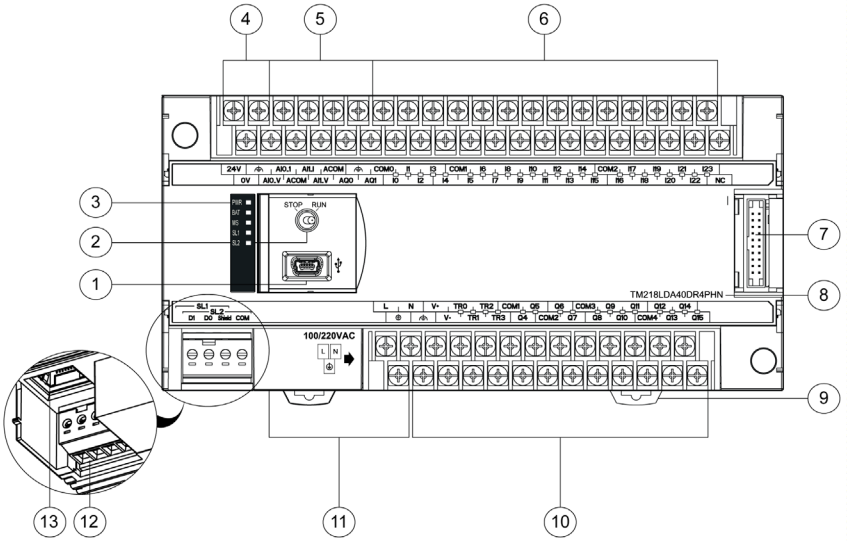
What Is in This Chapter?

This chapter contains the following topics:

TM218LDA40DR4PHN Presentation

Overview

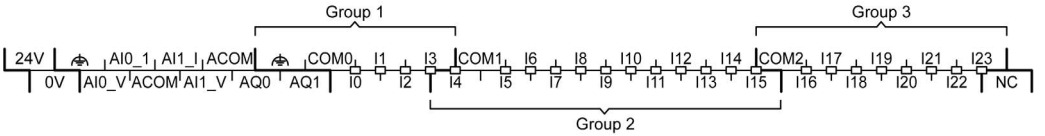
The following illustration shows the different components of the TM218LDA40DR4PHN controller:



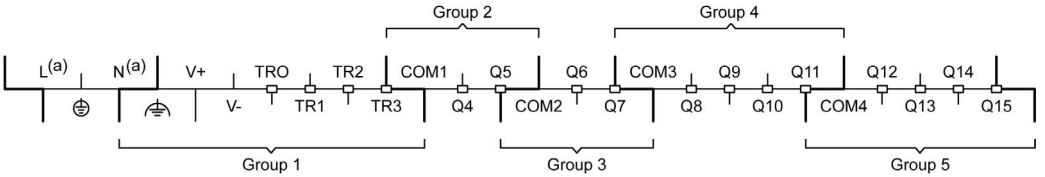
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System LEDs *(see page 51)*
4	24 V sensor power supply terminal block
5	Analog input *(see page 241)* and output *(see page 249)* terminal block
6	Input terminal block *(see page 233)*
7	Ribbon cable connector
8	Reference number
9	DIN rail clip
10	Output terminal block *(see page 233)*
11	100...220 Vac power supply terminal block and label
12	Serial link 2/terminal block *(see page 272)*
13	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

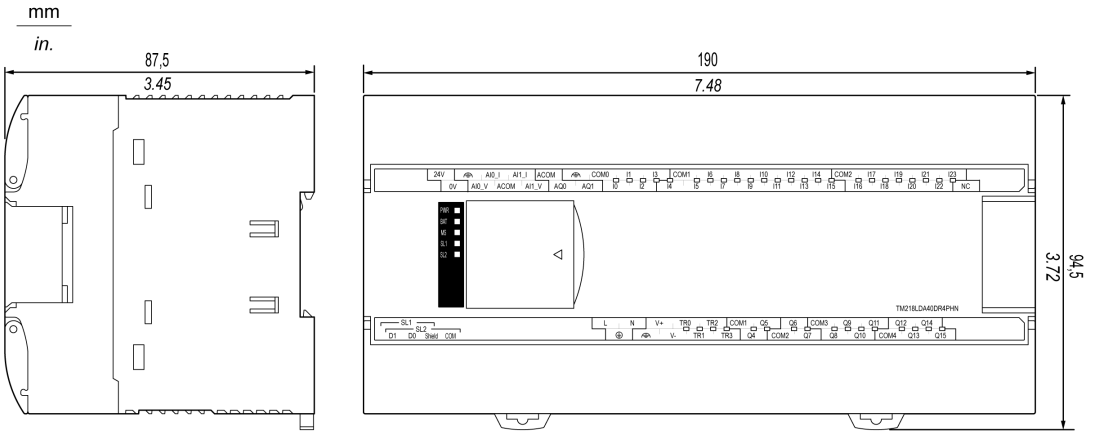
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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 52)* 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 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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
– No

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

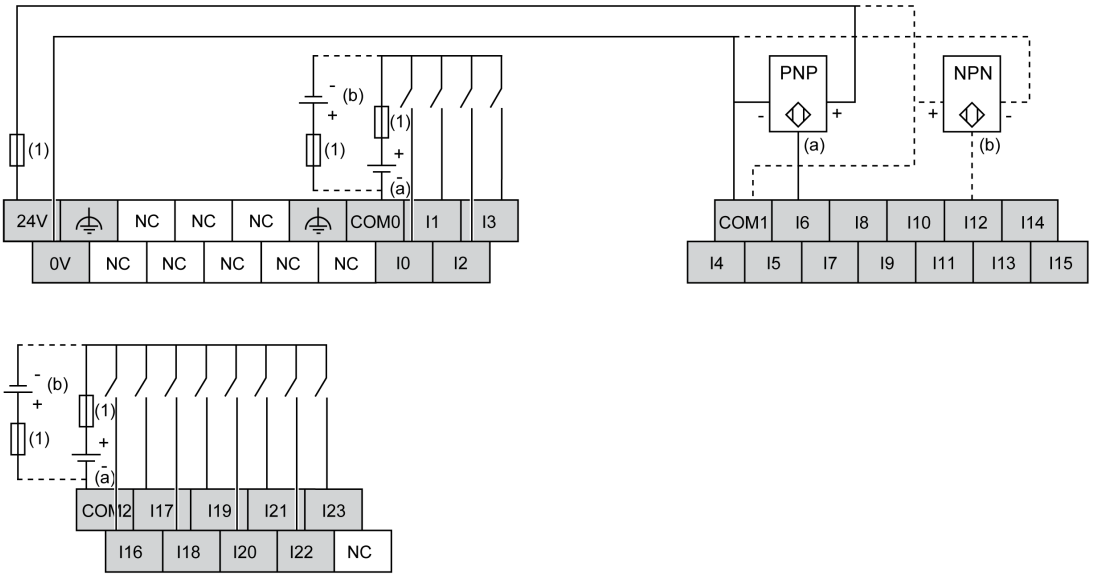
The table below describes the characteristics of the M218 controller digital inputs:

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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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.

TM218LDA40DR4PHN Fast Input

Overview

The TM218LDA40DR4PHN controller is equipped with 4 Fast digital inputs *(see page 235)* which can be used as HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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 2 rows are removable
HSC Maximum frequency		A/B phase: 50 kHz (20 µs) Single phase: 100 kHz Pulse/Direction: 100 kHz Minimum transition duration: 4 µs
HSC type		• A/B phase counter • Pulse/Direction counter • Single phase counter

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 wiring diagram for the Fast inputs is same as that of the digital inputs *(see page 238)*.

TM218LDA40DR4PHN Analog Input

Overview

The TM218LDA40DR4PHN controller is equipped with 2 analog inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

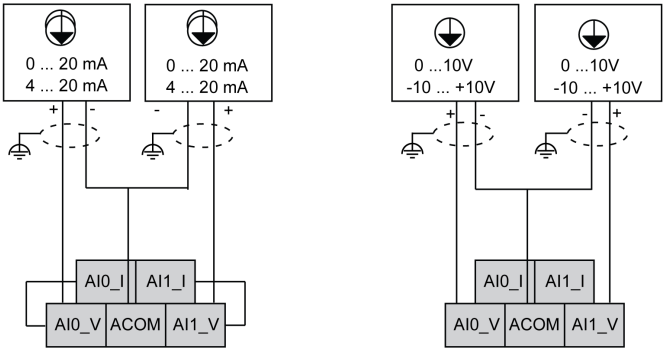
Analog Input Characteristics

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) ±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) **NOTE:** 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[1].
- Route communications and I/O cables separately from power cables.

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

[1]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 32)*.

For example, if you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in SoMachine, 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 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

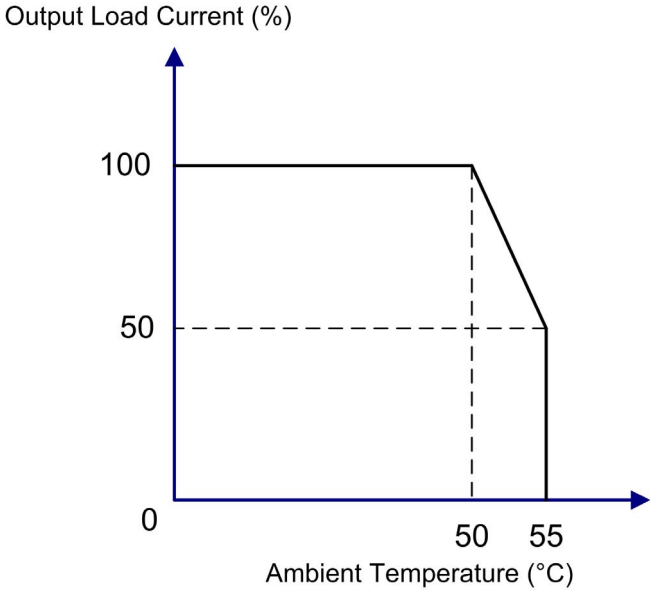
Relay Output Characteristics

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

Characteristic		Value
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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

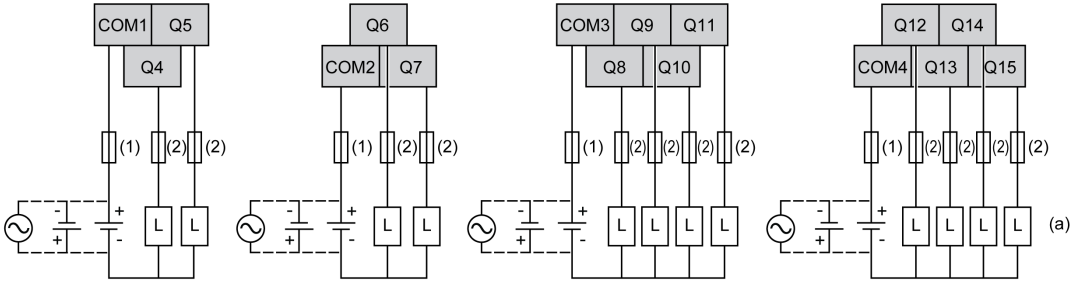
The following illustration shows the relay outputs de-rating curve:



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.

TM218LDA40DR4PHN Fast Output

Overview

The TM218LDA40DR4PHN controller is equipped with 4 digital outputs which can be used for Fast outputs *(see page 58)*.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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 34)*.

⚠ 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.

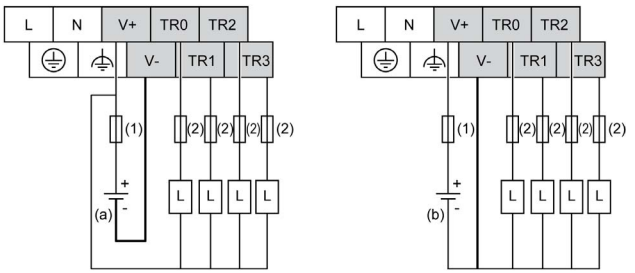
The table below describes the characteristics of the M218 controller Fast outputs:

Characteristic	Value
Output type	Push/Pull
Rated voltage	24 Vdc
PTO power supply input range	19.2...28.8 Vdc

Characteristic		Value
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 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 recommended wire sizes for the current capacity of the I/O channels and 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

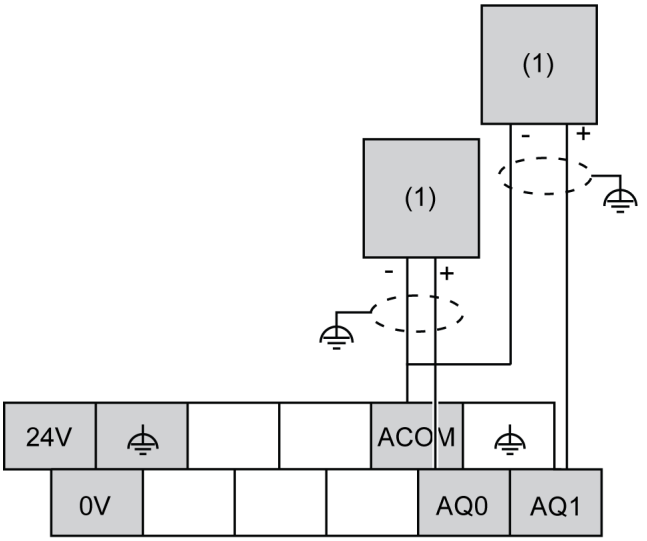
The table below describes the characteristics of the Modicon M218 Logic Controller analog outputs:

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	

Characteristic		Voltage output	Current output
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) **NOTE:** 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[1].
- Route communications and I/O cables separately from power cables.

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

[1]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 32)*.

For example, if you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in SoMachine, 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.

Chapter 16
TM218LDA60DRN

Overview

This chapter describes the TM218LDA60DRN controller.

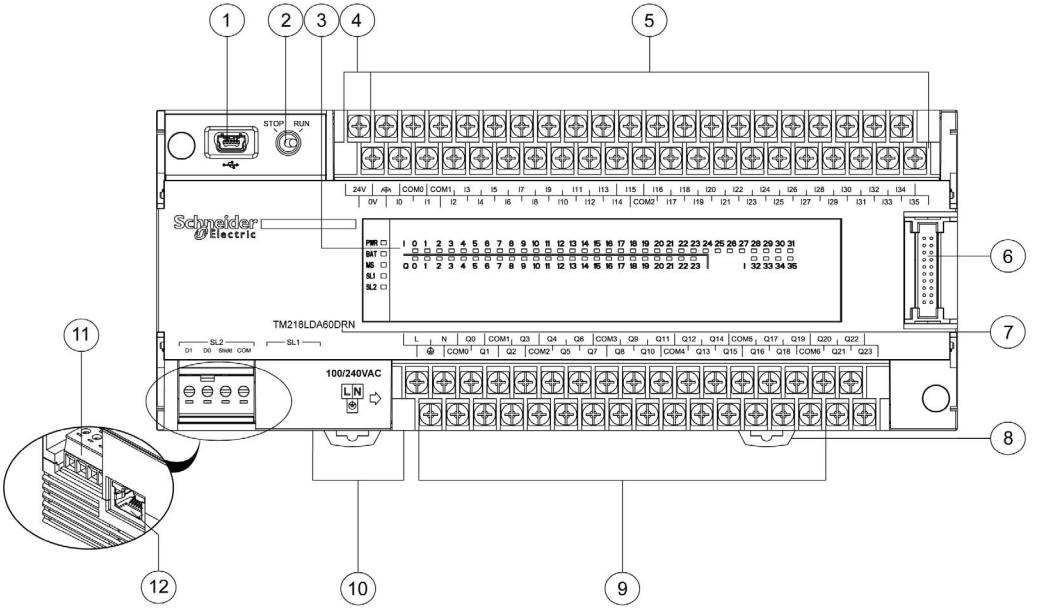
What Is in This Chapter?

This chapter contains the following topics:

TM218LDA60DRN Presentation

Overview

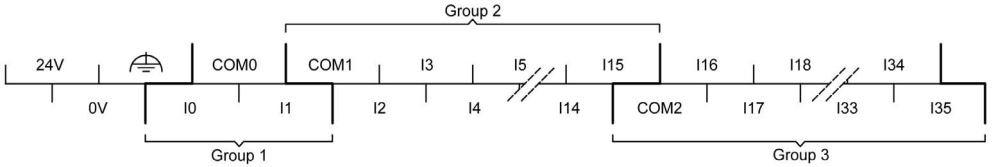
The following illustration shows the different components of the TM218LDA60DRN:



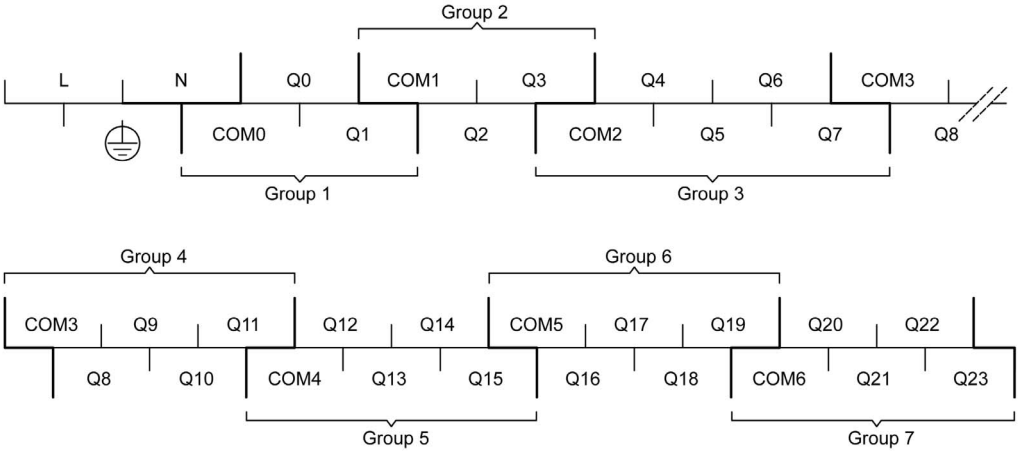
N°	Description
1	USB programming port *(see page 269)*
2	Run/Stop switch *(see page 54)*
3	System and I/O LEDs *(see page 51)*
4	24 V sensor power supply terminal block
5	Input terminal block *(see page 255)*
6	Ribbon cable connector
7	Reference number
8	DIN rail clip
9	Output terminal block *(see page 255)*
10	100...220 Vac power supply terminal block and label
11	Serial link 2/terminal block *(see page 272)*
12	Serial link 1/type RJ45 *(see page 270)*

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 76)*.

⚠ DANGER

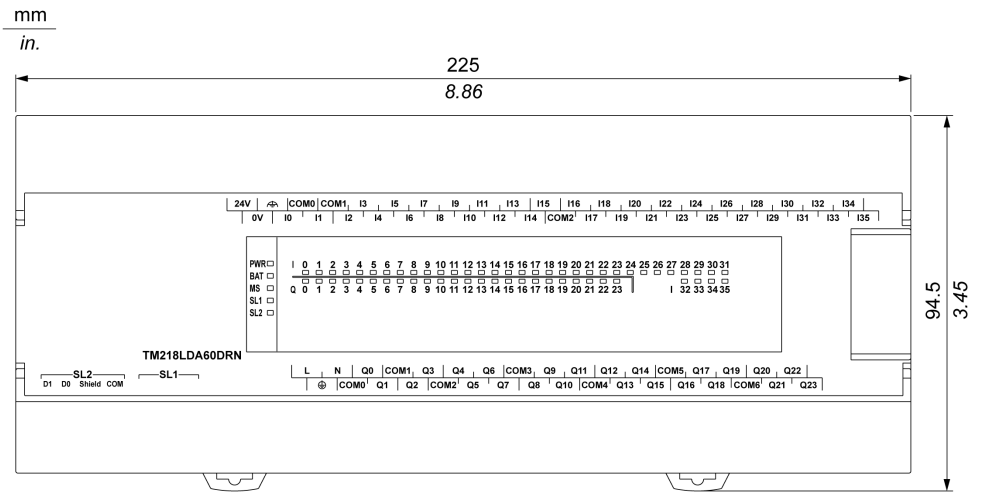
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

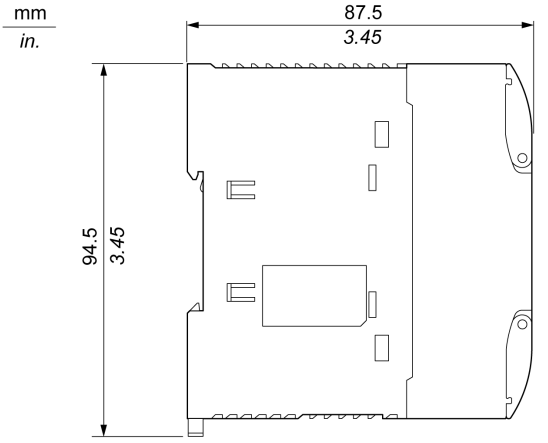
- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly 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 55)* for more information on managing inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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	
Fast Input[1]	I0	X	X	–	HSC
	I1	X	X	–	HSC
Digital Input	I2	X	X	–	–
	...	X	X	–	–
	I35	X	X	–	–

X Yes
– No
1 Can also be used as a regular input

You can use filters and functions to manage the controller inputs *(see page 55)*.

Digital Input Characteristics

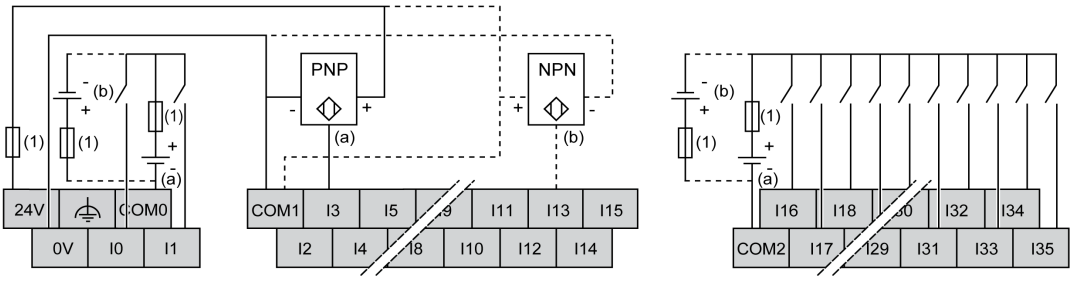
The table below describes the characteristics of the M218 controller digital inputs:

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 Selectable: No filter (1ms), 3 ms and 12 ms	
IEC61131-2 edition 3 type		Type 1	
Compatibility		Supports 2 wire and 3 wire sensors(1)	
Cable type and length		Shielded: Maximum 100 m (328 ft) Non-shielded: 50 m (164 ft) Use shielded cables for Fast inputs.	
Protection against over voltage		No	
Terminal blocks		Type: Screw, 7.62 mm (0.29 in.) pitch 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

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 85)* which can be used as 10 kHz HSC inputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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(1)
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) 2 rows are removable
HSC Maximum frequency		10 kHz (100 µs) Minimum transition duration: 40 µs
HSC type		Single phase counter

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 wiring diagram for the Fast inputs is same as that of the digital inputs *(see page 259)*.

TM218LDA60DRN Relay Outputs

Overview

See Output Management *(see page 58)* for more information on managing outputs.

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the I/O channels and 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.

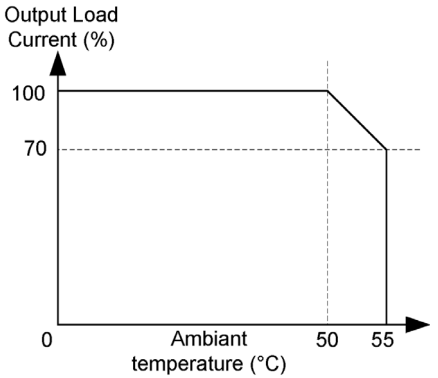
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Relay Output Characteristics

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

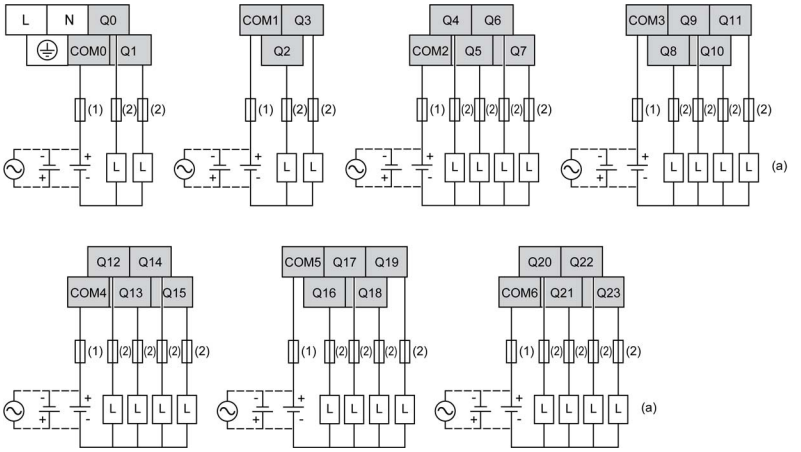
Characteristic		Value
Rated voltage		24 Vdc, 220 Vac
Input range		5...30 Vdc, 100...250 Vac
Rated current		Maximum 2 A for each point (see de-rating curve below)
Current/group (4 points)		4 A
Inrush values	Maximum switching voltage	250 Vac, 30 Vdc
	Current/point	5 A (see de-rating curve below)
Isolation		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 2 rows are removable
NOTE: Refer to Protecting Outputs from Inductive Load Damage *(see page 34)* for additional information on this topic.		

The following illustration shows the Relay Outpus 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
Integrated Communication Ports

What Is in This Chapter?

This chapter contains the following topics:

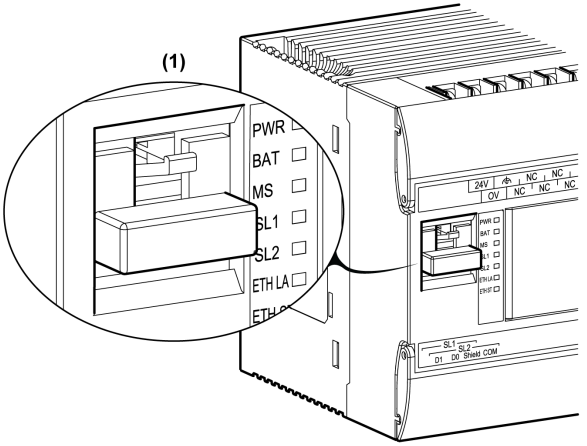
Ethernet Port

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

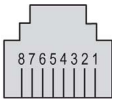
Characteristics

The table below describes the different Ethernet characteristics:

Characteristic	Description
Function	Modbus TCP/IP SoMachine Protocol
Connector type	RJ45
Driver	• 10 M half duplex (auto negotiation) • 100 M full duplex (auto negotiation)
Cable type	Shielded
Automatic cross-over detection	Yes

Pin Assignment

The following illustration shows the RJ45 Ethernet connector pin assignment:

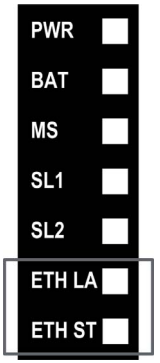


The table below describes the RJ45 Ethernet connector pins:

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 SoMachine software. Using a typical USB cable, this connection is suitable for quick updates of the program or short duration connections to perform maintenance and inspect data values. It is not suitable for long-term connections such as commissioning or monitoring without the use of specially adapted cables to help minimize electromagnetic interference.

⚠ WARNING

INOPERABLE EQUIPMENT OR UNINTENDED EQUIPMENT OPERATION

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

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

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

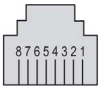
The serial link port 1 is used to communicate with devices supporting the Modbus protocol as either a master or slave, ASCII Protocol (printer, modem...), and SoMachine Protocol (HMI,...).

Characteristics

Characteristic		Description
Function		Modbus Master/Slave **NOTE:** Slave mode needs 120 Ω 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 Ω resistors are optional.
5 Vdc power supply for RS485		No

Pin Assignment

The following illustration shows the pins of the RJ45 connector:



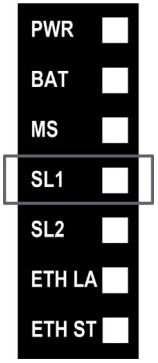
The table below describes the pin assignment of the RJ45 connector:

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 **NOTE:** Slave mode needs 120 Ω 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 Ω resistors are optional.
5 Vdc power supply for RS485		No

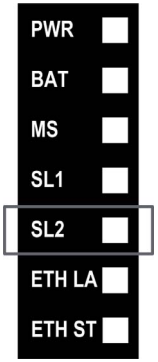
Pin Assignment

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 18
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 SoMachine 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.

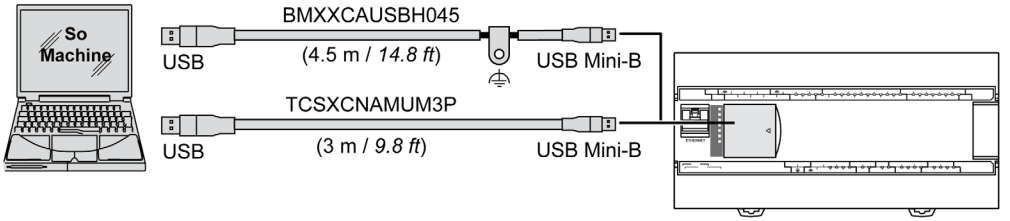
NOTE: You can only connect 1 controller to the PC at any one time.

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

⚠ WARNING
INOPERABLE EQUIPMENT OR UNINTENDED EQUIPMENT OPERATION ● You must use a shielded USB cable such as a BMX XCAUSBH0•• secured to the functional ground (FE) of the system for any long-term connection. ● Do not connect more than one controller at a time using USB connections. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

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

The following illustration shows the USB connection to a PC:

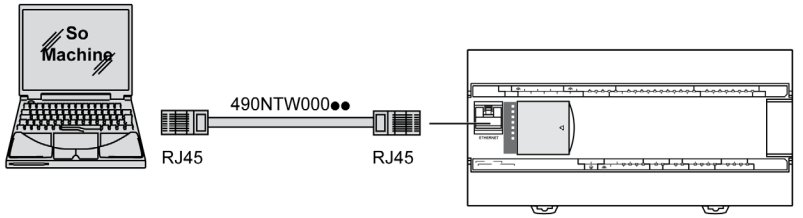


To connect the USB cable to your controller, follow the steps below:

Step	Action
1	**1a** 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. **1b** 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 your Ethernet cable to the PC.
2	Connect your Ethernet cable to the Ethernet port on the controller.

Glossary

0-9

%

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

controller

Automates industrial processes (also known as programmable logic controller or programmable controller).

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 1 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 IEE 802.3.

expansion I/O module

(*expansion input/output module*) Either a digital or analog module that adds additional I/O to the base controller.

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

HMI

(*human machine interface*) An operator interface (usually graphical) for human control over industrial equipment.

HSC

(*high-speed counter*)

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).

LD

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

LED

(*light emitting diode*) An indicator that illuminates under a low-level electrical charge.

M

machine

Consists of several *functions* and/or *equipment*.

master/slave

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

Modbus

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

ms

(*millisecond*)

N

NEMA

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

network

A system of interconnected devices that share a common data path and protocol for communications.

node

An addressable device on a communication network.

O

output terminal

A collection of connection points between the field wiring and the I/O modules or those integrated into the controller.

P

PE

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

power supply terminals

The power supply is connected to these terminals to provide power to the controller.

program

The component of an application that consists of compiled source code capable of being installed in the memory of a logic controller.

protocol

A convention or standard definition that controls or enables the connection, communication, and data transfer between 2 computing system and devices.

PTO

(*pulse train outputs*) a fast output that oscillates between off and on in a fixed 50-50 duty cycle, producing a square wave form. The PTO is especially well suited for applications such as stepper motors, frequency converters, and servo motor control, among others.

PWM

(*pulse width modulation*) 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). The PTO is well adapted to simulate or approximate an analog output in that it regulates the voltage of the output over its period making it useful in light dimming or speed control applications, among others.

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.

RJ-45

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 calender 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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