

Modicon TM3

Expert I/O Modules

Hardware Guide

12/2017



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

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

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

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

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

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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, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



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



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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

PLEASE NOTE

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

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

QUALIFICATION OF PERSONNEL

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product.

The qualified person must be able to detect possible hazards that may arise from parameterization, modifying parameter values and generally from mechanical, electrical, or electronic equipment. The qualified person must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when designing and implementing the system.

INTENDED USE

The products described or affected by this document, together with software, accessories, and options, are expansion modules, intended for industrial use according to the instructions, directions, examples, and safety information contained in the present document and other supporting documentation.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements, and the technical data.

Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety-related measures must be implemented.

Since the product is used as a component in an overall machine or process, you must ensure the safety of persons by means of the design of this overall system.

Operate the product only with the specified cables and accessories. Use only genuine accessories and spare parts.

Any use other than the use explicitly permitted is prohibited and can result in unanticipated hazards.

About the Book



At a Glance

Document Scope

This guide describes the hardware implementation of TM3 expert modules. It provides the parts description, characteristics, wiring diagrams, and installation details for TM3 expert modules.

Validity Note

This document has been updated for the release of TM3TI4D Add-on for SoMachine V4.3.

This document has been updated for the release of SoMachine Basic V1.6.

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

The technical characteristics of the devices described in this document also appear online. To access this information online:

Step	Action
1	Go to the Schneider Electric home page www.schneider-electric.com .
2	In the Search box type the reference of a product or the name of a product range. <ul style="list-style-type: none">• Do not include blank spaces in the reference or product range.• To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the Product Datasheets search results and click on the reference that interests you. If you entered the name of a product range, go to the Product Ranges search results and click on the product range that interests you.
4	If more than one reference appears in the Products search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click Download XXX product datasheet .

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 TM3 Expansion Modules Configuration - Programming Guide (SoMachine Basic)	EIO0000001396 (ENG) EIO0000001397 (FRA) EIO0000001398 (GER) EIO0000001399 (SPA) EIO0000001400 (ITA) EIO0000001401 (CHS) EIO0000001374 (POR) EIO0000001375 (TUR)
Modicon TM3 Expansion Modules Configuration - Programming Guide (SoMachine)	EIO0000001402 (ENG) EIO0000001403 (FRA) EIO0000001404 (GER) EIO0000001405 (SPA) EIO0000001406 (ITA) EIO0000001407 (CHS)
Modicon M221 Logic Controller - Hardware Guide	EIO0000001384 (ENG) EIO0000001385 (FRA) EIO0000001386 (GER) EIO0000001387 (SPA) EIO0000001388 (ITA) EIO0000001389 (CHS) EIO0000001370 (POR) EIO0000001371 (TUR)
Modicon M241 Logic Controller - Hardware Guide	EIO0000001456 (ENG) EIO0000001457 (FRA) EIO0000001458 (GER) EIO0000001459 (SPA) EIO0000001460 (ITA) EIO0000001461 (CHS)
Modicon M251 Logic Controller - Hardware Guide	EIO0000001486 (ENG) EIO0000001487 (FRA) EIO0000001488 (GER) EIO0000001489 (SPA) EIO0000001490 (ITA) EIO0000001491 (CHS)
TM3 Expert I/O Modules - Instruction sheet	HRB59608

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

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.

DANGER

POTENTIAL FOR EXPLOSION

- Only use this equipment in non-hazardous locations, or in locations that comply with Class I, Division 2, Groups A, B, C and D.
- Do not substitute components which would impair compliance to Class I, Division 2.
- Do not connect or disconnect equipment unless power has been removed or the location is known to be non-hazardous.
- Do not use the USB port(s), if so equipped, unless the location is known to be non-hazardous.

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.

Terminology Derived from Standards

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

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

Among others, these standards include:

Standard	Description
EN 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2008	Safety of machinery: Safety related parts of control systems. General principles for design.

Standard	Description
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 1088:2008 ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2006	Safety of machinery - Emergency stop - Principles for design
EN/IEC 62061:2005	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2008	Digital data communication for measurement and control: Functional safety field buses.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

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

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

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

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

Part I

TM3 General Overview

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
1	TM3 Description	15
2	TM3 Installation	17

Chapter 1

TM3 Description

General Description

TM3 Expert Module

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

Reference	Description	Terminal Type / Pitch
TM3XTYS4 (<i>see page 45</i>)	TeSys module	4 front connectors RJ-45 1 power supply connector / 5.08 mm

Accessories

Reference	Description	Use	Quantity
TMAT2PSET	Set of 5 removable screw terminal block.	Connects the 24 Vdc power supply.	1
AB1AB8P35	End brackets	Helps secure the logic controller or receiver module and their expansion modules on a top hat section rail (DIN rail).	1
TM2XMTGB	Grounding Bar	Connects the cable shield and the module to the functional ground	1
TM200RSRCEMC	Shielding take-up clip	Mounts and connects the ground to the cable shielding.	25 pack
TMAM2	Mounting Kit	Mounts the controller and I/O modules directly to a flat, vertical panel.	1

Connector and Cables

Use one of the TeSys cables to connect an TM3XTYS4 module to your TeSys system:

Reference	Description	Use	Length
LU9 R03	Connection cables equipped with an RJ45 connector at both ends.	Connects the TM3XTYS4 module to the TeSys system.	0.3 m (0.98 ft)
LU9 R10			1 m (3.28 ft)
LU9 R30			3 m (9.84 ft)

Chapter 2

TM3 Installation

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
2.1	TM3 General Rules for Implementing	18
2.2	TM3 Expansion Module Installation	23
2.3	TM3 Electrical Requirements	35

Section 2.1

TM3 General Rules for Implementing

What Is in This Section?

This section contains the following topics:

Topic	Page
Environmental Characteristics	19
Certifications and Standards	22

Environmental Characteristics


Enclosure Requirements

TM3 expansion module 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 these standards, 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 TM3 expansion module components meet European Community (CE) requirements for open equipment as defined by IEC/EN 61131-2. You must install them in an enclosure designed for the specific environmental conditions and to minimize the possibility of unintended contact with hazardous voltages. Use metal enclosures to improve the electromagnetic immunity of your TM3 expansion module components. Use enclosures with a keyed locking mechanism to minimize unauthorized access.

Environmental Characteristics

All the TM3 expansion module components are electrically isolated between the internal electronic circuit and the input/output channels. This equipment meets CE requirements as indicated in the table below. This equipment is intended for use in a Pollution Degree 2 industrial environment.

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

The following table shows the general environmental characteristics:

Characteristic		Specification
Standard compliance	IEC/EN 61131-2 IEC/EN 61010-2-201	
Ambient operating temperature	Horizontal installation	-10...55 °C (14...131 °F)
	Vertical installation	-10...35 °C (14...95 °F)
Storage temperature	-25...70 °C (- 13...158 °F)	
Relative humidity	Transport and storage	10...95 % (non-condensing)
	Operation	10...95 % (non-condensing)
Degree of pollution	IEC/EN 60664-1	2
Degree of protection	IEC/EN 61131-2	IP20

Characteristic		Specification
Machine Safety conformance	IEC/EN 61010-2-201	Yes
Corrosion immunity		Atmosphere free from corrosive gases
Operating altitude		0...2000 m (0...6560 ft)
Storage altitude		0...3000 m (0...9843 ft)
Vibration resistance	IEC/EN 61131-2 Panel mounting or mounted on a top hat section rail (DIN rail)	3.5 mm (0.13 in) fixed amplitude from 5...8.5 Hz 29.4 m/s ² or 96.45 ft/s ² (3 g _n) fixed acceleration from 8.7...150 Hz
Mechanical shock resistance		147 m/s ² or 482.28 ft/s ² (15 g _n) for a duration of 11 ms

Electromagnetic Susceptibility

The TM3 expansion module components meets electromagnetic susceptibility specifications as indicated in the following table:

Characteristic	Designed to specification	Range		
Electrostatic discharge	IEC/EN 61000-4-2	8 kV (air discharge) 4 kV (contact discharge)		
Radiated electromagnetic field	IEC/EN 61000-4-3	10 V/m (80...1000 MHz) 3 V/m (1.4...2 GHz) 1 V/m (2...3 GHz)		
Magnetic field	IEC/EN 61000-4-8	30 A/m 50 Hz, 60 Hz		
Fast transients burst	IEC/EN 61000-4-4	–	CM ¹ and DM ²	
		24 Vdc I/Os	1 kV	
Surge immunity	IEC/EN 61000-4-5 IEC/EN 61131-2	–	CM ¹	DM ²
		DC Power lines	1 kV	0.5 kV
		24 Vdc I/Os	1 kV	–
		Shielded cable (between shield and ground)	1 kV	–
Induced electromagnetic field	IEC/EN 61000-4-6	10 Vrms (0.15...80 MHz)		
Conducted emission	IEC/EN 55011 (IEC/CISPR Publication 11)	AC power line:		
		<ul style="list-style-type: none"> 0.15...0.5 MHz: 79 dBμV/m QP / 66 dBμV/m AV 0.5...300 MHz: 73 dBμV/m QP / 60 dBμV/m AV 		
		AC/DC power line:		
		<ul style="list-style-type: none"> 10...150 kHz: 120...69 dBμV/m QP 150...1500 kHz: 79...63 dBμV/m QP 1.5...30 MHz: 63 dBμV/m QP 		

Characteristic	Designed to specification	Range
Radiated emission	IEC/EN 55011 (IEC/CISPR Publication 11)	Class A, 10 m distance: <ul style="list-style-type: none"> ● 30...230 MHz: 40 dBμV/m QP ● 230...1000 MHz: 47 dBμV/m QP
<ol style="list-style-type: none"> 1 Common Mode 2 Differential Mode 		

Certifications and Standards

Introduction

The TM3 expansion modules are designed to conform to the main national and international standards concerning electronic industrial control devices:

- IEC/EN 61131-2
- UL 508

The TM3 have obtained the following conformity marks:

- CE
- UL/CSA
- EAC
- RCM
- cCSAus Hazardous Location

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

Section 2.2

TM3 Expansion Module Installation

What Is in This Section?

This section contains the following topics:

Topic	Page
Installation and Maintenance Requirements	24
Installation Guidelines	27
Top Hat Section Rail (DIN rail)	28
Assembling a Module to a Controller or Receiver Module	31
Disassembling a Module from a Controller or Receiver Module	33
Direct Mounting on a Panel Surface	34

Installation and Maintenance Requirements

Before Starting

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

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

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

Disconnecting Power

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

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

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

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

Programming Considerations

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Operating Environment

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

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Installation Considerations

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

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

Installation Guidelines

Introduction

TM3 expansion modules are assembled by connecting them to a logic controller or receiver module.

The logic controller or receiver module and their expansion modules can be installed on a top hat section rail (DIN rail).

Mounting Position and Minimum Clearances

The mounting position and minimum clearances of the expansion modules must conform with the rules defined for the appropriate hardware system. Refer to the *Installation chapter* in the *Controller Hardware* documentation for your specific controller.

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.

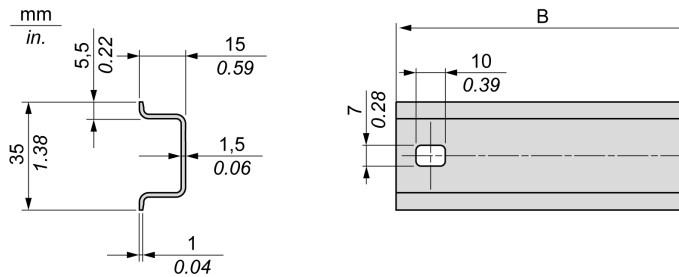
Top Hat Section Rail (DIN rail)

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.

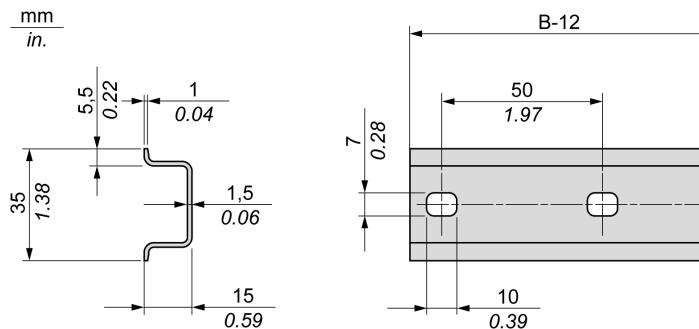
Symmetric Top Hat Section Rails (DIN Rail)

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



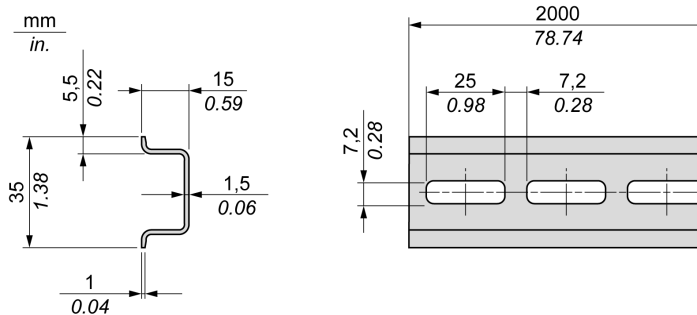
Reference	Type	Rail Length (B)
NSYSDR50A	A	450 mm (17.71 in.)
NSYSDR60A	A	550 mm (21.65 in.)
NSYSDR80A	A	750 mm (29.52 in.)
NSYSDR100A	A	950 mm (37.40 in.)

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.)

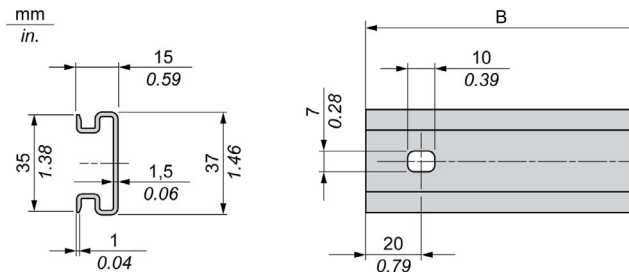
The following illustration and table shows the references of the symmetric top hat section rails (DIN rail) of 2000 mm (78.74 in.):



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

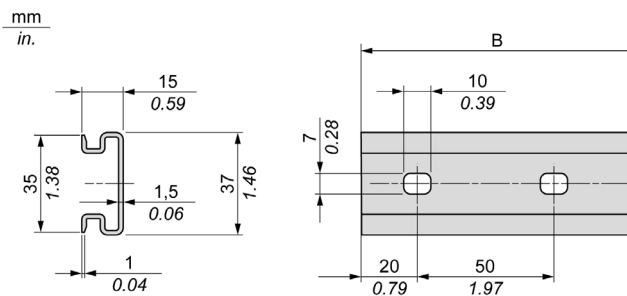
Double-Profile Top Hat Section Rails (DIN rail)

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.)

Assembling a Module to a Controller or Receiver Module

Introduction

This section describes how to assemble an expansion module to a controller, Receiver module or other modules.

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.

After connecting new modules to the controller, either directly or through a transmitter/receiver, update and reupload your application program before placing the system back in service. If you do not revise your application program to reflect the addition of new modules, I/O located on the expansion bus may no longer operate normally.

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.

Assembling a Module to a Controller or Receiver Module


The following procedure shows how to assemble a controller or receiver module and a module together.

Step	Action
1	Remove all power and dismount any existing controller I/O assembly from its DIN mounting.
2	Remove the expansion connector sticker from the controller or the outermost installed expansion module.
3	Verify that the locking device on the new module is in the upper position.
4	Align the internal bus connector on the left side of the module with the internal bus connector on the right side of the controller, Receiver module or expansion module.
5	Press the new module towards the controller, Receiver module or expansion module until it is securely in place.
6	Push down the locking device on the top of the new module to lock it to the controller, Receiver module or previously installed expansion module.

Disassembling a Module from a Controller or Receiver Module

Introduction

This section describes how to disassemble a module from a controller or receiver module.


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.

Disassembling a Module from a Controller or Receiver Module

The following procedure describes how to disassemble a module from a controller or receiver module.

Step	Action
1	Remove all power from the control system.
2	Dismount the assembled controller and modules from the mounting rail.
3	Push up the locking device from the bottom of the module to disengage it from the controller or receiver module.
4	Pull apart module from the controller or receiver module.

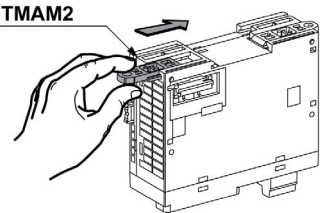
Direct Mounting on a Panel Surface

Overview

This section shows how to install TM3 expansion module using the Panel Mounting Kit. This section also provides mounting hole layout for all modules.

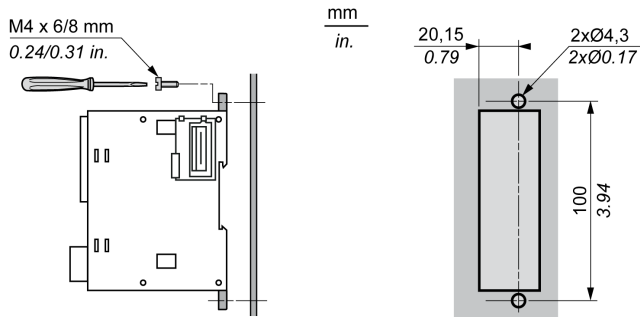
Installing the Panel Mount Kit

The following procedure shows how to install a mounting strip:

Step	Action
1	<p>Insert the mounting strip TMAM2 into the slot at the top of the module.</p> 

Mounting Hole Layout

The following diagram shows the mounting holes for TM3XTYS4 expansion modules:



Section 2.3

TM3 Electrical Requirements

Wiring Best Practices

Overview

This section describes the wiring guidelines and associated best practices to be respected when using the TM3 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.

Functional Ground (FE) on the DIN Rail

The DIN Rail for your TM3 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.

Protective Ground (PE) on the Backplane

The protective ground (PE) is connected to the conductive backplane by a heavyduty wire, usually a braided copper cable with the maximum allowable cable section.

Wiring Guidelines

The following rules must be applied when wiring a TM3 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.
- 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 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 point¹.
- Route communications and I/O cables separately from power cables.

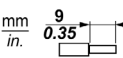










Failure to follow these instructions can result in death, serious injury, or equipment damage.

¹Multipoint 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.

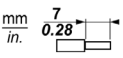










NOTE: Surface temperatures may exceed 60 °C (140 °F). To conform to IEC 61010 standards, route primary wiring (wires connected to power mains) separately and apart from secondary wiring (extra low voltage wiring coming from intervening power sources). If that is not possible, double insulation is required such as conduit or cable gains.

Rules for Removable Screw Terminal Block

The following tables show the cable types and wire sizes for a **3.81 pitch** removable screw terminal block (I/Os and power supply):

										
mm in.	mm ²	AWG	0.14...1.5	0.14...1.5	0.25...1.5	0.25...0.5	2 x 0.14...0.5	2 x 0.14...0.75	2 x 0.25...0.34	2 x 0.5
			26...16	26...16	22...16	22...20	2 x 26...20	2 x 26...20	2 x 24...22	2 x 20
 Ø 2,5 mm (0.1 in.)				N•m	0.28					
				lb-in	2.48					

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

										
mm in.	mm ²	AWG	0.2...2.5	0.2...2.5	0.25...2.5	0.25...2.5	2 x 0.2...1	2 x 0.2...1.5	2 x 0.25...1	2 x 0.5...1.5
			24...14	24...14	23...14	23...14	2 x 24...17	2 x 24...16	2 x 23...17	2 x 20...16
 Ø 3,5 mm (0.14 in.)				N•m	0.49					
				lb-in	4.34					

The use of copper conductors is required.

⚠ DANGER

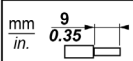

FIRE HAZARD

- Use only the correct wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output (2 A) wiring, use conductors of at least 0.5 mm² (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring (7 A), or relay output wiring greater than 2 A, use conductors of at least 1.0 mm² (AWG 16) with a temperature rating of at least 80 °C (176 °F).

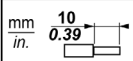





Failure to follow these instructions will result in death or serious injury.

Rules for Removable Spring Terminal Block

The following tables show the cable types and wire sizes for a **3.81 pitch** removable spring terminal block (I/Os and power supply):

				
mm ²	0.2...1.5	0.2...1.5	0.25...1.0	0.25...0.5
AWG	24...16	24...16	23...18	23...21

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

					
mm ²	0.2...2.5	0.2...2.5	0.25...2.5	0.25...2.5	2 x 0.5...1
AWG	24...14	24...14	23...14	23...14	2 x 20...17

The use of copper conductors is required.

⚠ DANGER

FIRE HAZARD

- Use only the correct wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output (2 A) wiring, use conductors of at least 0.5 mm² (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring (7 A), or relay output wiring greater than 2 A, use conductors of at least 1.0 mm² (AWG 16) with a temperature rating of at least 80 °C (176 °F).

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

The spring clamp connectors of the terminal block are designed for only one wire or one cable end. Two wires to the same connector must be installed with a double wire cable end to help prevent loosening.

DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCK

Do not insert more than one wire per connector of the terminal block unless using a double wire cable end (ferrule).

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.

AC-driven contactor coils are, under certain circumstances, inductive loads that generate pronounced high-frequency interference and electrical transients when the contactor coil is de-energized. This interference may cause the logic controller to detect an I/O bus error.

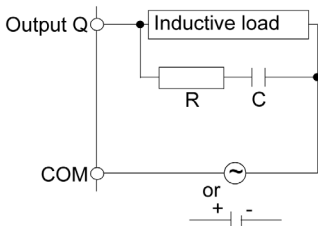
⚠ WARNING

CONSEQUENTIAL LOSS OF CONTROL

Install an RC surge suppressor or similar means, such as an interposing relay, on each TM3 expansion module relay output when connecting to AC-driven contactors or other forms of inductive loads.

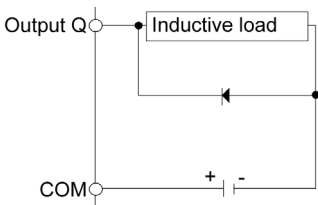
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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.

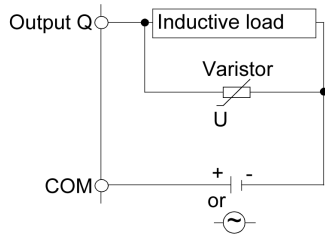
Protective circuit B: this protection circuit can be used for DC load power circuits.



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

Part II

TM3 TeSys Expansion Modules

Chapter 3

TM3XTYS4 TeSys Module

Overview

This chapter describes the TM3XTYS4 module, its characteristics, and its connection to the different devices.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
TM3XTYS4 Presentation	46
TM3XTYS4 Characteristics	52
TM3XTYS4 Wiring Diagram	55

TM3XTYS4 Presentation

Overview

TeSys module:

- 4 channels, each with
 - 3 sink inputs
 - 2 source transistor outputs
- Removable 24 Vdc power supply terminal block

TM3XTYS4 System Architecture

The TM3XTYS4 module connects the controller to the parallel wiring system of TeSys U and/or TeSys D. This parallel wiring module provides the status and command information for each starter. One TM3XTYS4 module can manage up to 4 starters, reverse or forward, whatever they are TeSys D or TeSys U.

TM3XTYS4 module is compatible with:

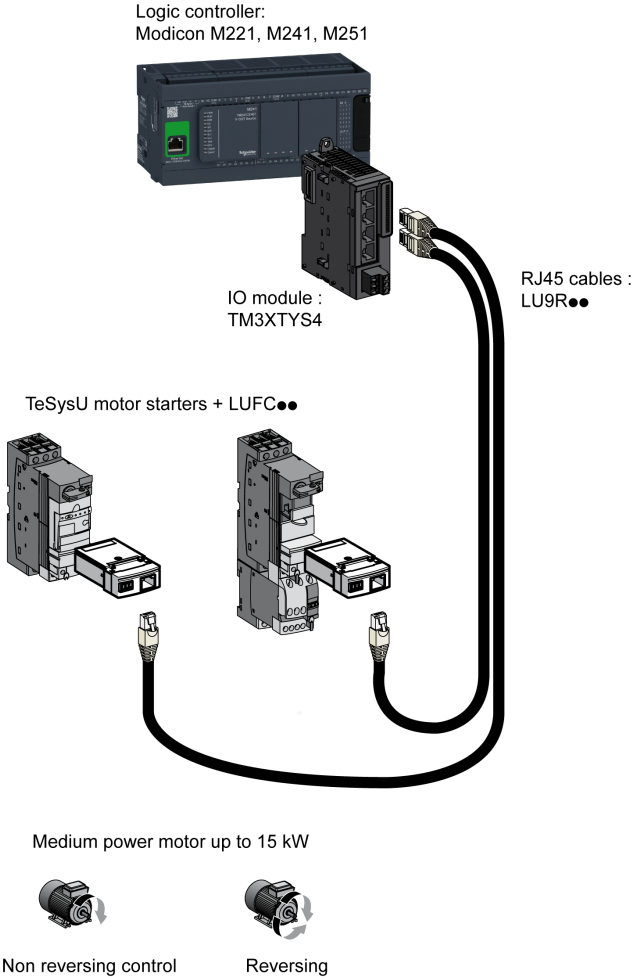
- TeSys U system
- TeSys D system

TeSys U System Architecture Example

TeSys model U is an integrated modular power management system for motor starters. The system provides motor starter overload protection and control functions.

The complete TeSys model U parallel wiring system consists in:

- a power base
- a contactor
- a thermal overload protection device
- a control unit for controller-starters



TeSys D System Architecture Example

TeSys model D is a motor control interface system for motor starters. The system provides motor starter overload protection and control functions.

The complete TeSys model D parallel wiring system consists in:

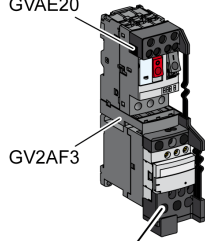
- a power base
- a contactor
- a thermal overload protection device
- a control unit for controller-starters

Logic controller:
Modicon M221, M241, M251



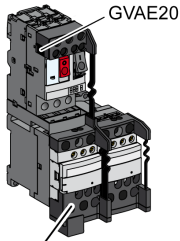
RJ45 cables :
LU9R●●

GV2ME●● + LC1D●●●/
GV2P + LC1D●●●
GVAE20



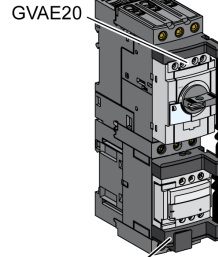
LAD5C11

GV2ME●● + LC2D●●●/
GV2P + LC2D●●●



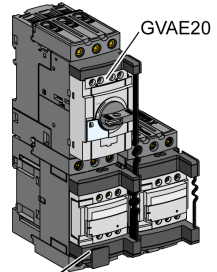
LAD5C12

GV3P●● + LC1D●●●



LAD5C31

GV3P●● + LC2D●●●



LAD5C32

Medium power motor up to 15 kW

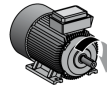


Non reversing control

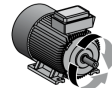


Reversing

High power motor up to 30 kW



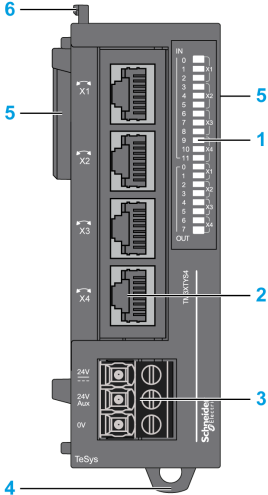
Non reversing control



Reversing

Description

The following figure shows the main elements of the TM3XTYS4 module:



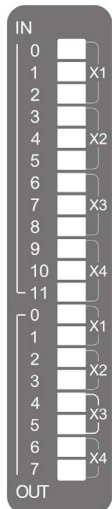
Label	Elements	Refer to
1	LEDs for displaying the state of the I/O channel.	–
2	TeSys RJ45 connectors.	–
3	Power supply screw terminal block.	Power Supply Wiring diagram <i>(see page 57)</i>
4	Clip-on lock for 35 mm (1.38 in.) top hat section rail (DIN-rail).	Top Hat Section Rail (DIN rail) <i>(see page 28)</i>
5	Expansion connector for TM3 I/O bus.	–
6	Locking device for attachment to the previous module.	–

Main Characteristics

Characteristics		Value
Input		Input 1: Ready Input 2: Run Input 3: Trip
Input type		24 Vdc Type 1 (IEC/EN 61131-2)
Logic type		Sink
Output		Output 1: Direction 1 control Output 2: Direction 2 control
Output type		24 Vdc / 0.3 A
Logic type		Source
Cable types and weight		
Cable type and length	Type	Ethernet CAT 5E
	Length	Max. 5 m (16.4 ft)
Weight		115 g (4 oz)

Status LEDs

The following figure shows the status LEDs:



The following table describes the status LEDs:

LED	Color	Status	Type	Description
X1 (0...2)	Green	On	Input	The input channel is activated
		Off		The input channel is deactivated
X2 (3...5)		On		The input channel is activated
		Off		The input channel is deactivated
X3 (6...8)		On		The input channel is activated
		Off		The input channel is deactivated
X4 (9...11)		On		The input channel is activated
		Off		The input channel is deactivated
X1 (0, 1)		On	Output	The output channel is activated
		Off		The output channel is deactivated
X2 (2, 3)		On		The output channel is activated
		Off		The output channel is deactivated
X3 (4, 5)	On	The output channel is activated		
	Off	The output channel is deactivated		
X4 (6, 7)	On	The output channel is activated		
	Off	The output channel is deactivated		

TM3XTYS4 Characteristics

Introduction

This section provides a description of the electrical of the TM3XTYS4 module.

See also Environmental Characteristics (*see page 19*).

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

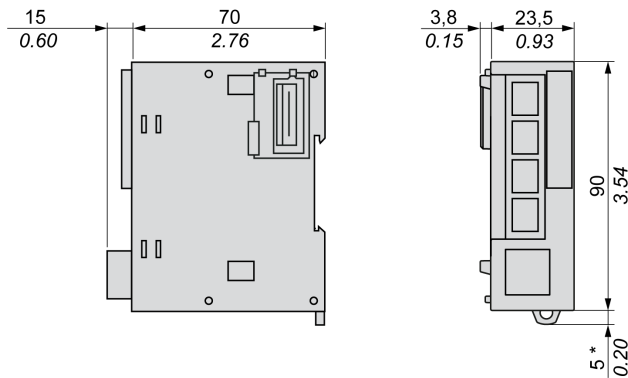
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

Dimensions

The following diagrams show the dimensions for the TM3XTYS4 module:

mm
in.



Input/Output Characteristics

The following table describes the characteristics of one channel RJ45 connector:

Characteristic		Value
Inputs		3 inputs <ul style="list-style-type: none"> ● Input 1: Ready ● Input 2: Run ● Input 3: Trip
Number of channels groups		1 common line for 3 inputs *
Input type		Type 1 (IEC/EN 61131-2)
Logic type		Sink
Rated input voltage		24 Vdc
Input voltage range		19.2...28.8 Vdc
Rated input current		5 mA
Turn on time		Typically 5 ms
Turn off time		Typically 5 ms
Outputs		2 outputs <ul style="list-style-type: none"> ● Output 1: Direction 1 control ● Output 2: Direction 2 control
Output type		Transistor
Logic type		Source
Rated input voltage		24 Vdc
Output voltage range		19.2...28.8 Vdc
Rated output current		0.3 A per channel
Voltage drop		Typically 0.15 Vdc (0.4 Vdc max.)
Leakage current when switched off		0.1 mA max.
Inductive load		L/R = 10 ms
Turn on time		Typically 400 μs (450 μs max.)
Turn off time		Typically 400 μs (450 μs max.)
Protection against short circuit		Yes
Clamping voltage		Typically 40 Vdc
Module		
Isolation	Between input and internal logic	500 Vac
	Between output and internal logic	500 Vac
Connection type		RJ45 connector
Connector insertion/removal durability		Over 100 times
* The common line (pins 3) of the 4 RJ45 connectors are internally connected together. The 12 inputs of the module share the same common.		

Characteristic	Value
Current draw on 5 Vdc internal bus	37 mA (all inputs and outputs on)
	17 mA (all inputs and outputs off)
Current draw on 24 Vdc internal bus	17 mA (all inputs and outputs on)
	0 mA (all inputs and outputs off)
* The common line (pins 3) of the 4 RJ45 connectors are internally connected together. The 12 inputs of the module share the same common.	

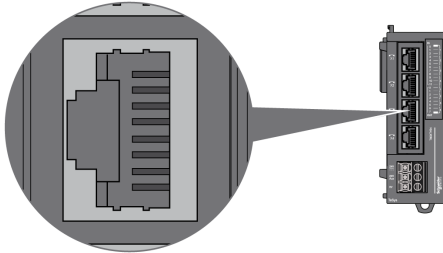
TM3XTYS4 Wiring Diagram

Wiring Rules

See Wiring Best Practices (*see page 35*).

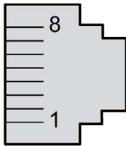
I/O Channel RJ45 Connector

The TM3XTYS4 module is equipped with 4 channels RJ45 connector:



Pin Assignment

The following graphic and table show the channel RJ45 connector pin assignment:



Pin N°	Designation	Signal	Description
1	Output 1	Direction 1 control	Drives the direct (forward) command of the motor.
2	Output 2	Direction 2 control	Drives the reverse (backward) command of the motor.
3	0 V	–	–
4	Input 1	Ready	Active if the selector of TeSys is in the ON position.
5	Input 2	Run	Input active if the power contacts of TeSys are closed.
6	N.C.	–	Reserved. Do not connect.
7	Input 3	Trip	Input active if the selector of TeSys is in the TRIP position (only for TeSys U).
8	24 Vdc input common	Common for sensors	Power supply for inputs 1, 2 and 3 (pins 4, 5 and 7).

 **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.

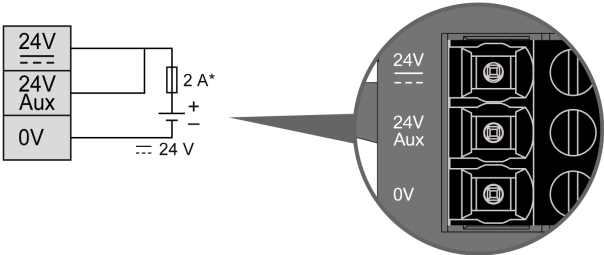
 **CAUTION**

INCOMPATIBLE EQUIPMENT

Use the RJ45 connector only for the link with devices which are compatible with the TeSys RJ45 connection system.

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

DC Power Supply Wiring Diagram



- * type T fuse
- 24 Vdc Aux is dedicated to inputs power supply.
- 24 Vdc is dedicated to outputs power supply.

⚠ WARNING

POTENTIAL OF OVERHEATING AND FIRE

- Do not connect the equipment directly to line voltage.
- Use only isolating PELV or SELV power supplies to supply power to the equipment¹.

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

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

For more details, refer to the Wiring Best Practices. *(see page 37)*

Glossary



A

application

A program including configuration data, symbols, and documentation.

C

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.

controller

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

E

EIA rack

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

EN

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

expansion bus

An electronic communication bus between expansion I/O modules and a controller.

expansion connector

A connector to attach expansion I/O modules.

H

HE10

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

I

I/O

(input/output)

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.

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.

N

NEMA

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

P

program

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

R

RJ45

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

T

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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