

# Modicon TM7

## CANopen Interface I/O Blocks

### Hardware Guide

04/2012



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

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

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

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

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

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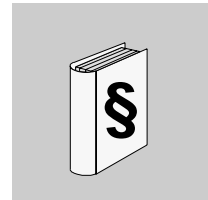


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## Safety Information



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### Important Information

#### NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, 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.

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 **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.

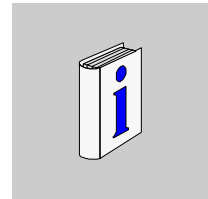
**PLEASE NOTE**

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.

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# About the Book



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## At a Glance

### Document Scope

This manual describes the hardware implementation of the Modicon TM7 field bus interface I/O blocks. It provides parts descriptions, specifications, wiring diagrams, installation and setup for Modicon TM7 field bus interface I/O blocks.

### Validity Note

This document has been updated with the release of the Performance Distributed I/O Configuration Software V1.0.

The technical characteristics of the device(s) described in this manual also appear online. To access this information online:

Step	Action
1	Go to the Schneider Electric home page <a href="http://www.schneider-electric.com">www.schneider-electric.com</a> .
2	In the <b>Search</b> box type the model number of a product or the name of a product range. <ul style="list-style-type: none"><li>● Do not include blank spaces in the model number/product range.</li><li>● To get information on a grouping similar modules, use asterisks (*).</li></ul>
3	If you entered a model number, go to the <b>Product datasheets</b> search results and click on the model number that interests you. If you entered the name of a product range, go to the <b>Product Ranges</b> search results and click on the product range that interests you.
4	If more than one model number appears in the <b>Products</b> search results, click on the model number 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 <b>Download XXX product datasheet</b> .

The characteristics presented in this manual should be the same as those that appear online. In line with our policy of constant improvement we may revise content over time to improve clarity and accuracy. In the event that 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 TM5 / TM7 CANopen Interface - Programming Guide	EIO0000000700 (Eng); EIO0000000701 (Fre); EIO0000000702 (Ger); EIO0000000703 (Spa); EIO0000000704 (Ita); EIO0000000705 (Chs)
Modicon TM7 Expansion Blocks DTM Configuration - Programming Guide	EIO0000000715 (Eng); EIO0000000716 (Fre); EIO0000000717 (Ger); EIO0000000718 (Spa); EIO0000000719 (Ita); EIO0000000720 (Chs)
Modicon TM5 / TM7 Flexible System - System Planning and Installation Guide	EIO0000000426 (Eng); EIO0000000427 (Fre); EIO0000000428 (Ger); EIO0000000429 (Spa); EIO0000000430 (Ita); EIO0000000431 (Chs)
Modicon TM7 - Digital I/O Blocks - Hardware Guide	EIO0000000703 (Eng); EIO0000000704 (Fre); EIO0000000705 (Ger); EIO0000000706 (Spa); EIO0000000707 (Ita); EIO0000000708 (Chs)
Modicon TM7 - Analog I/O Blocks - Hardware Guide	EIO0000000709 (Eng); EIO0000000710 (Fre); EIO0000000711 (Ger); EIO0000000712 (Spa); EIO0000000713 (Ita); EIO0000000714 (Chs)
TM7 CANopen Blocks Instruction Sheet	S1A3362000

You can download these technical publications and other technical information from our website at [www.schneider-electric.com](http://www.schneider-electric.com).



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## Product Related Information

### **DANGER**

#### **EXPLOSIVE POTENTIAL**

- Use devices with explosion protection as intended according to these operation instructions and corresponding documents.
- Only permit knowledgeable and qualified personnel to install, maintain and/or operate these devices.
- Conform to valid safety and accident prevention regulations and adhere to standards such as IEC/EN 60079-14.
- Be sure that all other associated equipment, such as cables and connectors, are also suitable for the operating location.
- Ground all devices, using a metal plate, terminal strip or mounting plate securely connected to the housing back plate, to an equalized potential.
- Remove all power from all equipment before installing or removing devices (including other connected devices), accessories, hardware, cables, or wires.
- Devices must remain voltage free until all installation or maintenance work is completed.
- Remove as necessary dust collecting on devices that can cause explosions.
- Be sure that all connectors and sealing plugs on the M8 and M12 connectors are in place and fastened with a torque between 0.2 and 0.4 N.m (1.8 and 3.5 lbf-in) before applying any power.
- Be sure that all connectors are firmly sealed with either properly wired connectors or sealing plugs before applying power during regular operation.

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

### **DANGER**

#### **EXPLOSIVE POTENTIAL**

- Only use this equipment in non-hazardous locations or in locations that comply either with the Class I, Division 2, Groups A, B, C and D, or with the ATEX Group II, Zone 2 specifications for hazardous locations, depending on your local and/or national regulations.
- Do not substitute components which would impair compliance to the hazardous location specifications of this equipment.
- Do not connect or disconnect equipment unless power has been removed or the area is known to be non-hazardous.

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

**NOTE:** Additional equipment used in conjunction with the equipment described herein must also be suitable for the operating location.

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## **WARNING**

### **LOSS OF CONTROL**

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

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

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

## **WARNING**

### **UNINTENDED EQUIPMENT OPERATION**

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

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

### **User Comments**

We welcome your comments about this document. You can reach us by e-mail at [techcomm@schneider-electric.com](mailto:techcomm@schneider-electric.com).

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# TM7 System General Rules for Implementing

# 1

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## What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Installation Requirements	12
Wiring Rules and Recommendations	15
Environmental Characteristics	17
Installation Guidelines	20
Dimensions	28

## Installation Requirements

### Before Starting

Read and understand this chapter before beginning the installation of your TM7 System.

### **DANGER**

#### **EXPLOSIVE POTENTIAL**

- Use devices with explosion protection as intended according to these operation instructions and corresponding documents.
- Only permit knowledgeable and qualified personnel to install, maintain and/or operate these devices.
- Conform to valid safety and accident prevention regulations and adhere to standards such as IEC/EN 60079-14.
- Be sure that all other associated equipment, such as cables and connectors, are also suitable for the operating location.
- Ground all devices, using a metal plate, terminal strip or mounting plate securely connected to the housing back plate, to an equalized potential.
- Remove all power from all equipment before installing or removing devices (including other connected devices), accessories, hardware, cables, or wires.
- Devices must remain voltage free until all installation or maintenance work is completed.
- Remove as necessary dust collecting on devices that can cause explosions.
- Be sure that all connectors and sealing plugs on the M8 and M12 connectors are in place and fastened with a torque between 0.2 and 0.4 N.m (1.8 and 3.5 lbf-in) before applying any power.
- Be sure that all connectors are firmly sealed with either properly wired connectors or sealing plugs before applying power during regular operation.

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

### **NOTICE**

#### **ELECTROSTATIC DISCHARGE**

- Never touch the pin connectors of the block.
- Always keep the cables or sealing plugs in place during normal operation.

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

## 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

### **DANGER**

#### **EXPLOSIVE POTENTIAL**

- Only use this equipment in non-hazardous locations or in locations that comply either with the Class I, Division 2, Groups A, B, C and D, or with the ATEX Group II, Zone 2 specifications for hazardous locations, depending on your local and/or national regulations.
- Do not substitute components which would impair compliance to the hazardous location specifications of this equipment.
- Do not connect or disconnect equipment unless power has been removed or the area is known to be non-hazardous.

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

**NOTE:** Additional equipment used in conjunction with the equipment described herein must also be suitable for the operating location.

Requirements for use in ATEX Group II, Zone 2:

- Install and use the equipment strictly in accordance to the installation and operating instructions found here and in other related documentation.
- Respect and follow all valid safety and accident prevention regulations, as well as adhering to standards such as IEC/EN 60079-14 or those that govern the eventual locality of your application.
- All equipment must be grounded to an equipotential ground plane dimensioned to the power system of your application.
- Equipment must remain unpowered until installation work is completed, including all cable connections with the proper torque having been applied to all connector unions.
- Before applying power, be sure that all connectors that are not being used (open connectors with no cable attached) are capped with suitable sealing plugs.

- During service or maintenance, the equipment must be shut down and protected from being accidentally restarted.
- Do not connect or disconnect cables or sealing plugs under power unless the equipment is in a known non-hazardous location.

** WARNING**

**UNINTENDED EQUIPMENT OPERATION**

Install and operate this equipment according to the environmental conditions described in the operating limits.

**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.
- 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 Not Connected (N.C.).

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

**NOTE:** Schneider Electric recommends the use of UL-recognized and CSA approved JDYX2 or JDYX8 fuse types.

## Wiring Rules and Recommendations

### Introduction

There are several rules that must be followed when wiring a TM7 System. Refer to TM7 Cables (*see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*) for additional details.

### Wiring Rules

#### **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.**

The following rules must be applied when wiring the TM7 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 only.
- Use only the TM7 expansion bus cables (*see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*).

## TM7 Blocks Grounding

The TM7 System blocks, when using Schneider Electric IP67 pre-fabricated cables, incorporate a grounding system intrinsic to the mounting and connecting hardware. The TM7 System blocks must always be mounted on a conductive backplane. The backplane or object used for mounting the blocks (metal machine frame, mounting rail or mounting plate) must be grounded (PE) according to your local, regional and national requirements and regulations. Refer to grounding of your system blocks (see *Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*), for more important information.

**NOTE:** If you do not use Schneider Electric IP67 pre-fabricated cables, you must use shielded cables and conductive connectors (metal threads on the connector), and be sure to connect the cable shield to the metal sleeve of the connector.

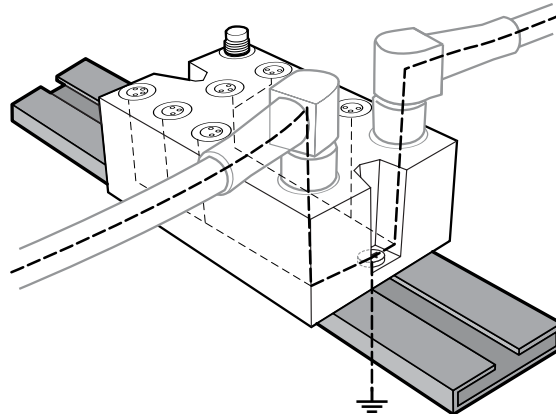
### **⚠ WARNING**

#### **IMPROPER GROUNDING CONTINUITY**

- Use only cables with insulated, shielded jackets.
- Use only IP67 connectors with metal threads.
- Connect the cable shield to the metal threads of the connectors.
- Always comply with local, regional and/or national wiring requirements.

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

The following figure shows the grounding of the TM7 System:





## Environmental Characteristics

### Introduction



The following information describes the system-wide environmental requirements and characteristics for the TM7 System.

The general environmental characteristics are common to all components of the TM7 System.

### Environmental Characteristics

This equipment meets cURus, GOST-R and c-Tick certifications and CE requirements as indicated in the table below. This equipment is intended for use in a Pollution Degree 2 industrial environment.

The table below provides the general environmental characteristics:

Characteristic	Specification	
This product is compliant with Europe RoHS recommendations and China RoHS regulations.		
		
	II 3G	Device group II, Category 3, Zone 2 suitable for explosive gas
	Ex	Protection according to European standards
	nA	Ignition protection "n"
	T5	Temperature class
	T84 °C	Maximum surface temperature
	IP67	Protection index according to EN/IEC 60529
	Ta = 0...60 °C (32...140 °F) <sup>1</sup>	Ambient temperature range
	TÜV 05 ATEX 7201	Certificate number
Standard	IEC61131-2 ed. 3 2007	
Agencies	UL 508 CSA 22.2 No. 142-M1987 CSA 22.2 No. 213-M1987	

Characteristic	Specification	
Ambient operating temperature	-10...60 °C (14...140 °F) <sup>1</sup>	
Storage temperature	-25...85 °C (-13...185 °F)	
Relative humidity	5...95% (non-condensing)	
Pollution degree	IEC60664	2 (non-conductive material)
Protection degree	EN/IEC60529	IP67
Operating altitude	0...2000 m (0...6560 ft.)	
	2000...3000 m (6560...9842 ft.) <sup>2</sup>	
Vibration resistance	IEC60721-3-5 Class 5M3	7.5 mm (0.295 in.) fixed amplitude from 2...8 Hz 20 m/s <sup>2</sup> (2 g <sub>n</sub> ) fixed acceleration from 8...200 Hz 40 m/s <sup>2</sup> (4 g <sub>n</sub> ) fixed acceleration from 200...500 Hz
Mechanical shock resistance	IEC60721-3-5 Class 5M3	300 m/s <sup>2</sup> (30 g <sub>n</sub> ) for a duration of 11 ms, half sine wave, shock type 1
Connection type	M8 or M12 depending on the I/O block	
<p><sup>1</sup> For compliance to ATEX and Class I, Div 2 environment ratings, do not operate this device in locations with ambient temperatures less than 0 °C (32 °F).</p> <p><sup>2</sup> Reduction of ambient temperature by 0.5 °C (32.5 °F) for every additional 100 m (328 ft.) of altitude beyond 2000 m (6560 ft.).</p>		

### Electromagnetic Susceptibility

The table below provides the TM7 System electromagnetic susceptibility specifications:

Characteristic	Specification	Range
Electrostatic discharge	EN/IEC 61000-4-2	± 8 kV, criteria B (air discharge) ± 6 kV, criteria B (contact discharge)
Electromagnetic fields	EN/IEC 61000-4-3	10 V/m, 80% amplitude modulation at 1 kHz (80 MHz...2 GHz) 1 V/m (2...2.7 GHz)
Fast transients burst	EN/IEC 61000-4-4	Power lines: 2 kV, criteria B I/O: 1 kV, criteria B Shielded cable: 1 kV, criteria B Repetition rate: 5 and 100 kHz

Characteristic	Specification	Range
Surge immunity 24 Vdc circuit	EN/IEC 61000-4-5	Power lines: 1 kV (12 Ω), criteria B in common mode 0.5 kV (2 Ω), criteria B in differential mode
		Unshielded lines: 0.5 kV (42 Ω), criteria B in common mode 1 kV (42 Ω), criteria B in differential mode
		Shielded lines: 1 kV (12 Ω), criteria B in common mode 0.5 kV (2 Ω), criteria B in differential mode
Induced electromagnetic field	EN/IEC 61000-4-6	Network, I/O signal connections > 10 m (32.8 ft.), functional ground connection: 10 V <sub>eff</sub> , criteria A, 80% amplitude modulation at 1 kHz (150...80 MHz)
Conducted emission	EN 55011 (IEC/CISPR11)	150...500 kHz quasi peak 79 dB μV
		500 kHz...30 MHz quasi peak 73 dB μV
Radiated emission	EN 55011 (IEC/CISPR11)	30...230 MHz, 10 m (32.8 ft)@40 dB (μV/m)
		230 MHz...1 GHz, 10 m (32.8 ft)@47 dB (μV/m)

### Conformity and Test Certification

These devices were developed and tested according to valid European guidelines and standards. Modules labelled ATEX meet the following EU guidelines including all changes:

Characteristic	Specification
Electromagnetic compatibility (EMC)	2004/108/EC
Low voltage (LV)	2006/95/EC
Equipment explosive atmospheres (ATEX)	94/9/EC
Standards met	EN 61131-2, EN 61000-6-2, EN 61000-6-4, EN 60204-1, EN 50178, EN 60079-15

## Installation Guidelines

### Introduction

The TM7 System can be mounted using:

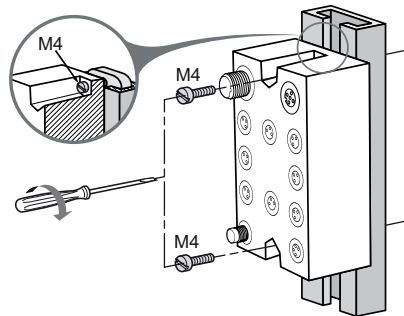
- An aluminium frame with two wedge nuts and M4 screws
- A DIN rail with TM7ACMP mounting plate
- Directly on the machine.

**NOTE:** Mounting on a DIN rail using the TM7ACMP mounting plate is only possible with the size 1 (smallest) block dimension (see *Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*).

**NOTE:** The TM7 System components must always be mounted to a conductive backplane.

### TM7 Block on an Aluminium Frame

Blocks can be mounted on an aluminium frame with two wedge nuts and M4 screws:



**NOTE:** Maximum torque to fasten the M4 screws is 0.6 N.m (5.3 lbf-in).

#### **INOPERABLE EQUIPMENT**

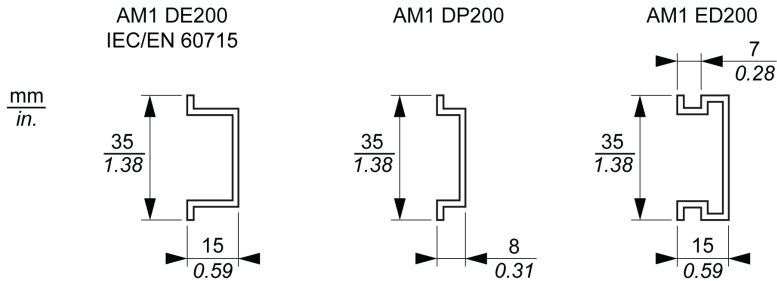
- Ensure that the block is securely affixed to its mounting surface.
- Do not tighten screws beyond the specified maximum torque.

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

**TM7 Block on a DIN Rail**

You can mount the size 1 blocks on a DIN rail with the TM7ACMP (see *Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*) mounting plate. For EMC (Electromagnetic Compatibility) compliance, a metal DIN rail must be attached to a flat metal mounting surface or mounted on an EIA (Electronic Industries Alliance) rack or in a NEMA (National Electrical Manufacturers Association) enclosure. In all cases, the mounting surface must be properly grounded (see *Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*).

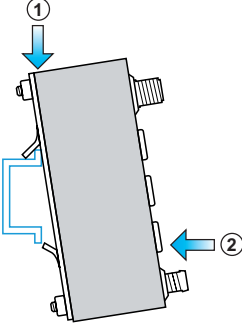
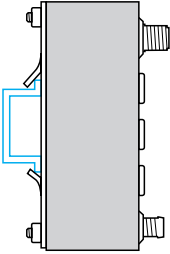
You can order a suitable DIN rail from Schneider Electric:



**NOTE:** Only size 1 (smallest) blocks can be installed on DIN rail with the mounting plate.

The following procedure gives step by step instructions to assemble and install a block on a DIN rail:

Step	Action	
1	Screw the block to the mounting plate. The required screws are supplied with the mounting plate. <b>NOTE:</b> Maximum torque to fasten the required screws is 0.6 N.m (5.3 lbf-in).	

Step	Action	
2	Place the upper protruding catches of the mounting plate on the top edge of the DIN rail (1). Rotate the block to the DIN rail until it clicks (2).	
3	The block is correctly installed to the DIN rail	

**INOPERABLE EQUIPMENT**

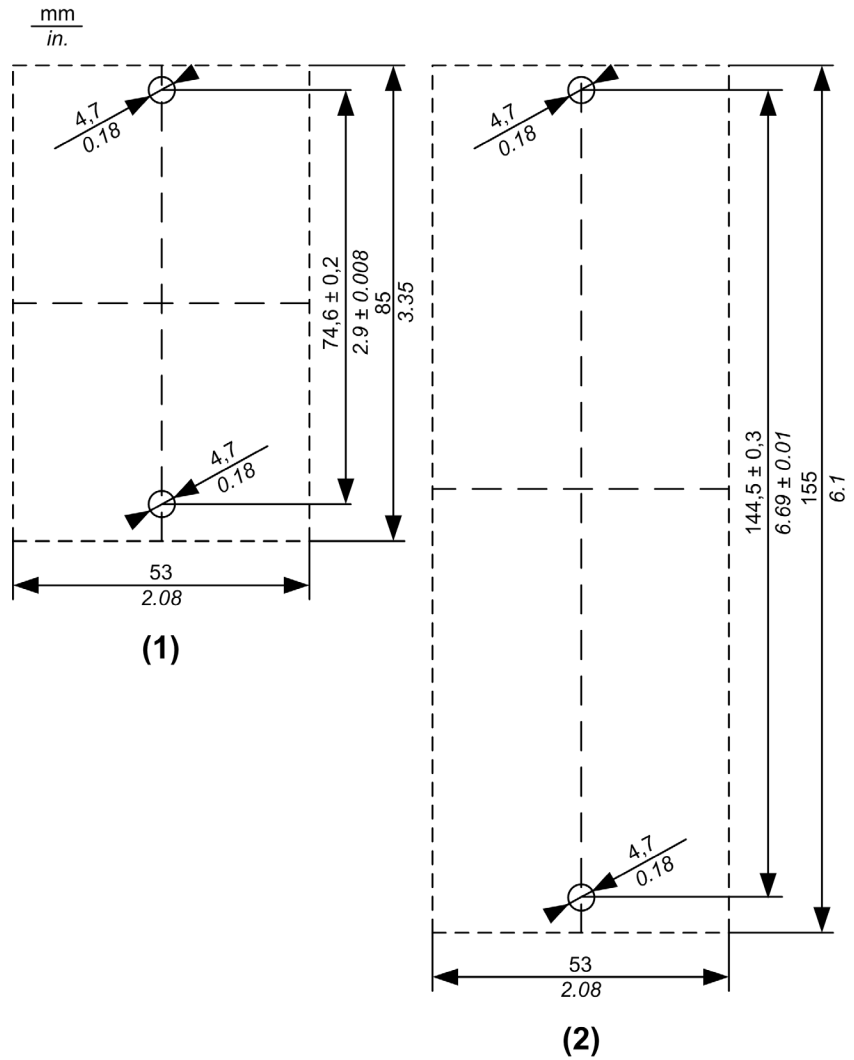
- Ensure that the block is securely affixed to its mounting surface.
- Do not tighten screws beyond the specified maximum torque.

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

For more information on mounting the DIN rail refer to the TM5 section DIN Rail Installation (see *Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*).

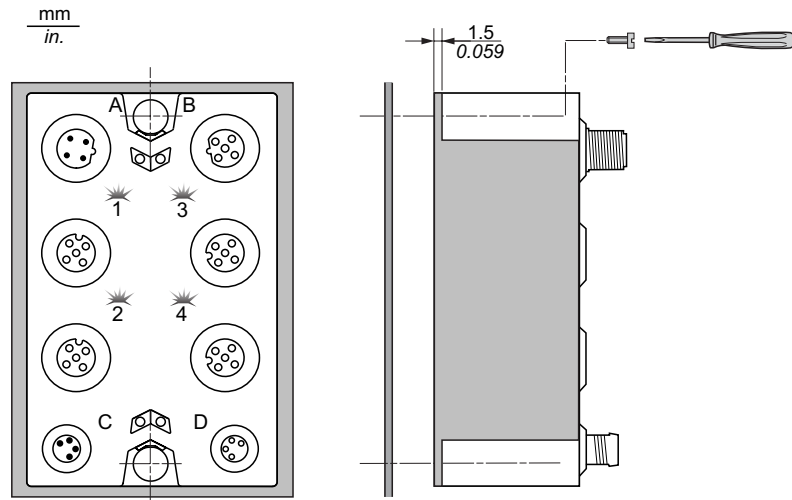
**TM7 Block Directly on the Machine**

The TM7 block can be mounted to any bare-metal surface of the machine, provided that the surface is properly grounded (see *Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*). To mount the block directly on the machine, the following figure gives the drilling template of the blocks:



- (1)** Size 1
- (2)** Size 2

The thickness of the base plate should be taken into consideration when defining the screw length.



**NOTE:** Maximum torque to fasten the required M4 screws is 0.6 N.m (5.3 lbf-in).

#### **INOPERABLE EQUIPMENT**

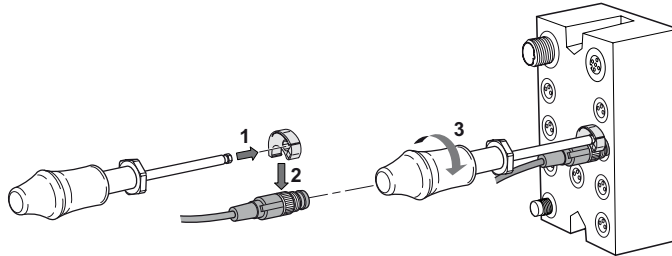
- Ensure that the block is securely affixed to its mounting surface.
- Do not tighten screws beyond the specified maximum torque.

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



## TM7 Cable Installation

The plug connector of the TM7 cables (see *Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*) is mounted by hand and then tightened to a defined force with the aid of the torque wrench (see *Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*):



Connector Size	Preset Torque
M8	0.2 N.m (1.8 lbf-in)
M12	0.4 N.m (3.5 lbf-in)

## **⚠ WARNING**

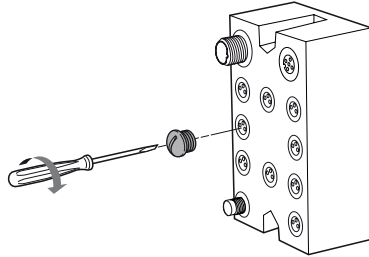
### **IP67 NON-CONFORMANCE**

- Properly fit all connectors with cables or sealing plugs and tighten for IP67 conformance according to the torque values as specified in this document.
- Do not connect or disconnect cables or sealing plugs in the presence of water or moisture.

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

### Sealing Plug Installation

Open connectors with no cable attached are capped with suitable sealing plugs (see *Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*):



Connector Size	Preset Torque
M8	0.2 N.m (1.8 lbf-in)
M12	0.4 N.m (3.5 lbf-in)

## ⚠ WARNING

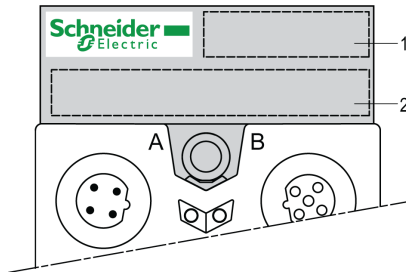
### IP67 NON-CONFORMANCE

- Properly fit all connectors with cables or sealing plugs and tighten for IP67 conformance according to the torque values as specified in this document.
- Do not connect or disconnect cables or sealing plugs in the presence of water or moisture.

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

## TM7 Block Labeling

The support for block label and its label are inserted in the appropriate opening in the top (the figure below) or in the bottom of the block:

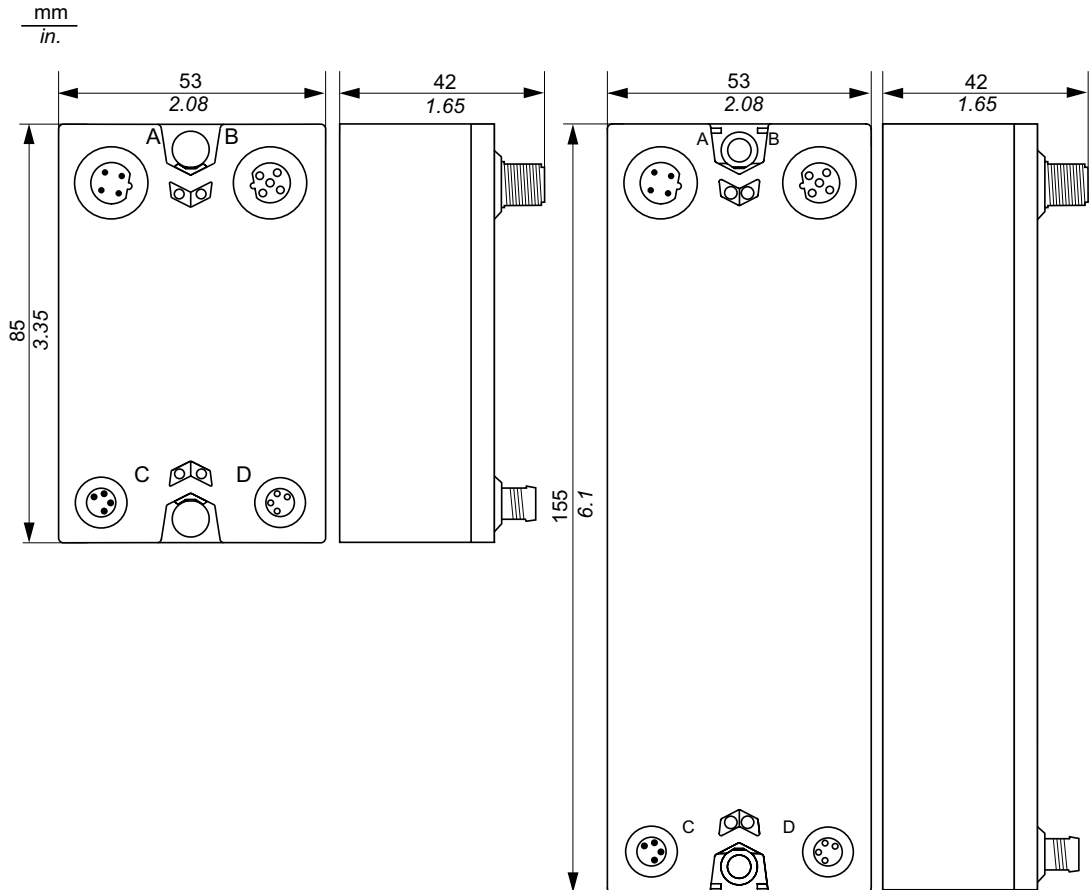


- 1 Reference of the block
- 2 Area for customer

## Dimensions

### Dimensions

The following figures show the dimensions of the TM7 blocks:



---

# TM7 Field Bus Interface General Overview

# 2

---

## What's in this Chapter?

This chapter contains the following topics:

Topic	Page
General Description	30
Physical Description	32

## General Description

### Introduction

The range of TM7 I/O blocks is composed of three blocks in any configuration of eight or sixteen inputs or outputs.

### Field Bus I/O Blocks Features

The table below provides the digital channels features of the field bus I/O blocks.

Reference	Field Bus Type	Number of Channels	Voltage/Current	Wiring	Signal Type
TM7NCOM08B <i>(see page 47)</i>	CANopen	8 inputs	24 Vdc/4 mA	M8 connector 2 or 3 wires	Sink
		8 outputs	24 Vdc/0.5 A max.	M8 connector 2 or 3 wires	Transistor source
TM7NCOM16B <i>(see page 59)</i>	CANopen	16 inputs	24 Vdc/4 mA	M8 connector 2 or 3 wires	Sink
		16 outputs	24 Vdc/0.5 A max.	M8 connector 2 or 3 wires	Transistor source
TM7NCOM16A <i>(see page 73)</i>	CANopen	16 inputs	24 Vdc/4 mA	M12 connector 2 or 3 wires	Sink
		16 outputs	24 Vdc/0.5 A max.	M12 connector 2 or 3 wires	Transistor source

**Field Bus I/O Blocks Features**

The table below provides the field bus connection of the CANopen interface I/O blocks.

Reference	Field Bus Connection		
	Type	In	Out
TM7NCOM08B (see page 47)	CANopen	Yes	No <sup>1</sup>
TM7NCOM16B (see page 59)		Yes	Yes
TM7NCOM16A (see page 73)		Yes	Yes
<sup>1</sup> To connect a TM7NCOM08B CANopen interface I/O block in a CANopen network use one of the following accessories: <ul style="list-style-type: none"> <li>● TM7ACYC</li> <li>● TM7ACYCJ</li> </ul>			

If the CANopen interface I/O block is at the end of the line, connect a TM7ACTLA M12 CAN bus terminating resistor (see *Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*):

- to the accessory TM7ACYC• for a TM7NCOM08B.
- to the field bus OUT connector for a TM7NCOM16A or TM7NCOM16B.

## Physical Description

### Introduction

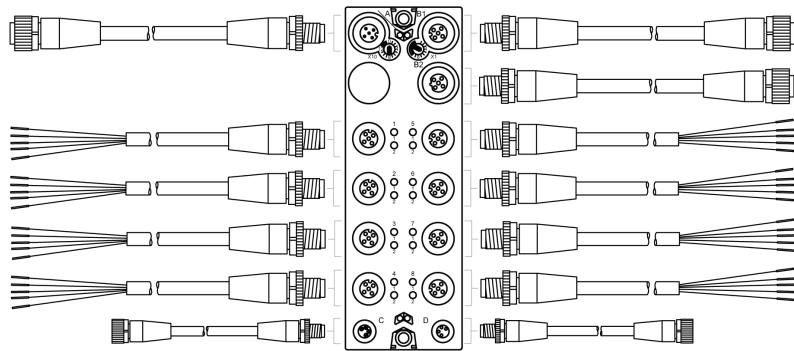
The TM7 System consists of IP67 I/O blocks along with field bus, expansion, sensor/actuator and power cables.

A TM7 I/O block can be a:

- analog I/O block, for details, refer to the *Modicon TM7 Analog I/O Blocks Hardware Guide*
- digital I/O block, for details, refer to the *Modicon TM7 Digital I/O Blocks Hardware Guide*
- field bus interface I/O block
- Power Distribution Block (PDB), for details, refer to the chapter *TM7SPS1A Power Distribution Block (PDB)* in the *Modicon TM5 / TM7 Flexible System - System Planning and Installation Guide*

### General View of a TM7 Field Bus Interface I/O Blocks and Cables

The following figure shows a TM7 field bus interface I/O block and associated cables:



Item	TM7 Cable Type	TM7 Block Connector
A	Expansion bus drop cable	Field bus IN
B1	Expansion bus drop cable	Field bus OUT
B2	Expansion bus drop cable	TM7 bus OUT
1...8	Sensor cable	I/O connectors
C	Power drop cable	24 Vdc power IN connector
D	Power drop cable	24 Vdc power OUT connector



**⚠ WARNING****IP67 NON-CONFORMANCE**

- Properly fit all connectors with cables or sealing plugs and tighten for IP67 conformance according to the torque values as specified in this document.
- Do not connect or disconnect cables or sealing plugs in the presence of water or moisture.

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

**ELECTROSTATIC DISCHARGE**

- Never touch the pin connectors of the block.
- Always keep the cables or sealing plugs in place during normal operation.

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

**TM7 Cables References**

Refer to TM7 Cables (*see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide*), for more information on the type and length of cables, along with their references.



---

# TM7 Field Bus Interface Installation

# 3

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## First Startup

### Overview

This procedure helps you through the installation and startup of your TM7 field bus interface.

### Startup Procedure

Step	Action	Comment
1	Unpack your field bus interface module and check the contents of the package.	Package content: <ul style="list-style-type: none"><li>● Instruction Sheet</li><li>● Field bus interface module</li></ul>
2	Choose the appropriate supports for your blocks	Refer to the Mechanical Requirements ( <i>see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide</i> ).
3	Fix the blocks on their supports.	Refer to the Installation Guidelines ( <i>see page 28</i> ).
4	Connect the external 24 Vdc power source.	Refer to the Wiring the Power Supply ( <i>see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide</i> ).
5	Connect the communication field bus.	Refer to the CANopen Interface I/O Blocks Features ( <i>see page 30</i> ).
6	Connect your blocks to the inputs and outputs.	Refer to the wiring diagram of your block TM7NCOM08B Block ( <i>see page 46</i> ), TM7NCOM16B Block ( <i>see page 58</i> ) or TM7NCOM16A Block ( <i>see page 72</i> ).
7	Verify all connections.	Be sure all connections are secured to their respective torque values, and that all connectors are in place, or have sealing plugs properly installed to maintain the IP67 rating.

<b>Step</b>	<b>Action</b>	<b>Comment</b>
8	Optional: Set the CANopen bit-rate	Refer to CANopen Bit-rate Setting Rotary Switches ( <i>see page 41</i> ).
9	Set the CANopen address	Refer to CANopen Address Settings Rotary Switches ( <i>see page 44</i> ).

---

# TM7 CANopen Interface I/O Blocks

# 4

---

## What's in this Chapter?

This chapter contains the following sections:

Section	Topic	Page
4.1	TM7 CANopen Interface Common Features	38
4.2	TM7NCOM08B Block	46
4.3	TM7NCOM16B Block	58
4.4	TM7NCOM16A Block	72

## 4.1 TM7 CANopen Interface Common Features

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### What's in this Section?

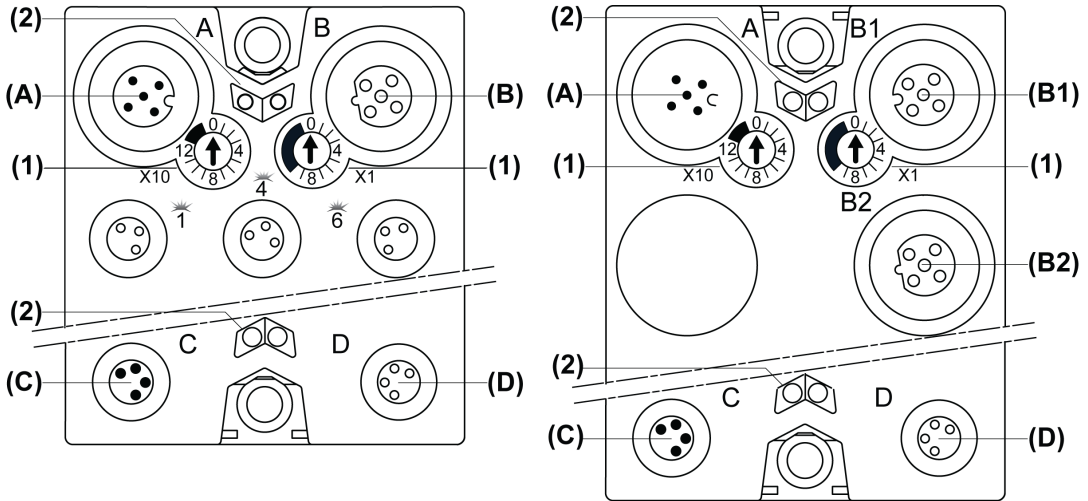
This section contains the following topics:

Topic	Page
CANopen Pins and Connectors	39
Setting the CANopen Bit-rate	41
Setting the CANopen Address	44

## CANopen Pins and Connectors

### Pin and Connector Assignments

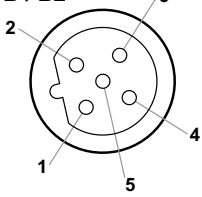
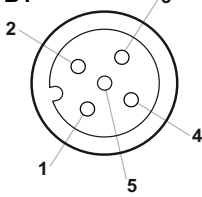
The following figure shows the connector assignments and LEDs of a TM7 CANopen I/O block:



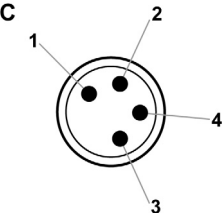
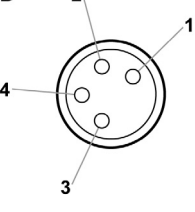
- (A) Field bus IN connector
- (B) and (B2) TM7 bus OUT connector M12
- (B1) CANopen bus OUT connector M12
- (C) 24 Vdc power IN connector
- (D) 24 Vdc power OUT connector
- (1) Address settings rotary switches
- (2) Status LEDs

The following figure shows the pin assignments of the field bus IN (A) and TM7 bus OUT (B or B1 and B2) connectors:

Connectors	Pin	Designation
	1	CAN_SHLD
	2	(CAN_V+)
	3	CAN_GND
	4	CAN_H
	5	CAN_L

Connectors	Pin	Designation
<b>B / B2</b> 	1	TM7 V+
	2	TM7 Bus Data
	3	TM7 0V
	4	TM7 Bus $\overline{\text{Data}}$
	5	N.C.
<b>B1</b> 	1	CAN_SHLD
	2	(CAN_V+)
	3	CAN_GND
	4	CAN_H
	5	CAN_L

The following figure shows the pin assignments of the 24 Vdc power IN (C) and OUT (D) connectors:

Connectors	Pin	Designation
<b>C</b> 	1	24 Vdc main power
	2	24 Vdc I/O power segment
	3	0 Vdc
	4	0 Vdc
<b>D</b> 	1	24 Vdc I/O power segment
	2	24 Vdc I/O power segment
	3	0 Vdc
	4	0 Vdc

**NOTE:** The pin assignments of the I/O connectors are provided in the *Wiring Diagram* section of each field bus I/O block.

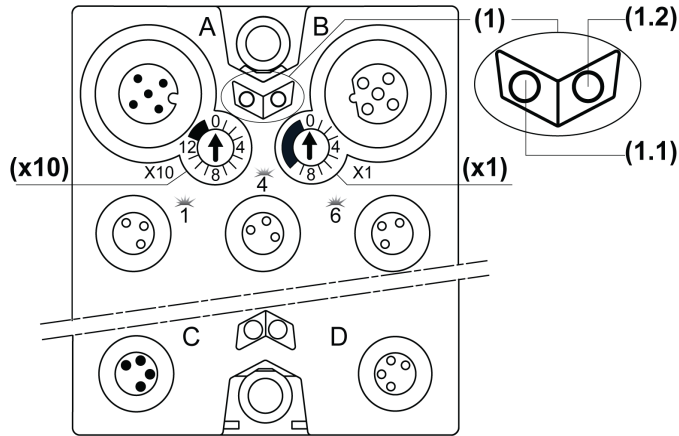


## Setting the CANopen Bit-rate

### Presentation

By default, the bit-rate is automatically detected by the CANopen Interface Block. However, you can force a bit-rate to be configured using the two rotary switches.

The following figure shows the CANopen rotary switches:



**(1)** CANopen status LEDs, set of two LEDs: 1.1 and 1.2 (mixed colors: green/red)

**(1.1)** CANopen bus status LED

**(1.2)** CANopen block status LED

**(x1)** Authorize to set the CANopen bit-rate

**(x10)** CANopen bit-rate setting

### The Bit-rate

The CANopen interface block detects a new bit-rate selection by the rotary switches only during power up. The bit-rate is written to non-volatile.

Set x1 rotary switch to any of the six unnumbered positions to set a particular bit-rate with the x10 rotary switch.

## Setting the Bit-rate

Instructions for setting the bit-rate are in the table.

Step	Action	Comment
1	Remove power to the CANopen interface block.	The CANopen interface block detects the changes you are about to make only at the next power up cycle.
2	With a small screwdriver, set the x1 rotary switch to any position after 9.	Setting the rotary switch to any of these unnumbered positions prepares the CANopen interface block to accept a new bit-rate.
3	With a small screwdriver, set the x10 rotary switch to the position that corresponds to your selected bit-rate.	Use the rotary switch position you selected in the last step. Use the bit-rate selection table below to determine the position of the rotary switch.
4	Reapply power your CANopen interface block.	The CANopen interface block reads the rotary switch settings only during power up.
5	Wait until the CANopen Block Status LED (1.2) ( <i>see page 41</i> ) flashes red 3 times (ON: 200 ms / OFF: 1 s).	The CANopen interface block has written the new bit-rate setting to memory.
6	Again, remove power to the CANopen interface block and proceed to the CANopen Address Settings Rotary Switches procedure ( <i>see page 44</i> ).	The bit-rate has been established for the CANopen Interface Block.

### Bit-rate Selection Table

The following table shows the rotary switch positions and the bit-rate:

Position x10 rotary switch	Bit-rate
0	10 kbits/s
1	20 kbits/s
2	50 kbits/s
3	125 kbits/s
4	250 kbits/s
5	500 kbits/s
6	800 kbits/s
7	1 Mbits/s
8	Automatic bit-rate detection
9	Automatic bit-rate detection (default value)
10...12	Not used

**NOTE:** Setting the x10 rotary switch between 10 and 12 and unnumbered part will generate an error detected at the next power on.

### CANopen Bit-rate Setting Example

The following figure shows an example when the CANopen bit-rate is configured to 500 kbits/s:



**x10** rotary switch: set the CANopen bit-rates

**x1** rotary switch: authorize to set the CANopen bit-rate

## Setting the CANopen Address

### Presentation

The CANopen interface block address (from 1 to 126, decimal) is configured using the two CANopen address settings rotary switches. The factory setting of the rotary switches is 0.

**⚠ CAUTION**

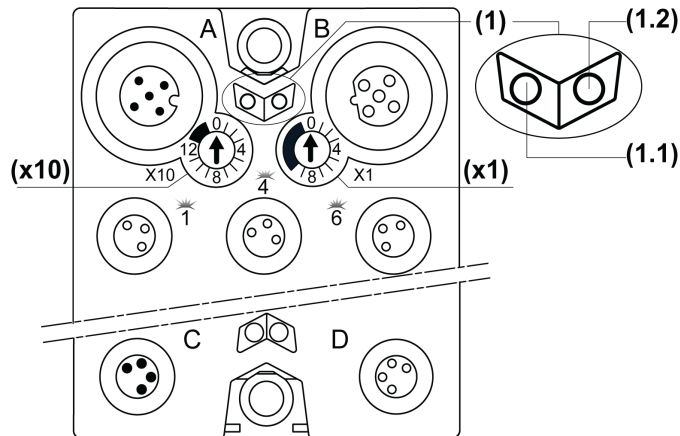
**UNINTENDED EQUIPMENT OPERATION**

Do not use an address outside of the specified range (from 1 to 126).

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

To reset the CANopen interface block, remove power and provide a correct address before reapplying power to the block.

The following figure shows the CANopen rotary switches:



(1) CANopen status LEDs, set of two LEDs: 1.1 and 1.2 (mixed colors: green/red)

(1.1) CANopen bus status LED

(1.2) CANopen block status LED

(x10) High order rotary switch: represents the 'tens' of the CANopen address

(x1) Low order rotary switch: represents the 'ones' of the CANopen address

### CANopen Address Setting Example

The following figure shows an example when the CANopen address is configured to 115 (decimal):



**(x10)** High order rotary switch: represents the 'tens' of the CANopen address

**(x1)** Low order rotary switch: represents the 'ones' of the CANopen address

## 4.2 TM7NCOM08B Block

---

### What's in this Section?

This section contains the following topics:

Topic	Page
TM7NCOM08B Presentation	47
TM7NCOM08B Characteristics	51
TM7NCOM08B Wiring Diagram	56

## TM7NCOM08B Presentation

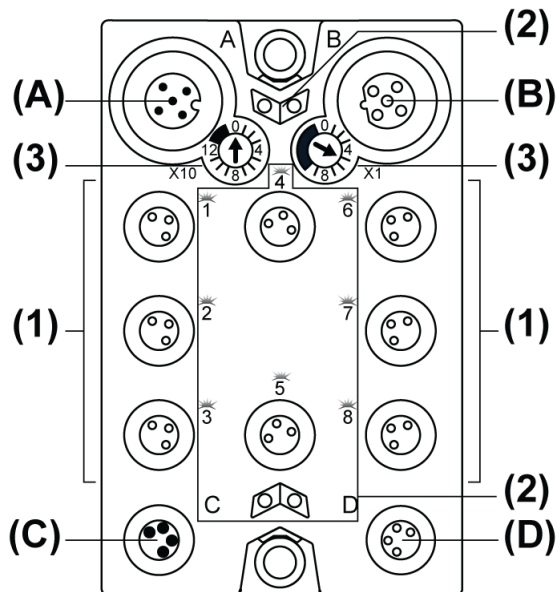
### Main Characteristics

The table below provides the main characteristics of the TM7NCOM08B block:

Main characteristics	
Number of input/output channels	8
Input type	Type 1
Input signal type	Sink
Output type	Transistor, 0.5 A max.
Output signal type	Source
Sensor and actuator connection type	M8, female connector type (see page 56)

### Description

The following figure shows the TM7NCOM08B block:



- (A) CANopen bus IN connector
- (B) TM7 bus OUT connector
- (C) 24 Vdc power IN connector
- (D) 24 Vdc power OUT connector
- (1) Input / Output connectors
- (2) Status and channel LEDs
- (3) CANopen address settings rotary switches

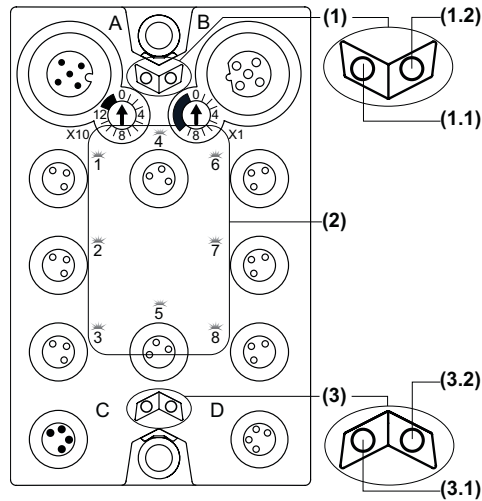
### Connector and Channel Assignments

The table below provides the connector and channel assignments of the TM7NCOM08B block:

I/O connectors	I/O status LEDs	Channel types	Channels
1	1	Input/Output	I0/Q0
2	2	Input/Output	I1/Q1
3	3	Input/Output	I2/Q2
4	4	Input/Output	I3/Q3
5	5	Input/Output	I4/Q4
6	6	Input/Output	I5/Q5
7	7	Input/Output	I6/Q6
8	8	Input/Output	I7/Q7

### Status LEDs

The following figure shows the LEDs of the TM7NCOM08B block:



- 1** CANopen status LEDs, set of two LEDs: 1.1 and 1.2 (mixed colors: green/red)
- (1.1)** CANopen bus status LED
- (1.2)** CANopen block status LED
- 2** Channel LEDs, composed of eight LEDs: 1 to 8 (orange)
- 3** TM7 block status LEDs, set of two LEDs: 3.1 (green) to 3.2 (red)
- (3.1)** TM7 block power supply status LED
- (3.2)** TM7 I/O block status LED



The table below provides the TM7 bus status LEDs of the TM7NCOM08B block:

CANopen Bus LEDs	Color LED	Status		Description
1.1 CANopen Bus Status	Green (CAN_RUN)	Flashing	On: 200 ms Off: 200 ms	Preoperational state
		1 x Flashing	On: 200 ms Off: 1 s	Stop state
		3 x Flashing	On: 200 ms Off: 1 s	Firmware update
		On		Operational state
	Red (CAN_ERR)	Off		No detected error or operational state
		Flashing	On: 200 ms Off: 200 ms	Invalid Configuration
		1 x Flashing	On: 200 ms Off: 1 s	At least one of the error counters of the CANopen interface block has reached the threshold "CANopen in Error Passive Mode".
		2 x Flashing	On: 200 ms Off: 1 s	Guard or heartbeat event occurred.
		3 x Flashing	On: 200 ms Off: 1 s	The synchronization message was not received in the configured time.
		4 x Flashing	On: 200 ms Off: 1 s	An expected PDO (Process Data Object) was not received before the event timer has expired.
		On		The CANopen interface block is in bus off state (no communication).
1.2 CANopen Block Status	Green	Off		No power supply
		Flashing for 5 s	On: 100 ms Off: 400 ms	Ready to erase all configuration settings
		On		Node started properly (boot successfully)
	Green/Red	Flashing	On: 200 ms Off: 200 ms	Bit-rate detection in progress
	Red	2 x Flashing	On: 200 ms Off: 1 s	Confirmation for deleting all configuration settings
		3 x Flashing	On: 200 ms Off: 1 s	Confirmation for configuration of a fixed transmission bit-rate
		Flashing	On: 400 ms Off: 800 ms	Invalid bit-rate or address rotary switch selection
		On		Detected error I/O block

The table below provides the I/O status LEDs of the TM7NCOM08B block:

Channel LEDs	State	Description
1 to 8	OFF	Corresponding input/output deactivated
1 to 8	ON	Corresponding input/output activated

The table below provides the I/O block status LEDs of the TM7NCOM08B block:

Block status LEDs	State	Description
3.1 (green)	OFF	No power supply
	Single flash	TM7 bus reset state
	Flashing	TM7 bus preoperational state
	ON	TM7 bus operational state
3.2 (red)	OFF	No power supply
	Single flash	Detected error for an output channel (short-circuit or over-current).
	Double flash	Power supply not in the valid range
	ON	Detected error or reset state

## TM7NCOM08B Characteristics

### General Characteristics

#### **DANGER**

##### **EXPLOSIVE POTENTIAL**

- Only use this equipment in non-hazardous locations or in locations that comply either with the Class I, Division 2, Groups A, B, C and D, or with the ATEX Group II, Zone 2 specifications for hazardous locations, depending on your local and/or national regulations.
- Do not substitute components which would impair compliance to the hazardous location specifications of this equipment.
- Do not connect or disconnect equipment unless power has been removed or the area is known to be non-hazardous.

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

**NOTE:** Additional equipment used in conjunction with the equipment described herein must also be suitable for the operating location.

#### **DANGER**

##### **FIRE HAZARD**

Use cable sizes that meet the I/O channel and power supply voltage and current ratings.

**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 following tables.

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

The table below provides the general characteristics of the TM7NCOM08B block:

<b>General characteristics</b>	
Rated power supply voltage	24 Vdc
Power supply range	18...30 Vdc
24 Vdc I/O power segment consumption	84 mA
Protection	Against reverse polarity
Power dissipation	5.7 W max.
Weight	195 g (6.9 oz.)
CANopen ID code	B12B hex

See also Environmental Characteristics (*see page 17*).

### TM7 Bus Power Output Characteristics

The table below provides the TM7 bus power output characteristics of the TM7NCOM08B block:

<b>Input characteristics</b>	
Rated output voltage	20 Vdc
Internal consumption on the TM7 power bus	135 mA
Rated output current for expansion modules	150 mA max.
Number of TM7 I/O expansion blocks	4 max. <sup>1</sup>
<sup>1</sup> To use more expansion blocks, add the <i>TM7SPS1A power distribution block</i> ( <i>see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide</i> ) to the TM7 Power bus.	

### Input Characteristics

The table below provides the input characteristics of the TM7NCOM08B block:

<b>Input characteristics</b>	
Number of input channels	0...8 (input or output by software configuration)
Wiring type	2 or 3 wires
Input range	18...30 Vdc
Rated input current at 24 Vdc	4 mA
Input type	Sink
Input impedance	6 kΩ
OFF state	U < 5 Vdc
ON state	U > 15 Vdc I > 2.5 mA

Input characteristics		
Input filter	Hardware - Channels I0 to I3	≤10 μs
	Hardware - Channels I4 to I7	≤70 μs
	Software	Can be configured between 0 and 25 ms in 0.2 ms intervals
Isolation between channels	Not isolated	
Isolation between channels and bus	See note <sup>1</sup>	

<sup>1</sup> The isolation of the block is 500 Vac RMS between the electronics powered by the TM7 power bus and those powered by the 24 Vdc I/O power segment connected to the block. In practice, there is a bridge between the TM7 power bus and the 24 Vdc I/O power segment. The two power circuits reference the same functional ground (FE) through specific components designed to reduce effects of electromagnetic interference. These components are rated at 30 Vdc or 60 Vdc. This effectively reduces isolation of the entire system from the 500 Vac RMS.

## Output Characteristics

The table below provides the output characteristics of the TM7NCOM08B block:

Output characteristics		
Number of output channels	0...8 (input or output by software configuration)	
Wiring type	2 or 3 wires	
Output type	Source	
Output current	0.5 A max. per output	
Total output current for the module	4 A max.	
Output range	18...30 Vdc	
Voltage drop	0.3 Vdc max. at 0.5 A rated current	
Leakage current when switched off	5 μA	
Turn on time	400 μs max.	
Turn off time	400 μs max.	
Switching frequency	Resistive load	100 Hz max.
	Inductive load	See the switching inductive load characteristics ( <i>see page 55</i> )
Breaking voltage when switching off inductive loads	Typically 50 Vdc	
Short circuit peak current	12 A max.	
Isolation between channels	Not isolated	

<b>Output characteristics</b>	
Isolation between channels and bus	See note <sup>1</sup>
Output protection	Protection against short circuit and overcurrent, thermal protection
Output reset after overcurrent or short circuit	Automatic restart when temperature decreases

<sup>1</sup> The isolation of the block is 500 Vac RMS between the electronics powered by the TM7 power bus and those powered by the 24 Vdc I/O power segment connected to the block. In practice, there is a bridge between the TM7 power bus and the 24 Vdc I/O power segment. The two power circuits reference the same functional ground (FE) through specific components designed to reduce effects of electromagnetic interference. These components are rated at 30 Vdc or 60 Vdc. This effectively reduces isolation of the entire system from the 500 Vac RMS.

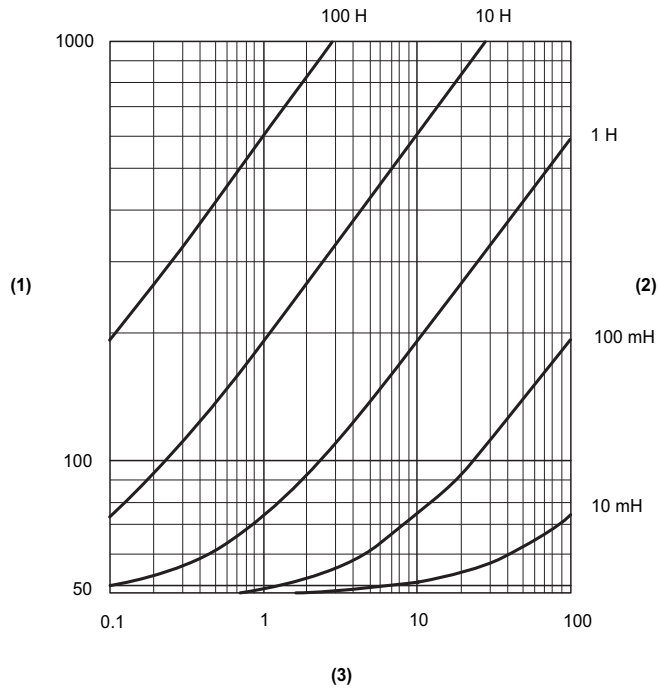
### Sensor and Actuator Supply

The table below provides the power supply for the sensors and actuators of the TM7NCOM08B block:

<b>Supply</b>	
Voltage	24 Vdc I/O power segment supply less voltage drop for internal protection
Voltage drop for internal protection at 500 mA	2 Vdc max.
Supply current (for all powered connected sensors and actuators)	500 mA max.
Internal protection	Overcurrent and short circuit

### Switching Inductive Load Characteristics

The following figure shows the switching inductive loads characteristics of the TM7NCOM08B block:

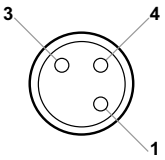


- (1) Load resistance in  $\Omega$
- (2) Load inductance in H
- (3) Max. operating cycles / second

## TM7NCOM08B Wiring Diagram

### Pin Assignments

The following figure shows the pin assignments for the I/O connectors of the TM7NCOM08B block:

Connection	Pin	Designation
	1	24 Vdc sensor / actuator supply
	3	0 Vdc
	4	DI/DO: input/output signal

### **⚠ DANGER**

#### **FIRE HAZARD**

Use cable sizes that meet the I/O channel and power supply voltage and current ratings.

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

If you do not properly wire the cable, you could introduce electromagnetic interference into the I/O block.

### **⚠ WARNING**

#### **ELECTROMAGNETIC INTERFERENCE**

- Do not connect cables to connectors that are not properly wired to the sensor or actuator.
- Always use sealing plugs for any unused connectors.

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



** WARNING**

**IP67 NON-CONFORMANCE**

- Properly fit all connectors with cables or sealing plugs and tighten for IP67 conformance according to the torque values as specified in this document.
- Do not connect or disconnect cables or sealing plugs in the presence of water or moisture.

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

## 4.3 TM7NCOM16B Block

---

### What's in this Section?

This section contains the following topics:

Topic	Page
TM7NCOM16B Presentation	59
TM7NCOM16B Characteristics	65
TM7NCOM16B Wiring Diagram	70

## TM7NCOM16B Presentation

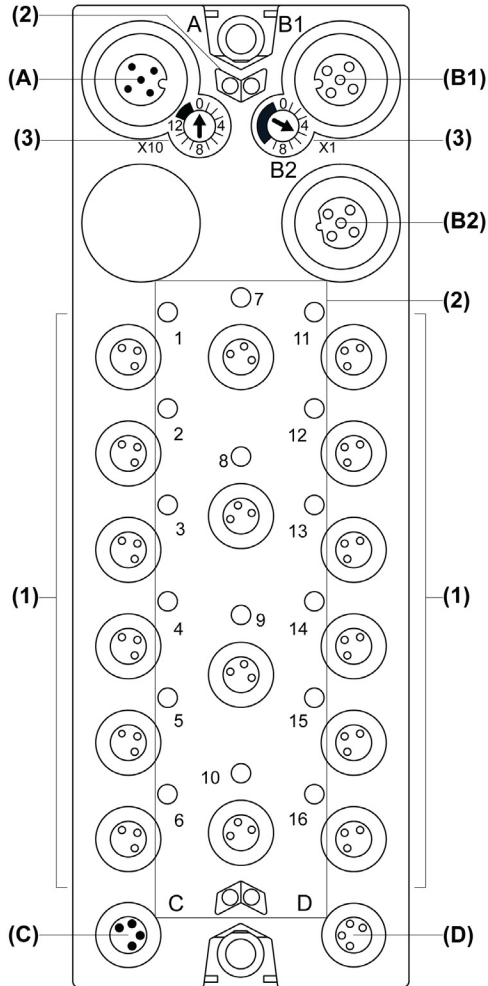
### Main Characteristics

The table below provides the main characteristics of the TM7NCOM16B block:

<b>Main Characteristics</b>	
Number of input/output channels	16
Input type	Type 1
Input signal type	Sink
Output type	Transistor, 0.5 A max.
Output signal type	Source
Sensor and actuator connection type	M8, female connector type ( <i>see page 70</i> )

**Description**

The following figure shows the TM7NCOM16B block:



- (A)** CANopen bus IN connector
- (B1)** CANopen bus OUT connector
- (B2)** TM7 bus OUT connector
- (C)** 24 Vdc power IN connector
- (D)** 24 Vdc power OUT connector
- (1)** Input / Output connectors
- (2)** Status and channel LEDs
- (3)** CANopen address settings rotary switches

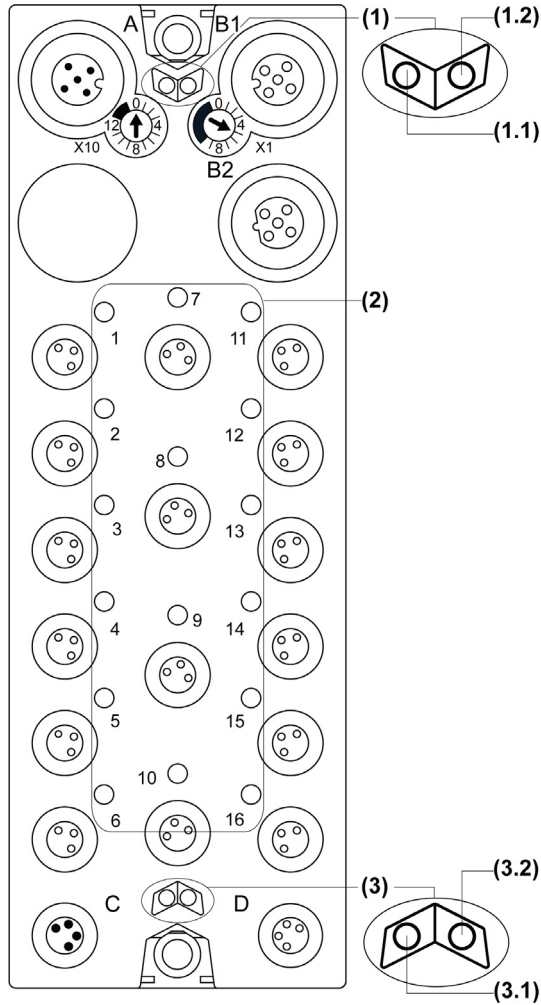
### Connector and Channel Assignments

The table below provides the connector and channel assignments of the TM7NCOM16B block:

I/O connectors	I/O status LEDs	Channel types	Channels
1	1	Input/Output	I0/Q0
2	2	Input/Output	I1/Q1
3	3	Input/Output	I2/Q2
4	4	Input/Output	I3/Q3
5	5	Input/Output	I4/Q4
6	6	Input/Output	I5/Q5
7	7	Input/Output	I6/Q6
8	8	Input/Output	I7/Q7
9	9	Input/Output	I8/Q8
10	10	Input/Output	I9/Q9
11	11	Input/Output	I10/Q10
12	12	Input/Output	I11/Q11
13	13	Input/Output	I12/Q12
14	14	Input/Output	I13/Q13
15	15	Input/Output	I14/Q14
16	16	Input/Output	I15/Q15

## Status LEDs

The following figure shows the LEDs of the TM7NCOM16B block:



- 1** CANopen status LEDs, set of two LEDs: 1.1 and 1.2 (mixed colors: green/red)
- (1.1)** CANopen bus status LED
- (1.2)** CANopen block status LED
- 2** I/O status LEDs, composed of sixteen LEDs: 1 to 16 (orange)
- 3** TM7 Block status LEDs, set of two LEDs: 3.1 (green) to 3.2 (red)
- (3.1)** TM7 block power supply status LED
- (3.2)** TM7 I/O block status LED

The table below provides the TM7 bus status LEDs of the TM7NCOM16B block:

CANopen Bus LEDs	Color LED	Status		Description	
1.1 CANopen Bus Status	Green (CAN_RUN)	Flashing	On: 200 ms Off: 200 ms	Preoperational state	
		Flashing	On: 200 ms Off: 1 s	Stop state	
		3 x Flashing	On: 200 ms Off: 1 s	Firmware update	
		On		Operational state	
	Red (CAN_ERR)	Off		No detected error or operational state	
		Flashing	On: 200 ms Off: 200 ms	Invalid Configuration	
		1 x Flashing	On: 200 ms Off: 1 s	At least one of the error counters of the CANopen interface block has reached the threshold "CANopen in Error Passive Mode".	
		2 x Flashing	On: 200 ms Off: 1 s	Guard or heartbeat event occurred.	
		3 x Flashing	On: 200 ms Off: 1 s	The synchronization message was not received in the configured time.	
		4 x Flashing	On: 200 ms Off: 1 s	An expected PDO (Process Data Object) was not received before the event timer has expired.	
		On		The CANopen interface block is in bus off state (no communication).	
	1.2 CANopen Block Status	Green	Off		No power supply
			Flashing for 5 s	On: 100 ms Off: 400 ms	Ready to erase all configuration settings
On				Node started properly (boot successfully)	
Green/Red		Flashing	On: 200 ms Off: 200 ms	Bit-rate detection in progress	
Red		2 x Flashing	On: 200 ms Off: 1 s	Confirmation for deleting all configuration settings	
		3 x Flashing	On: 200 ms Off: 1 s	Confirmation for configuration of a fixed transmission bit-rate	
		Flashing	On: 400 ms Off: 800 ms	Invalid bit-rate or address rotary switch selection	
		On		Detected error I/O block	

The table below provides the I/O status LEDs of the TM7NCOM16B block:

Channel LEDs	State	Description
1 to 16	OFF	Corresponding input/output deactivated
1 to 16	ON	Corresponding input/output activated

The table below provides the I/O block status LEDs of the TM7NCOM16B block:

Block status LEDs	State	Description
3.1 (green)	OFF	No power supply
	Single flash	TM7 bus reset state
	Flashing	TM7 bus preoperational state
	ON	TM7 bus operational state
3.2 (red)	OFF	No power supply
	Single flash	Detected error for an output channel (short-circuit or over-current).
	Double flash	Power supply not in the valid range
	ON	Detected error or reset state



## TM7NCOM16B Characteristics

### General Characteristics

#### **DANGER**

##### **EXPLOSIVE POTENTIAL**

- Only use this equipment in non-hazardous locations or in locations that comply either with the Class I, Division 2, Groups A, B, C and D, or with the ATEX Group II, Zone 2 specifications for hazardous locations, depending on your local and/or national regulations.
- Do not substitute components which would impair compliance to the hazardous location specifications of this equipment.
- Do not connect or disconnect equipment unless power has been removed or the area is known to be non-hazardous.

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

**NOTE:** Additional equipment used in conjunction with the equipment described herein must also be suitable for the operating location.

#### **DANGER**

##### **FIRE HAZARD**

Use cable sizes that meet the I/O channel and power supply voltage and current ratings.

**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 following tables.

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

The table below provides the general characteristics of the TM7NCOM16B block:

<b>General characteristics</b>	
Rated power supply voltage	24 Vdc
Power supply range	18...30 Vdc
24 Vdc I/O power segment consumption	125 mA
Protection	Against reverse polarity
Power dissipation	8.6 W max.
Weight	320 g (11.3 oz.)
CANopen ID code	B12C hex

See also Environmental Characteristics (*see page 17*).

### TM7 Bus Power Output Characteristics

The table below provides the TM7 bus power output characteristics of the TM7NCOM16B block:

<b>Input characteristics</b>	
Rated output voltage	20 Vdc
Internal consumption on the TM7 power bus	162 mA
Rated output current for expansion modules	750 mA max.
Number of TM7 I/O expansion blocks	20 max. <sup>1</sup>
<sup>1</sup> To use more expansion blocks, add the <i>TM7SPS1A power distribution block</i> ( <i>see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide</i> ) to the TM7 Power bus.	

### Input Characteristics

The table below provides the input characteristics of the TM7NCOM16B block:

<b>Input characteristics</b>	
Number of input channels	0...16 (input or output by software configuration)
Wiring type	2 or 3 wires
Input range	18...30 Vdc
Rated input current at 24 Vdc	4 mA
Input type	Sink
Input impedance	6 kΩ
OFF state	U < 5 Vdc
ON state	U > 15 Vdc I > 2.5 mA

Input characteristics		
Input filter	Hardware - Channels I0 to I3	≤10 μs
	Hardware - Channels I4 to I7	≤70 μs
	Software	Can be configured between 0 and 25 ms in 0.2 ms intervals
Isolation between channels	Not isolated	
Isolation between channels and bus	See note <sup>1</sup>	

<sup>1</sup> The isolation of the block is 500 Vac RMS between the electronics powered by the TM7 power bus and those powered by the 24 Vdc I/O power segment connected to the block. In practice, there is a bridge between the TM7 power bus and the 24 Vdc I/O power segment. The two power circuits reference the same functional ground (FE) through specific components designed to reduce effects of electromagnetic interference. These components are rated at 30 Vdc or 60 Vdc. This effectively reduces isolation of the entire system from the 500 Vac RMS.

## Output Characteristics

The table below provides the output characteristics of the TM7NCOM16B block:

Output characteristics		
Number of output channels	0...16 (input or output by software configuration)	
Wiring type	2 or 3 wires	
Output type	Source	
Output current	0.5 A max. per output	
Total output current for the module	8 A max.	
Output range	18...30 Vdc	
Voltage drop	0.3 Vdc max. at 0.5 A rated current	
Leakage current when switched off	5 μA	
Turn on time	400 μs max.	
Turn off time	400 μs max.	
Switching frequency	Resistive load	100 Hz max.
	Inductive load	See the switching inductive load characteristics ( <i>see page 69</i> )
Breaking voltage when switching off inductive loads	Typically 50 Vdc	
Short circuit peak current	12 A max.	

<b>Output characteristics</b>	
Isolation between channels	Not isolated
Isolation between channels and bus	See note <sup>1</sup>
Output protection	Protection against short circuit and overcurrent, thermal protection
Output reset after overcurrent or short circuit	Automatic restart when temperature decreases

<sup>1</sup> The isolation of the block is 500 Vac RMS between the electronics powered by the TM7 power bus and those powered by the 24 Vdc I/O power segment connected to the block. In practice, there is a bridge between the TM7 power bus and the 24 Vdc I/O power segment. The two power circuits reference the same functional ground (FE) through specific components designed to reduce effects of electromagnetic interference. These components are rated at 30 Vdc or 60 Vdc. This effectively reduces isolation of the entire system from the 500 Vac RMS.

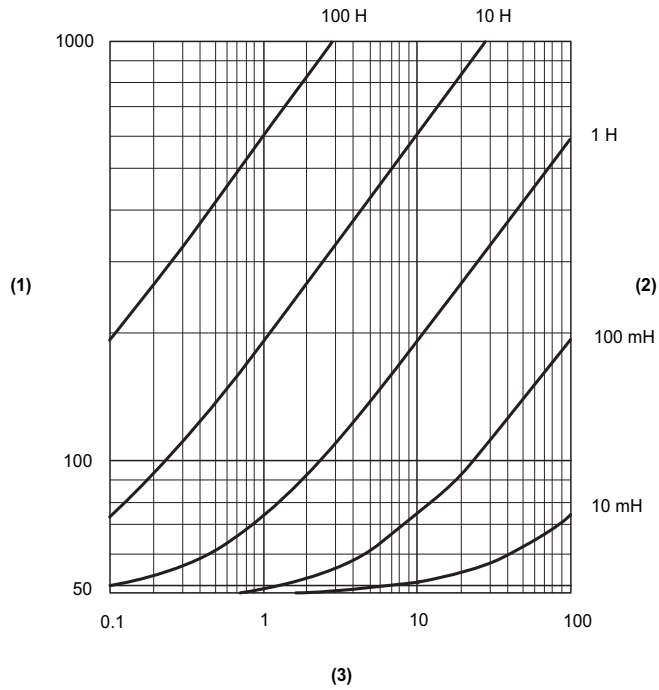
### Sensor and Actuator Supply

The table below provides the power supply for the sensors and actuators of the TM7NCOM16B block:

<b>Supply</b>	
Voltage	24 Vdc I/O power segment supply less voltage drop for internal protection
Voltage drop for internal protection at 500 mA	2 Vdc max.
Supply current (for all powered connected sensors and actuators)	500 mA max.
Internal protection	Overcurrent and short circuit

### Switching Inductive Load Characteristics

The following figure shows the switching inductive loads characteristics of the TM7NCOM16B block:

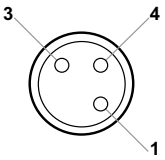


- (1) Load resistance in  $\Omega$
- (2) Load inductance in H
- (3) Max. operating cycles / second

## TM7NCOM16B Wiring Diagram

### Pin Assignments

The following figure shows the pin assignments for the I/O connectors of the TM7NCOM16B block:

Connection	Pin	Designation
	1	24 Vdc sensor / actuator supply
	3	0 Vdc
	4	DI/DO: input/output signal

## ⚠ DANGER

**EXPLOSIVE POTENTIAL**

- Only use this equipment in non-hazardous locations or in locations that comply either with the Class I, Division 2, Groups A, B, C and D, or with the ATEX Group II, Zone 2 specifications for hazardous locations, depending on your local and/or national regulations.
- Do not substitute components which would impair compliance to the hazardous location specifications of this equipment.
- Do not connect or disconnect equipment unless power has been removed or the area is known to be non-hazardous.

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

If you do not properly wire the cable, you could introduce electromagnetic interference into the I/O block.

## ⚠ WARNING

**ELECTROMAGNETIC INTERFERENCE**

- Do not connect cables to connectors that are not properly wired to the sensor or actuator.
- Always use sealing plugs for any unused connectors.

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

** WARNING**

**IP67 NON-CONFORMANCE**

- Properly fit all connectors with cables or sealing plugs and tighten for IP67 conformance according to the torque values as specified in this document.
- Do not connect or disconnect cables or sealing plugs in the presence of water or moisture.

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

## 4.4 TM7NCOM16A Block

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### What's in this Section?

This section contains the following topics:

Topic	Page
TM7NCOM16A Presentation	73
TM7NCOM16A Characteristics	79
TM7NCOM16A Wiring Diagram	84



## TM7NCOM16A Presentation

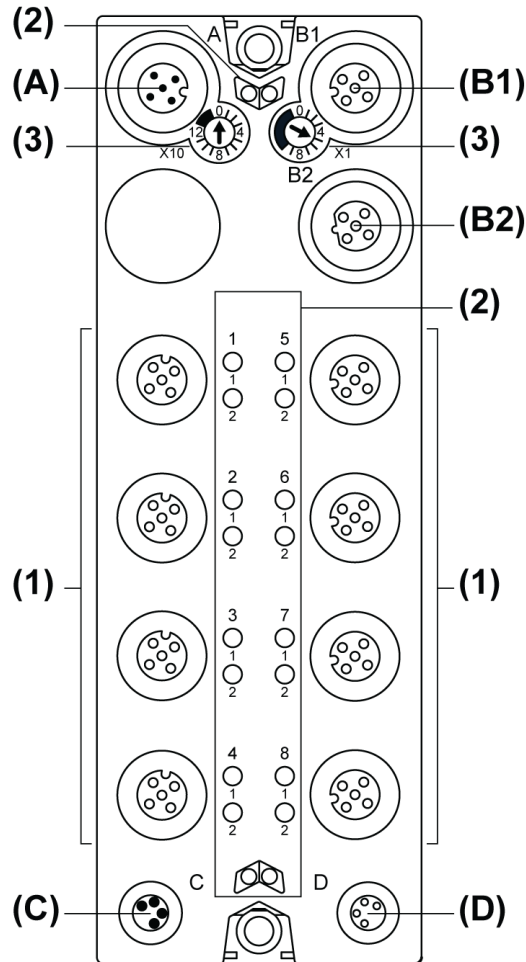
### Main Characteristics

The table below provides the main characteristics of the TM7NCOM16A block:

<b>Main Characteristics</b>	
Number of input/output channels	16
Input type	Type 1
Input signal type	Sink
Output type	Transistor, 0.5 A max.
Output signal type	Source
Sensor and actuator connection type	M12, female connector type (see page 84)

**Description**

The following figure shows the TM7NCOM16A block:



- (A) CANopen bus IN connector
- (B1) CANopen bus OUT connector
- (B2) TM7 bus OUT connector
- (C) 24 Vdc power IN connector
- (D) 24 Vdc power OUT connector
- (1) Input / Output connectors
- (2) Status and channel LEDs
- (3) CANopen Address settings rotary switches

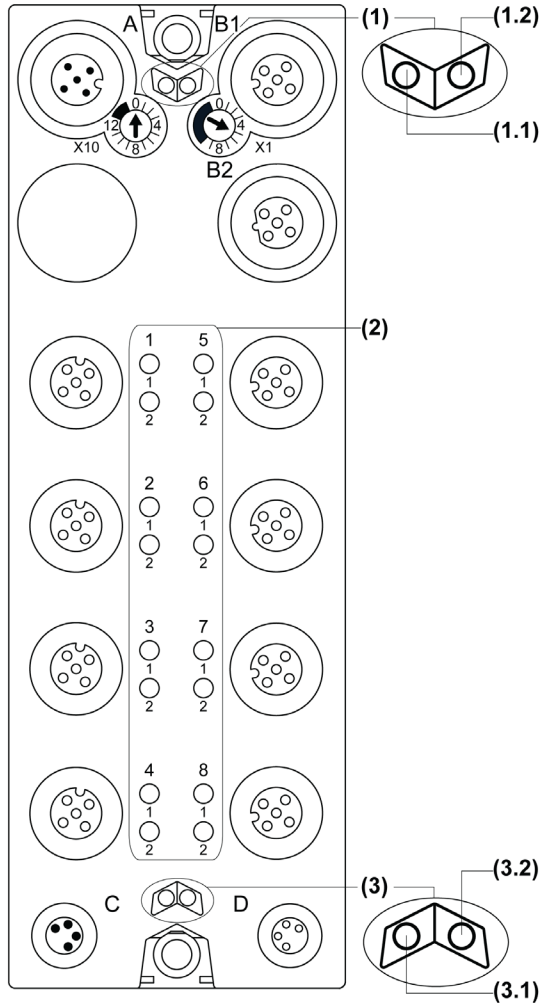
## Connector and Channel Assignments

The table below provides the connector and channel assignments of the TM7NCOM16A block:

I/O connectors	I/O status LEDs	Channel types	Channels
1	1	Input/Output	I0/Q0
2	2	Input/Output	I1/Q1
3	3	Input/Output	I2/Q2
4	4	Input/Output	I3/Q3
5	5	Input/Output	I4/Q4
6	6	Input/Output	I5/Q5
7	7	Input/Output	I6/Q6
8	8	Input/Output	I7/Q7
9	9	Input/Output	I8/Q8
10	10	Input/Output	I9/Q9
11	11	Input/Output	I10/Q10
12	12	Input/Output	I11/Q11
13	13	Input/Output	I12/Q12
14	14	Input/Output	I13/Q13
15	15	Input/Output	I14/Q14
16	16	Input/Output	I15/Q15

## Status LEDs

The following figure shows the LEDs of the TM7NCOM16A block:



- 1** CANopen status LEDs, set of two LEDs: 1.1 and 1.2 (mixed colors: green/red)
- (1.1)** CANopen bus status LED
- (1.2)** CANopen block status LED
- 2** I/O status LEDs, composed of sixteen LEDs: 1 to 16 (orange)
- 3** TM7 Block status LEDs, set of two LEDs: 3.1 (green) to 3.2 (red)
- (3.1)** TM7 block power supply status LED
- (3.2)** TM7 I/O block status LED

The table below provides the TM7 bus status LEDs of the TM7NCOM16A block:

CANopen Bus LEDs	Color LED	Status		Description	
1.1 CANopen Bus Status	Green (CAN_RUN)	Flashing	On: 200 ms Off: 200 ms	Preoperational state	
		Flashing	On: 200 ms Off: 1 s	Stop state	
		3 x Flashing	On: 200 ms Off: 1 s	Firmware update	
		On		Operational state	
	Red (CAN_ERR)	Off		No detected error or operational state	
		Flashing	On: 200 ms Off: 200 ms	Invalid Configuration	
		1 x Flashing	On: 200 ms Off: 1 s	At least one of the error counters of the CANopen interface block has reached the threshold "CANopen in Error Passive Mode".	
		2 x Flashing	On: 200 ms Off: 1 s	Guard or heartbeat event occurred.	
		3 x Flashing	On: 200 ms Off: 1 s	The synchronization message was not received in the configured time.	
		4 x Flashing	On: 200 ms Off: 1 s	An expected PDO (Process Data Object) was not received before the event timer has expired.	
		On		The CANopen interface block is in bus off state (no communication).	
	1.2 CANopen Block Status	Green	Off		No power supply
			Flashing for 5 s	On: 100 ms Off: 400 ms	Ready to erase all configuration settings
On				Node started properly (boot successfully)	
Green/Red		Flashing	On: 200 ms Off: 200 ms	Bit-rate detection in progress	
Red		2 x Flashing	On: 200 ms Off: 1 s	Confirmation for deleting all configuration settings	
		3 x Flashing	On: 200 ms Off: 1 s	Confirmation for configuration of a fixed transmission bit-rate	
		Flashing	On: 400 ms Off: 800 ms	Invalid bit-rate or address rotary switch selection	
		On		Detected error I/O block	

The table below provides the I/O status LEDs of the TM7NCOM16A block:

Channel LEDs	State	Description
1 to 16	OFF	Corresponding input/output deactivated
1 to 16	ON	Corresponding input/output activated

The table below provides the I/O block status LEDs of the TM7NCOM16A block:

Block status LEDs	State	Description
3.1 (green)	OFF	No power supply
	Single flash	TM7 bus reset state
	Flashing	TM7 bus preoperational state
	ON	TM7 bus operational state
3.2 (red)	OFF	No power supply
	Single flash	Detected error for an output channel (short-circuit or over-current).
	Double flash	Power supply not in the valid range
	ON	Detected error or reset state

## TM7NCOM16A Characteristics

### General Characteristics

#### **DANGER**

##### **FIRE HAZARD**

Use cable sizes that meet the I/O channel and power supply voltage and current ratings.

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

**NOTE:** Additional equipment used in conjunction with the equipment described herein must also be suitable for the operating location.

#### **DANGER**

##### **FIRE HAZARD**

Use cable sizes that meet the I/O channel and power supply voltage and current ratings.

**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 following tables.

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

The table below provides the general characteristics of the TM7NCOM16A block:

<b>General characteristics</b>	
Rated power supply voltage	24 Vdc
Power supply range	18...30 Vdc
24 Vdc I/O power segment consumption	125 mA
Protection	Against reverse polarity
Power dissipation	8.6 W max.
Weight	320 g (11.3 oz.)
CANopen ID code	B12D hex

See also Environmental Characteristics (*see page 17*).

### TM7 Bus Power Output Characteristics

The table below provides the TM7 bus power output characteristics of the TM7NCOM16A block:

<b>Input characteristics</b>	
Rated output voltage	20 Vdc
Internal consumption on the TM7 power bus	162 mA
Rated output current for expansion modules	750 mA max.
Number of TM7 I/O expansion blocks	20 max. <sup>1</sup>
<sup>1</sup> To use more expansion blocks, add the <i>TM7SPS1A power distribution block</i> ( <i>see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide</i> ) to the TM7 Power bus.	

### Input Characteristics

The table below provides the input characteristics of the TM7NCOM16A block:

<b>Input characteristics</b>	
Number of input channels	0...16 (input or output by software configuration)
Wiring type	2 or 3 wires
Input range	18...30 Vdc
Rated input current at 24 Vdc	4 mA
Input type	Sink
Input impedance	6 kΩ
OFF state	U < 5 Vdc
ON state	U > 15 Vdc I > 2.5 mA



Input characteristics		
Input filter	Hardware - Channels I0 to I3	≤10 μs
	Hardware - Channels I4 to I7	≤70 μs
	Software	Can be configured between 0 and 25 ms in 0.2 ms intervals
Isolation between channels	Not isolated	
Isolation between channels and bus	See note <sup>1</sup>	

<sup>1</sup> The isolation of the block is 500 Vac RMS between the electronics powered by the TM7 power bus and those powered by the 24 Vdc I/O power segment connected to the block. In practice, there is a bridge between the TM7 power bus and the 24 Vdc I/O power segment. The two power circuits reference the same functional ground (FE) through specific components designed to reduce effects of electromagnetic interference. These components are rated at 30 Vdc or 60 Vdc. This effectively reduces isolation of the entire system from the 500 Vac RMS.

## Output Characteristics

The table below provides the output characteristics of the TM7NCOM16A block:

Output characteristics		
Number of output channels	0...16 (input or output by software configuration)	
Wiring type	2 or 3 wires	
Output type	Source	
Output current	0.5 A max. per output	
Total output current for the module	8 A max.	
Output range	18...30 Vdc	
Voltage drop	0.3 Vdc max. at 0.5 A rated current	
Leakage current when switched off	5 μA	
Turn on time	400 μs max.	
Turn off time	400 μs max.	
Switching frequency	Resistive load	100 Hz max.
	Inductive load	See the switching inductive load characteristics ( <i>see page 83</i> )
Breaking voltage when switching off inductive loads	Typically 50 Vdc	
Short circuit peak current	12 A max.	

<b>Output characteristics</b>	
Isolation between channels	Not isolated
Isolation between channels and bus	See note <sup>1</sup>
Output protection	Protection against short circuit and overcurrent, thermal protection
Output reset after overcurrent or short circuit	Automatic restart when temperature decreases

<sup>1</sup> The isolation of the block is 500 Vac RMS between the electronics powered by the TM7 power bus and those powered by the 24 Vdc I/O power segment connected to the block. In practice, there is a bridge between the TM7 power bus and the 24 Vdc I/O power segment. The two power circuits reference the same functional ground (FE) through specific components designed to reduce effects of electromagnetic interference. These components are rated at 30 Vdc or 60 Vdc. This effectively reduces isolation of the entire system from the 500 Vac RMS.

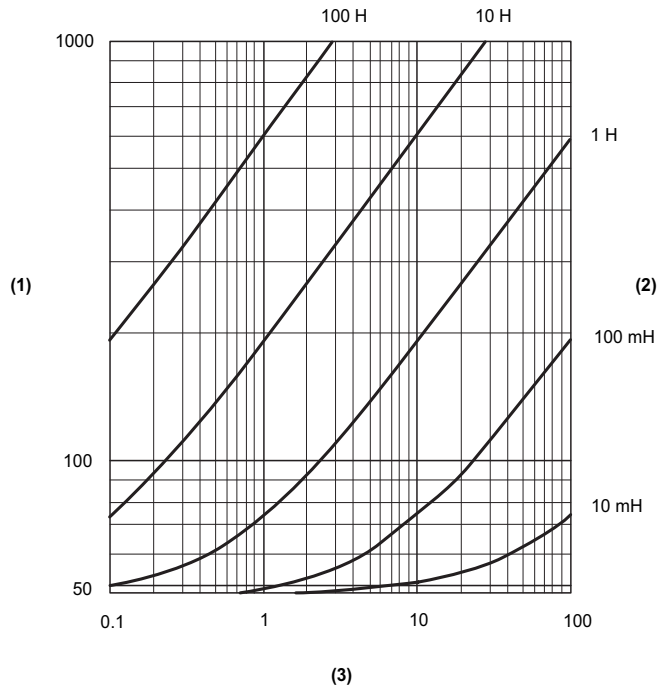
### Sensor and Actuator Supply

The table below provides the power supply for the sensors and actuators of the TM7NCOM16A block:

<b>Supply</b>	
Voltage	24 Vdc I/O power segment supply less voltage drop for internal protection
Voltage drop for internal protection at 500 mA	2 Vdc max.
Supply current (for all powered connected sensors and actuators)	500 mA max.
Internal protection	Overcurrent and short circuit

### Switching Inductive Load Characteristics

The following figure shows the switching inductive loads characteristics of the TM7NCOM16A block:

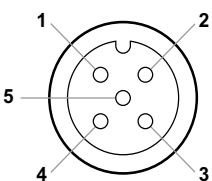


- (1) Load resistance in  $\Omega$
- (2) Load inductance in H
- (3) Max. operating cycles / second

## TM7NCOM16A Wiring Diagram

### Pin Assignments

The following figure shows the pin assignments for the I/O connectors of the TM7NCOM16A block:

Connection	Pin	Designation
	1	24 Vdc sensor supply
	2	DI: input signal channel 1
	3	0 Vdc
	4	DI: input signal channel 2
	5	N.C.

### DANGER

#### FIRE HAZARD

Use cable sizes that meet the I/O channel and power supply voltage and current ratings.

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

If you do not properly wire the cable, you could introduce electromagnetic interference into the I/O block.

### WARNING

#### ELECTROMAGNETIC INTERFERENCE

- Do not connect cables to connectors that are not properly wired to the sensor or actuator.
- Always use sealing plugs for any unused connectors.

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

** WARNING**

**IP67 NON-CONFORMANCE**

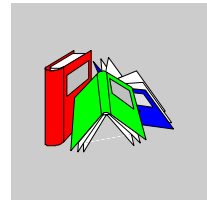
- Properly fit all connectors with cables or sealing plugs and tighten for IP67 conformance according to the torque values as specified in this document.
- Do not connect or disconnect cables or sealing plugs in the presence of water or moisture.

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



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# Glossary



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## A

### analog input

An *analog input* module contains circuits that convert an analog DC input signal to a digital value that can be manipulated by the processor. By implication, the analog input is usually direct. That means a data table value directly reflects the analog signal value.

### analog output

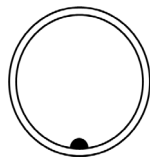
An *analog output* module contains circuits that transmit an analog DC signal proportional to a digital value input to the module from the processor. By implication, these analog outputs are usually direct. That means a data table value directly controls the analog signal value.

### AWG

The *american wire gauge* standard specifies wire gauges in North America.

### A coded

These connectors have one raised key on the male connector and one mating slot on the female connector. This is the standard coding used for sensors and distribution box applications:



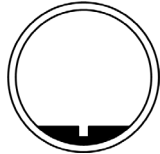
## B

### bus base

A *bus base* is a mounting device that is designed to seat an electronic module on a DIN rail and connect it to the TM5 bus for M258 and LMC058 controllers. Each base bus extends the TM5 data and to the power buses and the 24 Vdc I/O power segment. The electronic modules are added to the TM5 system through their insertion on the base bus. The base bus also supplies the articulation point for the terminal blocks.

### B coded

These connectors have one raised key on the female connector and one mating slot on the male connector. These connectors (also called reverse keyed) are used for field bus applications:



## C

### CAN

The *controller area network* protocol (ISO 11898) for serial bus networks is designed for the interconnection of smart devices (from multiple manufacturers) in smart systems for real-time industrial applications. CAN multimaster systems help ensure high data integrity through the implementation of broadcast messaging and advanced diagnostic mechanisms. Originally developed for use in automobiles, CAN is now used in a variety of industrial automation control environments.

### CANopen

CANopen is an open industry-standard communication protocol and device profile specification.

### compact I/O module

A *compact I/O module* is an indissociable group of five analog and/or digital I/O electronic modules in a single reference.



**configuration**

The *configuration* includes the arrangement and interconnection of hardware components within a system and the hardware and software selections that determine the operating characteristics of the system.

**controller**

A *controller* (or “programmable logic controller,” or “programmable controller”) is used to automate industrial processes.

**CPDM**

*controller power distribution module*

**crosstalk**

The crosstalk is an undesired signal caused by a capacitive, inductive or conductive coupling between two channels.

**CSA**

The *canadian standards association* defines and maintains standards for industrial electronic equipment in hazardous environments.

**CTS**

*Clear to send* is a data transmission signal and acknowledges the RDS signal from the transmitting station.

**D****De-rating**

*De-rating* describes a reduction in an operating specification. For devices in general it is usually a specified reduction in nominal power to facilitate operation at increased ambient conditions like higher temperatures or higher altitudes.

**DHCP**

The *dynamic host configuration protocol* is an advanced extension of BOOTP. DHCP is a more advanced, but both DHCP and BOOTP are common. (DHCP can handle BOOTP client requests.)

**digital I/O**

A *digital input* or *output* has an individual circuit connection at the electronic module that corresponds directly to a data table bit that holds the value of the signal at that I/O circuit. It gives the control logic digital access to I/O values.

**DIN**

*Deutsches Institut für Normung* is a German institution that sets engineering and dimensional standards.

**E**

**electronic module**

In a programmable controller system, most electronic modules directly interface to the sensors, actuators, and external devices of the machine/process. This electronic module is the component that mounts in a bus base and provides electrical connections between the controller and the field devices. Electronic modules are offered in a variety of signal levels and capacities. (Some electronic modules are not I/O interfaces, including power distribution modules and transmitter/receiver modules.)

**EN**

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

**encoder**

An *encoder* is a device for length or angular measurement (linear or rotary encoders).

**Ethernet**

*Ethernet* is a physical and data link layer technology for LANs, also known as IEEE 802.3.

**expansion bus**

The *expansion bus* is an electronic communication bus between expansion modules and a CPU.

**expert I/O**

*Expert I/Os* are dedicated modules or channels for advanced features. These features are generally embedded in the module in order to not use the resources of the PLC Controller and to allow a fast response time, depending of the feature. Regarding the function, it could be considered as a “stand alone” module, because the function is independent of the Controller processing cycle, it just exchanges some information with the Controller CPU.

**F****FAST I/O**

*FAST I/Os* are specific I/Os with some electrical features (response time, for example) but the treatment of these channels is done by the Controller CPU.

**FE**

*Functional ground* is the point of a system or device that must be grounded to help prevent equipment damage.

**FG**

*frequency generator*

**firmware**

The *firmware* represents the operating system on a controller.

**H****hot swapping**

*Hot swapping* is the replacement of a component with a like component while the system remains operational. The replacement component begins to function automatically after it is installed.

**HSC**

*high-speed counter.*

## I

### I/O

*input/output*

### IEC

The *international electrotechnical commission* is a non-profit and non-governmental international standards organization that prepares and publishes international standards for all electrical, electronic, and related technologies.

### input filter

An *input filter* is a special function that rejects input noises. It is useful for helping to minimize input noises and chatter in limit switches. All inputs provide a level of input filtering using the hardware. Additional filtering with software is also configurable through the programming or the configuration software.

### IP 20

*Ingress protection* rating according to IEC 60529. IP20 modules are protected against ingress and contact of objects larger than 12.5 mm. The module is not protected against harmful ingress of water.

### IP 67

*Ingress protection* rating according to IEC 60529. IP67 modules are completely protected against ingress of dust and contact. Ingress of water in harmful quantity is not possible when the enclosure is immersed in water up to 1 m (3.28 ft.).

## L

### LED

A *light emitting diode* is an indicator that lights up when electricity passes through it.

## M

### Modbus

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

## N

### NC

A *normally closed* contact is a contact pair that is closed when the actuator is de-energized (no power is applied) and open when the actuator is energized (power is applied).

### network

A network includes interconnected devices that share a common data path and protocol for communications.

## P

### PCI

A *peripheral component interconnect* is an industry-standard bus for attaching peripherals.

### PDM

A *power distribution module* distributes either AC or DC field power to a cluster of I/O modules.

### PE

*Protective ground* is a return line across the bus for fault currents generated at a sensor or actuator device in the control system.

### **Profibus DP**

*Profibus Decentralised Peripheral* is a linear bus with a centralized access procedure of the Master/Slave type. Only Master stations, also known as active stations, have access rights to the bus. The Slave or passive stations can only respond to prompts. The physical connection is a single shielded twisted pair, but fiber optic interfaces are available to create tree, star, or ring structures. Compared to the ISO model, only layers 1, 2 are implemented, since access from the user interface is made directly to the link layer via simple mapping of variables.

### **Pt100/Pt1000**

Platinum resistance thermometer are characterized by their nominal resistance  $R_0$  at a temperature of  $0^\circ \text{C}$ .

- Pt100 ( $R_0 = 100 \text{ Ohm}$ )
- Pt1000 ( $R_0 = 1 \text{ kOhm}$ )

### **PWM**

*Pulse width modulation* is used for regulation processes (e.g. actuators for temperature control) where a pulse signal is modulated in its length. For these kind of signals, transistor outputs are used.

## **R**

### **RS-232**

*RS-232* (also known as EIA RS-232C or V.24) is a standard type of serial communication bus, based on three wires.

### **RS-485**

*RS-485* (also known as EIA RS-485) is a standard type of serial communication bus, based on two wires.

### **RTS**

*Request to send* is a data transmission signal and will be acknowledged by the CTS signal from the destination node.

### **RxD**

*receiving data* (data transmission signal)

---

## S

### SEL-V

A system that follows IEC 61140 guidelines for *safety extra low voltage* is protected in such a way that voltage between any 2 accessible parts (or between 1 accessible part and the PE terminal for Class 1 equipment) does not exceed a specified value under normal conditions or under single-fault conditions.

### SERCOS

The *SERial Realtime COmmunications System* is a digital control bus that interconnects:

- motion controls,
- drives,
- I/Os,
- sensors and actuators, for numerically controlled machines and systems.

It is a standardized and open controller-to-intelligent digital device interface, designed for high-speed serial communication of standardized closed-loop real-time data.

### SERCOS III

Industrial Ethernet based on the SERCOS implementation.

### sink input

A *sink input* is a wiring arrangement in which the device provides current to the input electronic module. A sink input is referenced to 0 Vdc.

### SL

*serial line*

### source output

A *source output* is a wiring arrangement in which the output electronic module provides current to the device. A source output is referenced to +24 Vdc.

## T

### terminal block

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

**TxD**

TxD represents a transmit signal.

**U**

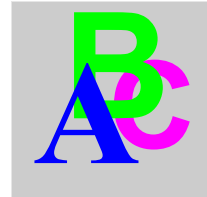
**UL**

*Underwriters laboratories*, US organization for product testing and safety certification.



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