

Modicon TM5

Sercos III Interface

Hardware Guide

09/2020



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

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

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

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

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Safety Information



Important Information

NOTICE

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



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



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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

PLEASE NOTE

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

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

About the Book



At a Glance

Document Scope

This manual describes the hardware implementation of the Modicon TM5 field bus interface. It provides parts descriptions, specifications, wiring diagrams, installation and setup for Modicon TM5 field bus interface.

Validity Note

This document has been updated for the release of EcoStruxure™ Machine Expert V1.2.5.

The technical characteristics of the devices described in the present document also appear online.

To access the information online:

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

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

Related Documents

| Title of Documentation | Reference Number |
|--|--|
| PacDrive TM5 / TM7 Flexible System- System Planning and Installation Guide | EIO0000001058 (ENG) EIO0000001060 (GER) |
| PacDrive TM5 / TM7 Safety Flexible System - System Planning and Installation Guide | EIO0000001064 (ENG) EIO0000001066 (GER) |

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

Product Related Information

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

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

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

DANGER

POTENTIAL FOR EXPLOSION

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

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

WARNING

LOSS OF CONTROL

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

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

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

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Chapter 1

TM5 System General Rules for Implementing

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|---|------|
| Installation and Maintenance Requirements | 12 |
| Wiring Best Practices | 14 |
| TM5 Environmental Characteristics | 18 |

Installation and Maintenance Requirements

Before Starting

Read and understand this chapter before beginning the installation of your TM5 System.

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

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

NOTICE

ELECTROSTATIC DISCHARGE

- Store all components in their protective packaging until immediately before assembly.
- Never touch exposed conductive parts such as contacts or terminals.

Failure to follow these instructions can result in equipment damage.

Disconnecting Power

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


DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

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


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

Programming Considerations


| |
|---|
|  WARNING |
| UNINTENDED EQUIPMENT OPERATION |
| <ul style="list-style-type: none"> • 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

For important hazardous location information, refer to the individual product descriptions contained in their hardware guides.

| |
|--|
|  WARNING |
| UNINTENDED EQUIPMENT OPERATION |
| Install and operate this equipment according to the conditions described in the Environmental Characteristics. |
| Failure to follow these instructions can result in death, serious injury, or equipment damage. |

Installation Considerations

| |
|--|
|  WARNING |
| UNINTENDED EQUIPMENT OPERATION |
| <ul style="list-style-type: none"> • Use appropriate safety interlocks where personnel and/or equipment hazards exist. • Install and operate this equipment in an enclosure appropriately rated for its intended environment and secured by a keyed or tooled locking mechanism. • Use the sensor and actuator power supplies only for supplying power to the sensors or actuators connected to the module. • Power line and output circuits must be wired and fused in compliance with local and national regulatory requirements for the rated current and voltage of the particular equipment. • Do not use this equipment in safety-critical machine functions unless the equipment is otherwise designated as functional safety equipment and conforming to applicable regulations and standards. • Do not disassemble, repair, or modify this equipment. • Do not connect any wiring to reserved, unused connections, or to connections designated as No Connection (N.C.). |
| Failure to follow these instructions can result in death, serious injury, or equipment damage. |

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

Wiring Best Practices

Introduction

There are several rules that must be followed when wiring the TM5 System.

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 TM5 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 twisted pair, shielded cables for analog, expert, or fast I/O and TM5 bus signals.
- Use twisted pair, shielded cables for encoder, networks and Sercos bus.

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION






- Use shielded cables for all fast I/O, analog I/O and communication signals.
- Ground cable shields for all analog I/O, fast I/O and communication signals at a single point¹.
- Route communication and I/O cables separately from power cables.

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





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

To ground the shielded cables, refer to the section Grounding the TM5 System.

This table provides the wire sizes to use with the removable terminal blocks TM5ACTB06, TM5ACTB12, TM5ACTB12PS and TM5ACTB32:

| $\frac{\text{mm}}{\text{in.}}$  |  |  |  |  |
|---|---|---|---|---|
| mm ² | 0,08...2,5 | 0,25...2,5 | 0,25...1,5 | 2 x 0,25...2 x 0,75 |
| AWG | 28...14 | 24...14 | 24...16 | 2 x 24...2 x 18 |

This table provides the wire sizes to use with the removable terminal block TM5ACTB16:

| $\frac{\text{mm}}{\text{in.}}$  |  |  |  |
|--|--|--|--|
| mm ² | 0,08...1,5 | 0,25...1,5 | 0,25...0,75 |
| AWG | 28...16 | 24...16 | 24...20 |

⚠ DANGER

FIRE HAZARD

Use only the correct wire sizes for the maximum current capacity of the I/O channels and power supplies.

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

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

  **DANGER**

LOOSE WIRING CAUSES ELECTRIC SHOCK

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

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

TM5 Terminal Block

Inserting an incorrect terminal block into the electronic module can cause unintended operation of the application and/or damage the electronic module.

  **DANGER**

ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION

Connect the terminal blocks to their designated location.

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

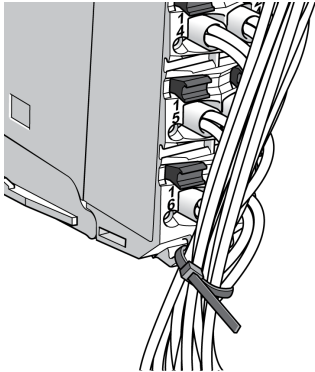
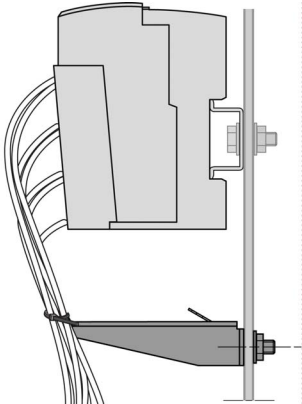
NOTE: To help prevent a terminal block from being inserted incorrectly, ensure that each terminal block and electronic module is clearly and uniquely coded.

TM5 Strain Relief Using Cable Tie

There are 2 methods to reduce the stress on cables:

- The terminal blocks have slots to attach cable ties. A cable tie can be fed through this slot to secure cables and wires to reduce stress between them and the terminal block connections.
- After grounding the TM5 System by means of the grounding plate TM2XMTGB, wires can be bundled and affixed to the grounding plate tabs using wire ties to reduce stress on the cables.

The following table provides the size of the cable tie and presents the two methods to reduce the stress on the cables:

| Cable Tie Size | Terminal Block | TM2XMTGB Grounding Plate |
|-----------------------|---|--|
| Thickness | 1.2 mm (0.05 in.) maximum | 1.2 mm (0.05 in.) |
| Width | 4 mm (0.16 in.) maximum | 2.5...3 mm (0.1...0.12 in.) |
| Mounting illustration |  |  |

⚠ WARNING

ACCIDENTAL DISCONNECTION FROM PROTECTIVE GROUND (PE)

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

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

TM5 Environmental Characteristics

Enclosure Requirements

TM5 components are designed as Zone B, Class A industrial equipment according to IEC/CISPR Publication 11. If they are used in environments other than those described in the standard, or in environments that do not meet the specifications in this manual, your ability to meet electromagnetic compatibility requirements in the presence of conducted and/or radiated interference may be reduced.

The TM5 components meet European Community (CE) requirements for open equipment as defined by EN61131-2. You must install them in an enclosure designed for the specific environmental conditions and to minimize the possibility of unintended contact with hazardous voltages. The enclosure should be constructed of metal to improve the electromagnetic immunity of your TM5 System. The enclosure should, and in the case of UL compliance, must, have a keyed locking mechanism to minimize unauthorized access.

Environmental Characteristics

This equipment meets UL and CSA standards and, for the majority of the modules, carry both certification marks. In addition, all modules are certified as CE compliant. This equipment is intended for use in a Pollution Degree 2 industrial environment.

NOTE: Some module characteristics may differ from those presented in the following tables. Refer to the chapter concerning your specific module for more information.

The table below provides the general environmental characteristics:

| Characteristic | Minimum Specification | Tested Range | |
|-------------------------------|--|----------------------------|-------------------------|
| Standard | IEC61131-2 | – | |
| Agency Standards | UL 508 CSA 22.2 No. 142-M1987 CSA 22.2 No. 213-M1987 | – | |
| Ambient operating temperature | – | Horizontal installation | 0...55 °C (32...131 °F) |
| | | Vertical installation | 0...50 °C (32...122 °F) |
| Storage temperature | – | -25...70 °C (-13...158 °F) | |
| Relative humidity | – | 5...95% (non-condensing) | |
| Degree of pollution | IEC60664 | 2 | |
| Degree of protection | IEC61131-2 | IP20 | |
| Corrosion immunity | None | – | |
| Operating altitude | – | 0...2000 m (0...6.560 ft.) | |
| Storage altitude | – | 0...3000 m (0...9.842 ft.) | |

NOTE: The tested ranges may indicate values beyond that of the IEC Standard. However, our internal standards define what is necessary for industrial environments. In all cases, we uphold the minimum specification if indicated.

| Characteristic | | Minimum Specification | Tested Range |
|---|---------------------------------|-----------------------|--|
| Vibration resistance | | – | Mounted on a DIN rail 3.5 mm (0.138 in.) fixed amplitude from 5...8.4 Hz 9.8 m/s ² (1 g _n) fixed acceleration from 8.4...150 Hz |
| Mechanical shock resistance | | – | 147 m/s ² (15 g _n) for a duration of 11 ms |
| Connection type | Removable spring terminal block | – | – |
| Connector insertion/removal cycles | | – | 50 |
| NOTE: The tested ranges may indicate values beyond that of the IEC Standard. However, our internal standards define what is necessary for industrial environments. In all cases, we uphold the minimum specification if indicated. | | | |

Electromagnetic Susceptibility

The following table provides the TM5 System electromagnetic susceptibility specifications:

| Characteristic | | Minimum Specification | Tested Range |
|--|--|------------------------|--|
| Electrostatic discharge | | IEC/EN 61000-4-2 | 8 kV (air discharge), criteria B 4 kV (contact discharge), criteria B |
| Electromagnetic fields | | IEC/EN 61000-4-3 | 10 V/m (80 MHz...2 GHz), criteria A 10 V/m (80 MHz...2.7 GHz) ⁽¹⁾ |
| Fast transients burst | | IEC/EN 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 |
| Surge immunity 24 Vdc circuit | | IEC/EN 61000-4-5 | 1 kV in common mode, criteria B 0.5 kV in differential mode, criteria B |
| Surge immunity 230 Vac circuit | | IEC/EN 61000-4-5 | 2 kV in common mode, criteria B 1 kV in differential mode, criteria B |
| Induced electromagnetic field | | IEC/EN 61000-4-6 | 10 V _{eff} (0.15...80 MHz), criteria A |
| 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@40 dB (μV/m) 230 MHz...1 GHz, 10 m@47 dB (μV/m) |
| <p>Criteria A Uninterrupted operation during test. Criteria B Brief interruption during the test allowed. (1) Applies for TM5SE11C20005 and TM5SE1MISC20005.</p> <p>NOTE: The tested ranges may indicate values beyond that of the IEC Standard. However, our internal standards define what is necessary for industrial environments. In all cases, we uphold the minimum specification if indicated.</p> | | | |

Chapter 2

TM5 Field Bus Interface General Overview

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|----------------------|------|
| General Description | 22 |
| Physical Description | 24 |

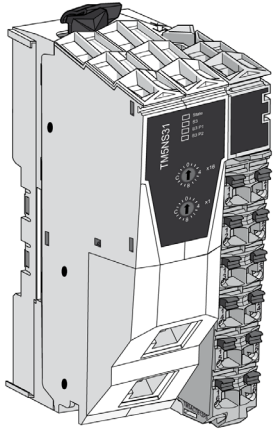
General Description

Introduction

The TM5 fieldbus interface with built-in power distribution is the first element of the TM5 distributed I/O island. When assembled, the TM5 fieldbus interface is composed of four elements:

- Fieldbus interface bus base
- Fieldbus interface module
- Interface Power Distribution Module (IPDM)
- Terminal block

The following figure shows a TM5 fieldbus interface when assembled:



TM5 Fieldbus Interface Features

The table below provides the bus base reference:

| Reference | Description |
|-----------|---|
| TM5ACBN1 | Bus base for fieldbus interface module and Interface Power Distribution Module (IPDM) |

The table below provides the fieldbus interface module references:

| Reference | Description |
|--------------------------------|-----------------------------|
| TM5NS31 (<i>see page 29</i>) | SERCOS III interface module |

The table below provides the Interface Power Distribution Module (IPDM) reference:

| Reference | Description |
|--------------------------------|--|
| TM5SPS3 (<i>see page 39</i>) | Fieldbus interface 24 Vdc power supply |

The table below provides the terminal block reference:

| Reference | Description |
|-------------|--|
| TM5ACTB12PS | 24 Vdc, 12-pin terminal block for PDM, IPDM and receiver electronic module |

Physical Description

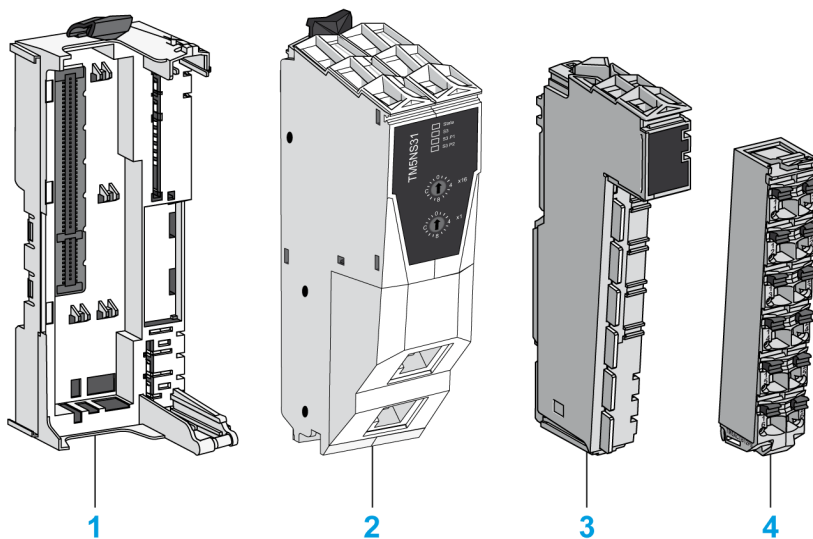
Introduction

Each fieldbus interface consists of four elements. These elements are the:

- Fieldbus interface bus base
- Fieldbus interface module
- Interface Power Distribution Module (IPDM)
- Terminal block

Elements

The following figure shows the different parts that compose the TM5 fieldbus interface:



- (1) Fieldbus interface bus base
- (2) Fieldbus interface module
- (3) Interface Power Distribution Module (IPDM)
- (4) Terminal block

When assembled the four elements form an integral unit that resists vibration and electrostatic discharge.

NOTICE

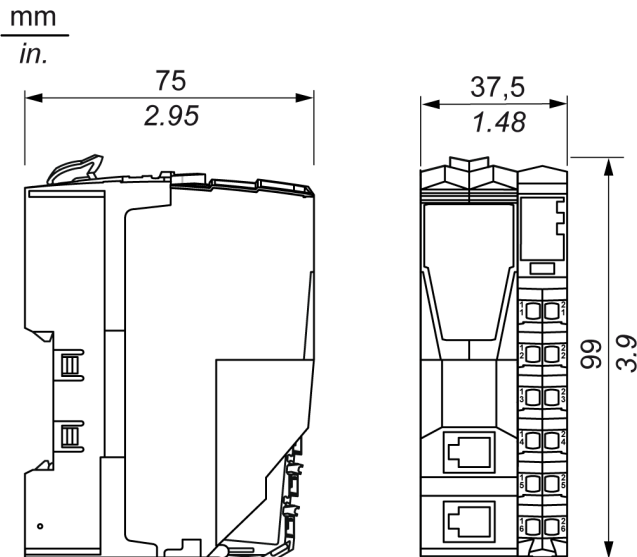
ELECTROSTATIC DISCHARGE

- Do not touch the pin connectors of the block.
- Keep the cables or sealing plugs in place during normal operation.

Failure to follow these instructions can result in equipment damage.

Dimensions

The following figure shows the dimensions of the TM5 fieldbus interface:



Accessories

Refer to the Installation of Accessories.

Labeling

Refer to the Labeling the TM5 System.

Chapter 3

TM5 Field Bus Interface Installation

First Startup

Overview

This procedure helps you through the installation and startup of your TM5 field bus interface.

Startup Procedure

| Step | Action | Comment |
|------|--|---|
| 1 | Unpack your field bus interface module and verify the contents of the package. | Package content: <ul style="list-style-type: none">● field bus interface module |
| 2 | Unpack: <ul style="list-style-type: none">● The bus base of your field bus interface● the Interface Power Distribution Module (IPDM)● The terminal block | For more information, refer to the Physical Description (<i>see page 24</i>). |
| 3 | Assemble all separate parts together. | For more information, refer to the Field Bus Interface Installation. |
| 4 | Choose an appropriate cabinet and DIN rail and install your field bus interface on the DIN rail. | For more information, refer to the DIN Rail Installation and Enclosing the TM5 System. |
| 5 | Install the expansion modules. | For more information, refer to the Slices Installation or Compact I/O Installation. |
| 6 | Connect the communication field bus interface | For more information, refer to TM5NS31 Wiring Diagram (<i>see page 37</i>). |
| 7 | Connect your devices to the inputs and outputs. | For more information refer to TM5 Hardware Guides. |
| 8 | Connect the external 24 Vdc power source(s) to the Interface Power Distribution Module (IPDM) and any optional Power Distribution Modules (PDM). | For more information, refer to IPDM Wiring Diagram (<i>see page 46</i>). |
| 9 | Verify all connections. | — |

Chapter 4

TM5 Sercos III Interface Module

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|--------------------------------|------|
| TM5NS31 Presentation | 30 |
| Setting the Sercos III Address | 34 |
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TM5NS31 Presentation

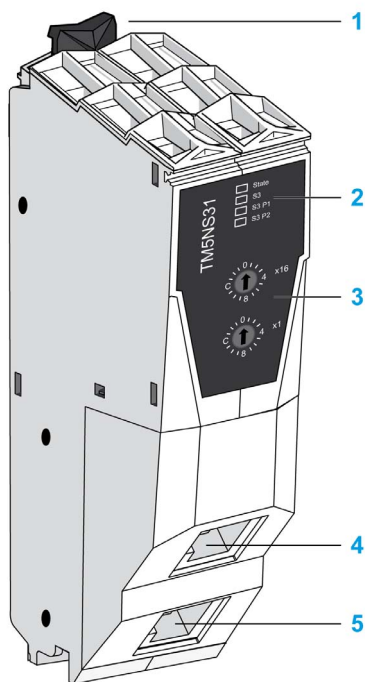
Main Characteristics

This table describes the main characteristics of the TM5NS31 Sercos interface module:

| Characteristic | Description |
|----------------|-------------|
| Standard | Sercos III |
| Connector type | RJ45 |

Presentation

The following figure shows the TM5NS31:



- 1 Locking clip
- 2 Status LEDs
- 3 Sercos III address setting rotary switches
- 4 Sercos III Port 1 connector (RJ45)
- 5 Sercos III Port 2 connector (RJ45)

Status LEDs

The following LEDs are provided:

- **State**
- **S3**
- **S3 P1 (Port 1)**
- **S3 P2 (Port 2)**

The **State** LED is a green / red dual LED. The color green (status) is superimposed on the color red (detected error).

This table describes the **State** LEDs:

| Color | State | Description |
|-------|--------------------|---|
| - | Off | No power applied. |
| Green | On | No error is detected, bus interface is initialized and ready for operation. |
| Green | Flashing (12.5 Hz) | Initialization phase (booting of the I/O modules or setting up the I/O functional groups). |
| Green | Flashing (4 Hz) | Minor error detected, such as missing I/O module (is reset when the correction is made). |
| Green | Flashing (0.66 Hz) | New or changed configuration data (I/O modules or bus interface) have been received but not yet stored in the flash memory. |
| Red | Flashing (8 Hz) | Major error detected (for example lack of resources, error detected in the firmware data flow). |

NOTE: After applying power to the bus interface, the LED will flash red several times intermittently. These signals are not error indications.

This table describes the **S3** LEDs:

| Color | State | Description | Instructions |
|-------------|----------------------------|--|--|
| - | Off | No power applied or there is no communication due to an interrupted or separated connection. | Sercos III boot-up or hot plug. |
| Green | On | Active Sercos III connection without an error detected in the CP4 (Communication Phase 4). | n.a. |
| | Flashing (4 Hz, 125 ms) | The device is in loopback mode. Loopback describes the situation in which the Sercos III telegrams have to be sent back on the same port on which they were received. Possible causes: <ul style="list-style-type: none"> ● Line topology ● Sercos III ring break | Close the ring. |
| Red | On | Sercos III diagnostic class 1 (DK1) error has been detected on port 1 and/or 2. Sercos III communication is no longer possible on the ports (for example due to encoder error detection). | Reset condition <ul style="list-style-type: none"> ● Clear the device errors ● Acknowledge the error in the menu ● Switch from CP2 to CP3 alternatively. NOTE: Diagnostic messages pending in the system are not acknowledged by these actions. |
| Red / green | Flashing (4 Hz, 125 ms) | Communication error detected. Possible causes: <ul style="list-style-type: none"> ● Improper functioning of the telegram ● CRC (Cyclic Redundancy Check) error detected | Reset condition <ul style="list-style-type: none"> ● The controller configuration displays the error ● Acknowledge the error. ● Switch from CP2 to CP3 alternatively. NOTE: Diagnostic messages pending in the system are not acknowledged by these actions. |
| Orange | On | The device is in a communication phase CP0 up to and including CP3 or HP0 (Hot Plug Phase) up to and including HP2. Sercos III telegrams are received. | n.a. |
| Orange | Flashing (4 Hz, 125 ms) | Device identification | Triggered by means of the parameter <code>IdentifyDevice</code> or the DriveAssistant tool. |

This table describes the **S3 P1** and **S3 P2** LEDs:

| Color | State | Description |
|--------------|--------------|---|
| Off | Off | No cable connected. |
| Green | Flashing | Active Sercos III or Ethernet communication. |
| Green | On | Link, but no telegrams / communication (for example controller is booting). |

Setting the Sercos III Address

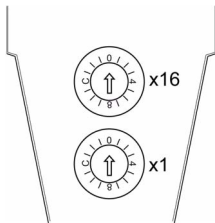
Sercos III Module Address

The Sercos III address of the TM5NS31 module is set by using two rotary switches. The address is preset to 0 by default. This way, an automatic addressing is triggered.

NOTE: Only addresses from 1 to 239 are permitted.

The Sercos III address at the rotary switches is in hexadecimal notation.

The following figure shows the rotary switches:

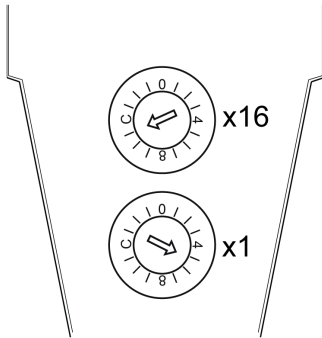


This table describes the addresses for Sercos III:

| Addresses | Description |
|--|--|
| 0 dec (0 hex) | Auto-addressing (not a valid address) The setting 0 is recognized when the value <code>SerialNumberController</code> or <code>TopologyAddress</code> or <code>ApplicationType</code> is selected for the parameter <code>IdentificationMode</code> ⁽¹⁾ . |
| 1-255 dec (1-FF hex) ⁽¹⁾ | Manual addressing This setting is recognized when the value <code>SercosAddress</code> is selected for the parameter <code>IdentificationMode</code> ⁽¹⁾ . |
| (1) <code>IdentificationMode</code> is a parameter in EcoStruxure Machine Expert. | |

Sercos III Address Setting Example

The following figure shows an example when the Sercos III address is configured to 181 (decimal):



(x16) High-order rotary switch: set to B (Hex) = 11 (decimal)

(x1) Low-order rotary switch: set to 5 (Hex) = 5 (decimal)

Sercos III address = $11 \times 16 + 1 \times 5 = 181$

TM5NS31 Characteristic

Characteristic

General

| Characteristic | Value |
|---|-----------------------------------|
| Maximum number of bus interfaces in the Sercos III loop | 255 |
| Transmission medium | Twisted-Pair S-UTP 100 Ohm Cat 5e |
| Transmission rate | 100 MBit / full duplex |
| Weight | 30 g (1.1 oz) |

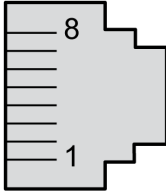
Electrical data

| Characteristic | Value |
|---------------------------------|-----------------|
| Current consumption via TM5 bus | 350 mA at 5 Vdc |
| Power dissipation | 1.75 W |

TM5NS31 Wiring

Pin Assignment

This illustration shows the pins of the Sercos ports:



This table describes the pin assignment of the Sercos ports:

| Pin | Signal | Description |
|-----|--------|-----------------|
| 1 | TD+ | Transmit data + |
| 2 | TD- | Transmit data - |
| 3 | RD+ | Receive data + |
| 4 | - | Reserved |
| 5 | - | Reserved |
| 6 | RD- | Receive data - |
| 7 | - | Reserved |
| 8 | - | Reserved |

Chapter 5

TM5 Interface Power Distribution Module (IPDM)

What Is in This Chapter?

This chapter contains the following topics:

| Topic | Page |
|-------------------------|------|
| TM5SPS3 Presentation | 40 |
| TM5SPS3 Characteristics | 43 |
| TM5SPS3 Wiring Diagram | 46 |

TM5SPS3 Presentation

Main Characteristics

The TM5SPS3 Interface Power Distribution Module (IPDM) consists of two dedicated electrical circuits:

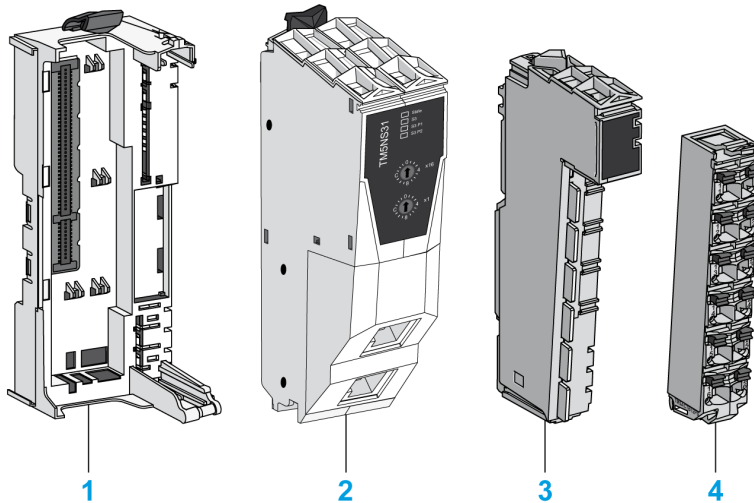
- A 24 Vdc main power that serves the electronics of the fieldbus interface module and generates independent power for the TM5 power bus that serves the expansion modules.
- A 24 Vdc I/O power segment that serves:
 - The expansion modules,
 - The sensors and actuators connected to the expansion modules,
 - The external devices connected to the Common Distribution Modules (CDM)

The table below provides the main characteristics of the TM5SPS3 interface power distribution module:

| Main characteristics | |
|--|----------|
| Maximum current provided on 24 Vdc I/O power segment | 10000 mA |
| TM5 power bus generated | 750 mA |

Ordering Information

The following figure and table provide the references to create a TM5 fieldbus interface with the TM5SPS3 IPDM:

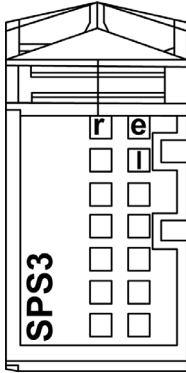


| Number | Reference | Description | Color |
|--------|-------------|---|-------|
| 1 | TM5ACBN1 | Bus base 24 Vdc I/O power segment left isolated | White |
| 2 | TM5NS31 | Fieldbus interface Sercos III module | White |
| 3 | TM5SPS3 | Fieldbus interface 24 Vdc power supply (Interface Power Distribution Module (IPDM)) | Grey |
| 4 | TM5ACTB12PS | 24 Vdc, 12-pin terminal block for PDM, IPDM, and receiver electronic module | Grey |

NOTE: For more information, refer to *TM5 Bus Bases and Terminal Blocks*.

Status LEDs

The following figure and table provide the TM5SPS3 IPDM status LEDs:



| LED | Color | Status | Description |
|-----|-------------------------------|--------------|--|
| r | Green | Off | Power supply not connected |
| | | Single flash | Reset status |
| | | Flashing | TM5 expansion bus in preoperational status |
| | | On | RUN status |
| e | Red | Off | OK or module not connected |
| | | Double flash | Indicates one of the following conditions: <ul style="list-style-type: none"> • 24 Vdc I/O power segment, via the external power supply or supplies, is too low. • TM5 power bus, via the external power supply or supplies, is too low. |
| e+r | Steady red/single green flash | | Invalid firmware |
| l | Red | Off | The TM5 interface power distribution module supply is within the acceptable range |
| | | On | The TM5 interface power distribution module supply is insufficient |

TM5SPS3 Characteristics

General Characteristics

DANGER

FIRE HAZARD

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

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

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

The table below provides the general characteristics of the TM5SPS3:

| General Characteristics | |
|---------------------------------------|----------------|
| Rated power supply voltage | 24 Vdc |
| 24 Vdc I/O power segment current draw | 25 mA |
| Power dissipation | 1.82 W maximum |
| Weight | 30 g (1.1 oz) |
| ID code | 8076 dec |

See also Environmental Characteristics.

TM5 Power Bus Characteristics

The table below provides the TM5 power bus characteristics of the TM5SPS3:

| TM5 Power Bus Characteristics | |
|--|--|
| Power supply range | 20.4...28.8 Vdc |
| Rated input current | 0.7 A at 24 Vdc |
| Reverse polarity protection | Yes |
| Fuse | Integrated, cannot be exchanged |
| Current generated | <ul style="list-style-type: none"> ● On TM5 power bus: 750 mA ● To supply the field bus interface module: 300 mA |
| Electrical isolation | See note ¹ |
| Parallel operation | Yes ² |
| <p>¹ The isolation of the electronic module is 500 Vac RMS between the electronics powered by the TM5 bus and those powered by 24 Vdc I/O power segment connected to the module. In practice, the TM5 electronic module is installed in the bus base, and there is a bridge between the TM5 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.</p> <p>² In parallel operation, only 75% of the rated power can be assumed. Ensure that all parallel operating power supplies are switched on and off simultaneously.</p> | |

Temperature De-rating

The TM5SPS3 is subject to temperature restrictions depending on the current consumption on the TM5 power bus:

- up to 500 mA: 0...60°C (32...140°F)
- over 500 mA: 0...55°C (32...131°F)

24 Vdc I/O Power Segment Characteristics

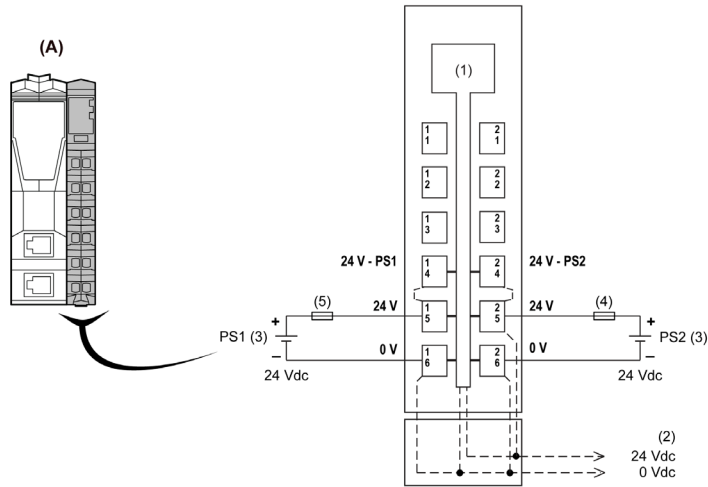
The table below provides the 24 Vdc I/O power segment characteristics of the TM5SPS3:

| 24 Vdc I/O Power Segment Characteristics | |
|--|---|
| Power supply range | 20.4...28.8 Vdc |
| Rated power supply voltage | 24 Vdc |
| Maximum current provided | 10 A |
| Reverse polarity protection | No |
| Short circuit protection | External fuse type T slow-blow 10 A maximum 250 V |
| Isolation between power segment and TM5 buses | See note ¹ |
| ¹ The isolation of the electronic module is 500 Vac RMS between the electronics powered by the TM5 bus and those powered by 24 Vdc I/O power segment connected to the module. In practice, the TM5 electronic module is installed in the bus base, and there is a bridge between the TM5 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. | |

TM5SPS3 Wiring Diagram

Wiring Diagram

The following figure shows the wiring diagram for the TM5SPS3 interface power distribution module:



- (A) Interface Power Distribution Module (IPDM)
- (1) Internal electronics
- (2) 24 Vdc I/O power segment integrated in the bus bases
- (3) PS1/PS2: External isolated power supply 24 Vdc
- (4) External fuse, Type T slow blow, 10 A max., 250 V
- (5) External fuse, Type T slow blow, 1 A, 250 V

⚠ WARNING

POTENTIAL OF OVERHEATING AND FIRE

- Do not connect the modules directly to line voltage.
- Use only isolating PELV systems according to IEC 61140 to supply power to the modules.

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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



!

%

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

C

CSA

(*Canadian standards association*) The Canadian standard for industrial electronic equipment in hazardous environments.

D

DIN

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

E

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

A device for length or angular measurement (linear or rotary encoders).

equipment

A part of a machine including sub-assemblies such as conveyors, turntables, and so on.

F

FAST I/O

FAST input/output Specific I/O modules with some electrical features (for example, response time) while the treatment of these channels are done directly by the controller

I

IEC

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

IP 20

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

IP 67

(ingress protection) The protection classification according to IEC 60529. IP 67 modules are protected against ingress of dust, contact, and water up to an immersion depth of 1 m.

M

ms

(millisecond)

N

network

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

S

Sercos

(serial real-time communications system) 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.

T

terminal block

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

U

UL

(*underwriters laboratories*) A US organization for product testing and safety certification.



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