

Modicon TM5

Sercos III Interface

Hardware Guide

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The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

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Safety Information

Important Information

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

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 V2.2.

The characteristics that are described in the present document, as well as those described in the documents included in the Related Documents section below, can be found online. To access the information online, go to the Schneider Electric home page www.se.com/ww/en/download/.

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.

For product compliance and environmental information (RoHS, REACH, PEP, EOL, etc.), go to www.se.com/ww/en/work/support/green-premium/.

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)
Modicon TM5 / TM7 Flexible System - System Planning and Installation Guide	EIO0000003161 (ENG)
	EIO0000003162 (FRE)
	EIO0000003163 (GER)
	EIO0000003164 (SPA)
	EIO0000003165 (ITA)
	EIO0000003166 (CHS)

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
<p>LOSS OF CONTROL</p> <ul style="list-style-type: none"> • Perform a Failure Mode and Effects Analysis (FMEA), or equivalent risk analysis, of your application, and apply preventive and detective controls before implementation. • Provide a fallback state for undesired control events or sequences. • Provide separate or redundant control paths wherever required. • Supply appropriate parameters, particularly for limits. • Review the implications of transmission delays and take actions to mitigate them. • Review the implications of communication link interruptions and take actions to mitigate them. • Provide independent paths for control functions (for example, emergency stop, over-limit conditions, and error conditions) according to your risk assessment, and applicable codes and regulations. • Apply local accident prevention and safety regulations and guidelines.¹ • Test each implementation of a system for proper operation before placing it into service. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

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
<p>UNINTENDED EQUIPMENT OPERATION</p> <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. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

Terminology Derived from Standards

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

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

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2023	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.

Standard	Description
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2021	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2021	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

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

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

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

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

Information on Non-Inclusive or Insensitive Terminology

As a responsible, inclusive company, Schneider Electric is constantly updating its communications and products that contain non-inclusive or insensitive terminology. However, despite these efforts, our content may still contain terms that are deemed inappropriate by some customers.

TM5 System General Rules for Implementing

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
<p>UNINTENDED EQUIPMENT OPERATION</p> <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. <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

Operating Environment

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

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

Installation Considerations

⚠ WARNING
<p>UNINTENDED EQUIPMENT OPERATION</p> <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.). <p>Failure to follow these instructions can result in death, serious injury, or equipment damage.</p>

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

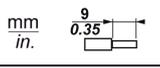
- Use shielded cables for all fast I/O, analog I/O and communication signals.
- Ground cable shields for all analog I/O, fast I/O and communication signals at a single point¹.
- Route communication and I/O cables separately from power cables.

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

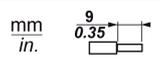
¹Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

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:

				
mm in.	mm ²	AWG	mm ²	AWG
	0,08...2,5	28...14	0,25...2,5	24...14
			0,25...1,5	24...16
			2 x 0,25...2 x 0,75	2 x 24...2 x 18

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

			
mm in.	mm ²	AWG	mm ²
	0,08...1,5	28...16	0,25...1,5
			0,25...0,75
			24...20

⚠ DANGER

FIRE HAZARD

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

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

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

⚠⚠ DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCK

Do not insert more than one wire per connector of the 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.

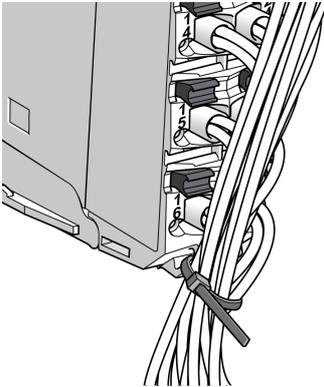
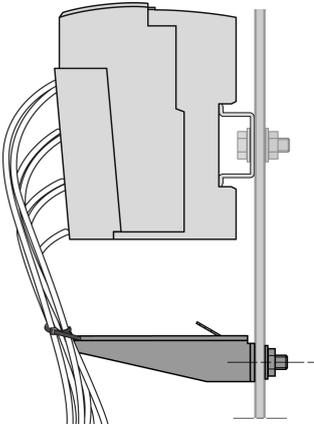
NOTE: To help prevent a terminal block from being inserted incorrectly, ensure that each terminal block and electronic module is clearly and uniquely coded.

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.)	
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	
<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>				

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⁾

Characteristic	Minimum Specification	Tested Range
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.</p> <p>Criteria B Brief interruption during the test allowed.</p> <p>(1) Applies for TM5SE1IC20005 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>		

TM5 Field Bus Interface General Overview

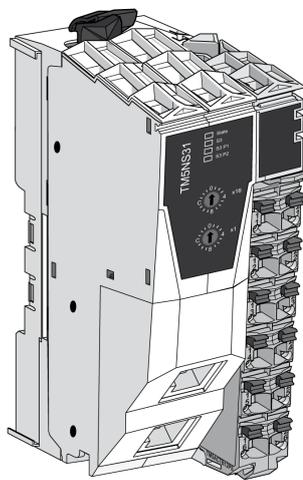
General Description

Introduction

The TM5 fieldbus interface with built-in power distribution is the first element of the TM5 distributed I/O island (see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide). 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 (see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide)	Bus base for fieldbus interface module and Interface Power Distribution Module (IPDM)

The table below provides the fieldbus interface module references:

Reference	Description
TM5NS31, page 21	SERCOS III interface module

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

Reference	Description
TM5SPS3, page 26	Fieldbus interface 24 Vdc power supply

The table below provides the terminal block reference:

Reference	Description
TM5ACTB12PS (see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide)	24 Vdc, 12-pin terminal block for PDM, IPDM and receiver electronic module

Physical Description

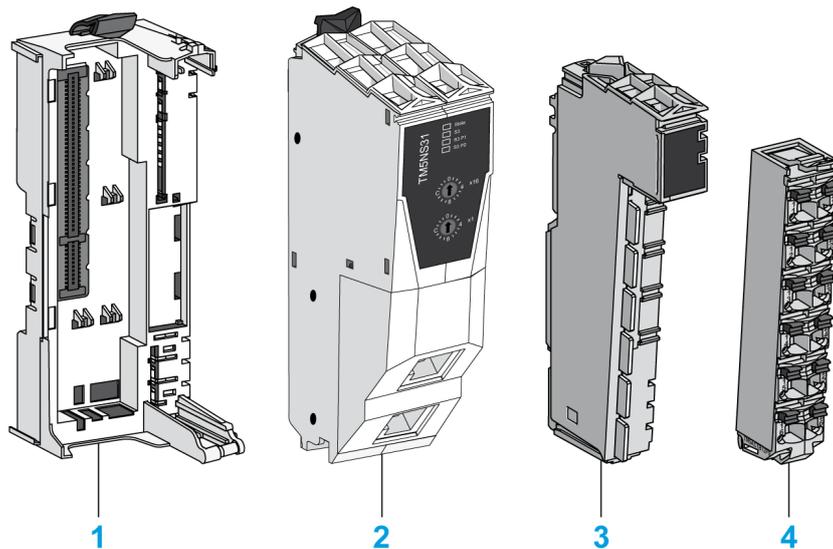
Introduction

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

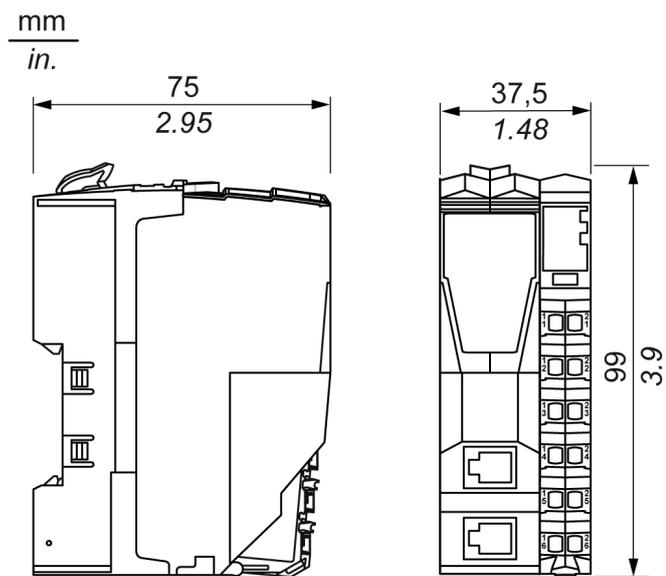
ELECTROSTATIC DISCHARGE

- 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 (see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide).

Labeling

Refer to the Labeling the TM5 System (see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide).

TM5 Field Bus Interface Installation

Introduction

This chapter describes the installation requirements, wiring rules, recommendations, first startup, dimensions and mounting position of the TM5 Field Bus Interface.

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, page 18.
3	Assemble the parts together.	For more information, refer to the Field Bus Interface Installation (see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide).
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 (see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide).
5	Install the expansion modules.	For more information, refer to the Slices Installation or Compact I/O Installation (see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide).
6	Connect the communication field bus interface	For more information, refer to TM5NS31 Wiring Diagram, page 25.
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, page 29.
9	Verify all connections.	—

TM5 Sercos III Interface Module

TM5NS31 Presentation

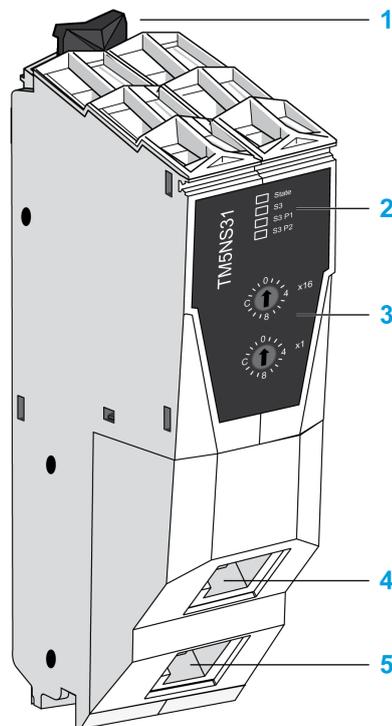
Main Characteristics

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 swap.
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. <p>NOTE: Diagnostic messages pending in the system are not acknowledged by these actions.</p>

Color	State	Description	Instructions
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. <p>NOTE: Diagnostic messages pending in the system are not acknowledged by these actions.</p>
Orange	On	The device is in a communication phase CP0 up to and including CP3 or HP0 (Hot Swap 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

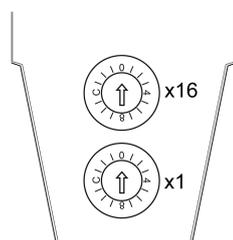
Sercos III Module Address

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:



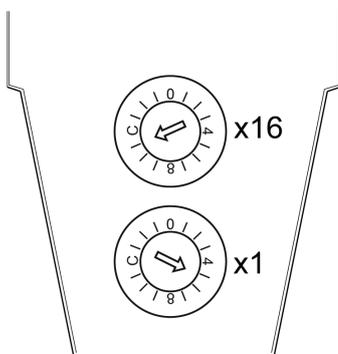
This table describes the addresses for Sercos III:

Addresses	Description
0 dec (0 hex)	Auto-addressing (not a valid address); address assigned by controller <ul style="list-style-type: none"> For PacDrive LMC controllers, 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⁾. For Modicon TM262M* controllers, the setting 0 is recognized, when the value <code>Topology mode</code> is selected for the parameter <code>IdentificationMode</code>⁽¹⁾.
1-255 dec (1-FF hex) ⁽¹⁾	Manual addressing <ul style="list-style-type: none"> For PacDrive LMC controllers, this setting is recognized when the value <code>SercosAddress</code> is selected for the parameter <code>IdentificationMode</code>⁽¹⁾. For Modicon TM262M* controllers, the setting is recognized when the value <code>Sercos mode</code> is selected for the parameter <code>IdentificationMode</code>⁽¹⁾.

(1) IdentificationMode 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)

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

TM5NS31 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)

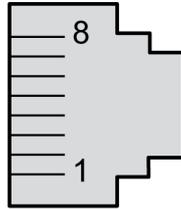
Electrical data:

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

TM5 Interface Power Distribution Module (IPDM)

TM5SPS3 Presentation

Main Characteristics

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

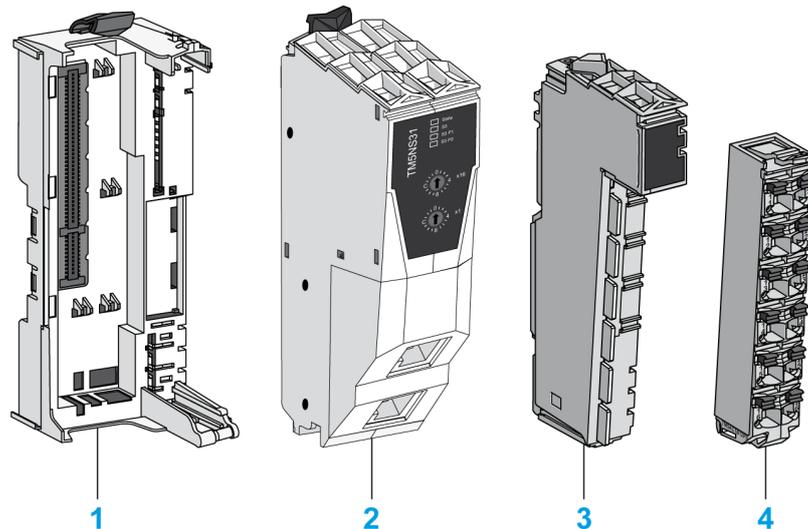
- A 24 Vdc main power that serves the electronics of the fieldbus interface module and generates independent power for the TM5 power bus that serves the expansion modules.
- A 24 Vdc I/O power segment that serves:
 - the expansion modules
 - the sensors and actuators connected to the expansion modules
 - 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:

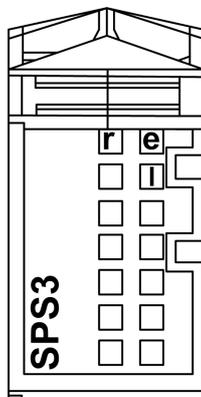


Number	Reference	Description	Color
1	TM5ACBN1	Bus base 24 Vdc I/O power segment left isolated	White
2	TM5NS31	Fieldbus interface Sercos III module	White
3	TM5SPS3	Fieldbus interface 24 Vdc power supply (Interface Power Distribution Module (IPDM))	Grey
4	TM5ACTB12PS	24 Vdc, 12-pin terminal block for PDM,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

NOTE: For more information, refer to *TM5 Bus Bases and Terminal Blocks* (see Modicon TM5 / TM7 Flexible System, System Planning and Installation Guide).

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 insufficient. TM5 power bus, via the external power supply or supplies, is insufficient.
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, page 15.

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:

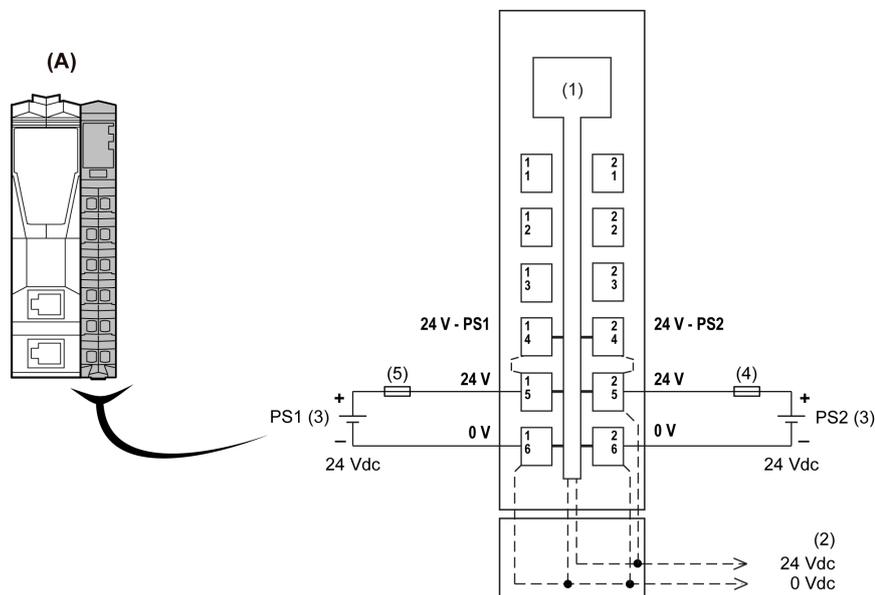
24 Vdc I/O Power Segment Characteristics	
Power supply range	20.4...28.8 Vdc
Rated power supply voltage	24 Vdc
Maximum current provided	10 A
Reverse polarity protection	No
Short circuit protection	External fuse type T slow-blow 10 A maximum 250 V
Isolation between power segment and TM5 buses	See note 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 maximum, 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.

Glossary

A

%:

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

CAN:

(*controller area network*) A protocol (ISO 11898) for serial bus networks, designed for the interconnection of smart devices (from multiple manufacturers) in smart systems and for real-time industrial applications. Originally developed for use in automobiles, CAN is now used in a variety of industrial automation control environments.

control network:

A network containing logic controllers, SCADA systems, PCs, HMI, switches, ...

Two kinds of topologies are supported:

- flat: all modules and devices in this network belong to same subnet.
- 2 levels: the network is split into an operation network and an inter-controller network.

These two networks can be physically independent, but are generally linked by a routing device.

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

encoder:

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

EN:

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

equipment:

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

Ethernet:

A physical and data link layer technology for LANs, also known as IEEE 802.3.

F**FAST I/O:**

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

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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