

Modicon TMC4

Cartridges

Programming Guide

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As part of a group of responsible, inclusive companies, we are updating our communications that contain non-inclusive terminology. Until we complete this process, however, our content may still contain standardized industry terms that may be deemed inappropriate by our customers.

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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 document describes the software configuration of the TMC4 cartridges for EcoStruxure Machine Expert. For further information, refer to the separate documents provided in the EcoStruxure Machine Expert online help.

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.

Related Documents

Title of Documentation	Reference Number
EcoStruxure Machine Expert Programming Guide	EIO0000002854 (ENG) EIO0000002855 (FRE) EIO0000002856 (GER) EIO0000002858 (SPA) EIO0000002857 (ITA) EIO0000002859 (CHS)
Modicon M241 Logic Controller - Programming Guide	EIO0000003059 (ENG) EIO0000003060 (FRE) EIO0000003061 (GER) EIO0000003062 (SPA) EIO0000003063 (ITA) EIO0000003064 (CHS)
Modicon TMC4 Cartridges - Hardware Guide	EIO0000003113 (ENG) EIO0000003114 (FRE) EIO0000003115 (GER) EIO0000003116 (SPA) EIO0000003117 (ITA) EIO0000003118 (CHS)
Modicon M241 Logic Controller - Hardware Guide	EIO0000003083 (ENG) EIO0000003084 (FRE) EIO0000003085 (GER) EIO0000003086 (SPA) EIO0000003087 (ITA) EIO0000003088 (CHS)

Product Related Information

⚠ WARNING

LOSS OF CONTROL

- 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.

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

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Terminology Derived from Standards

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

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

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2015	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.
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 62061:2015	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 61784-3:2016	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.

TMC4 Cartridges Configuration General Information

Introduction

This chapter provides general information to help you configure TMC4 cartridges for EcoStruxure Machine Expert.

I/O Configuration General Practices

Match Software and Hardware Configuration

The I/O that may be embedded in your controller is independent of the I/O that you may have added in the form of I/O expansion. It is important that the logical I/O configuration within your program matches the physical I/O configuration of your installation. If you add or remove any physical I/O to or from the I/O expansion bus or, depending on the controller reference, to or from the controller (in the form of cartridges), then you must update your application configuration. This is also true for any field bus devices you may have in your installation. Otherwise, there is the potential that the expansion bus or field bus no longer function while the embedded I/O that may be present in your controller continues to operate.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Update the configuration of your program each time you add or delete any type of I/O expansions on your I/O bus, or you add or delete any devices on your field bus.

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

General Description

Introduction

The TMC4 cartridges connect to Modicon M241 Logic Controllers to increase the number of I/Os available on the controller.

Cartridge Features

The following table describes the TMC4 cartridge features:

Reference	Description
TMC4AI2	TMC4 cartridge with 2 analog voltage or current inputs (0...10 V, 0...20 mA, 4...20 mA), 12 bits
TMC4TI2	TMC4 cartridge with 2 analog temperature inputs (thermocouple, RTD), 14 bits
TMC4AQ2	TMC4 cartridge with 2 analog voltage or current outputs (0...10 V, 4...20 mA), 16 bits
TMC4HOIS01	TMC4 application cartridge with 2 analog voltage or current inputs for hoisting load cells
TMC4PACK01	TMC4 application cartridge with 2 analog voltage or current inputs for packaging

Logic Controller Compatibility

The following table describes the number of TMC4 cartridges that can be installed in a Modicon M241 Logic Controller:

Reference	Cartridge Slots
TM241C24R	1
TM241CE24R	1
TM241CEC24R	1
TM241C24T	1
TM241CE24T	1
TM241CEC24T	1
TM241C24U	1
TM241CE24U	1
TM241CEC24U	1
TM241C40R	2
TM241CE40R	2
TM241C40T	2
TM241CE40T	2
TM241C40U	2
TM241CE40U	2

NOTE: For more information on cartridge compatibility with specific controllers, refer to your controller-specific hardware guide.

Adding Cartridges to a Configuration

Adding a Cartridge

TMC4 cartridges can be connected to Modicon M241 Logic Controllers with 1 or 2 available cartridge slots.

To add a cartridge to your configuration, select the cartridge in the **Hardware Catalog**, drag it to the **Devices tree**, and drop it on one of the highlighted nodes.

For more information on adding a device to your project, refer to:

- Using the Drag-and-drop Method (see EcoStruxure Machine Expert, Programming Guide)
- Using the Contextual Menu or Plus Button (see EcoStruxure Machine Expert, Programming Guide)

Configuring Cartridges

I/O Configuration

The configuration of a cartridge is carried out through the **I/O Mapping** and **I/O Configuration** tabs of the cartridge module.

To display the configuration tabs:

Step	Action
1	In the Devices tree , double-click the cartridge. The I/O Mapping tab appears.
2	Edit the parameters of the I/O Mapping tab to configure the addresses used by the cartridge module and diagnostic information.
3	Click the I/O Configuration tab to configure the cartridge. For details on the I/O Configuration tab, refer to the description of individual modules.

I/O Mapping Tab Description

The **I/O Mapping** tab allows you to:

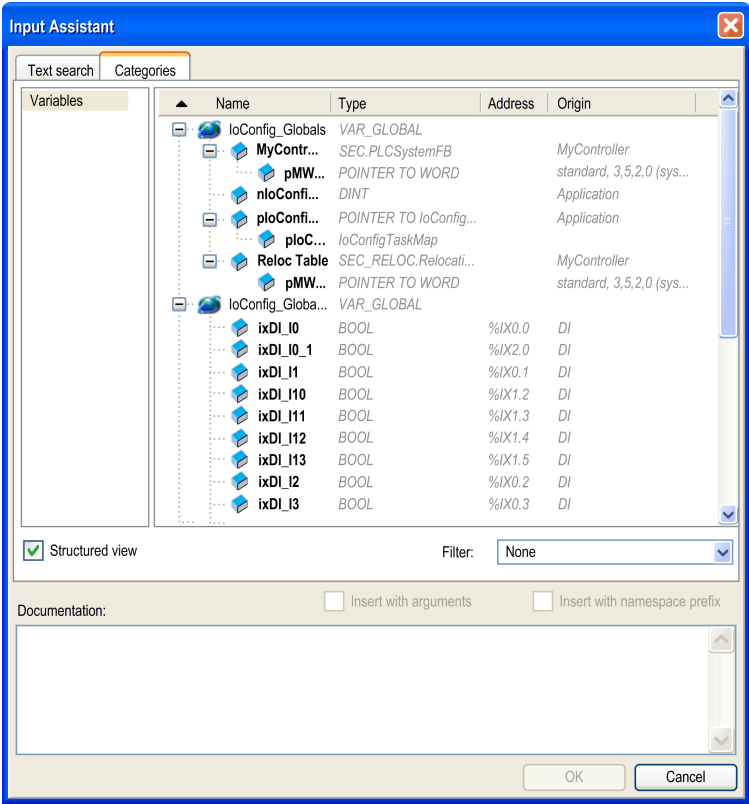
- Map input and output channels onto variables.
- View diagnostic information relating to the status of the cartridge.

This figure shows an example of the **I/O Mapping** tab:

I/O Mapping I/O Configuration Information								
Channels								
Variable	Mapping	Channel	Address	Type	Default Value	Unit	Description	
 Inputs								
		IW0	%IW2	INT				
		IW1	%IW3	INT				
 Diagnostic								
		IW2	%IB8	BYTE				
		Reserved	%IX8.0	BOOL			Reserved	
		Reserved	%IX8.1	BOOL			Reserved	
 ixModule_1_2...		24VFault	%IX8.2	BOOL			+24 V Power disable	
		Reserved	%IX8.3	BOOL			Reserved	
		Reserved	%IX8.4	BOOL			Reserved	
 ixModule_1_O...		OutOfRan...	%IX8.5	BOOL			Input out of range (CH0)	
 ixModule_1_O...		OutOfRan...	%IX8.6	BOOL			Input out of range (CH1)	
		Reserved	%IX8.7	BOOL			Reserved	

I/O Mapping for Inputs/Outputs

This table describes each parameter of the **I/O Mapping** tab for inputs and outputs:

Parameter	Description
Variable	Allows you to map the channel on a variable. NOTE: Expand the list of variables from the category Inputs or Outputs. You can map a channel by either creating a new variable or mapping to an existing variable. Create new variable: Double-click the variable to enter the new variable name. A new variable is created if the variable does not already exist. Map to existing variable: Double-click the variable and click [...] to open the Input Assistant window. Select the variable from the list and press OK. This figure shows the Input Assistant window: 
Mapping	Indicates whether the channel is mapped on a new variable or an existing variable.
Channel	Displays the channel name of the device.
Address	Displays the address of the channel. NOTE: If the channel is mapped to an existing variable, the corresponding address appears as strikethrough text in the table.
Type	Displays the data type of the channel.
Default Value	Indicates the value taken by the output when the controller is in a STOPPED or HALT state. Double-click the cell to change the default value.
Unit	Displays the unit of the channel value.
Description	Allows you to enter a short description of the channel.

Updating Cartridges Firmware

Introduction

The TMC4 cartridges have a firmware that you can update. The firmware update can only be done when the cartridge is mounted on the controller.

The firmware version of the cartridge can be seen in the *i_uiFirmwareVersion* variable of the *CART_R_STRUCT* (see Modicon M241 Logic Controller, System Functions and Variables, PLCSystem Library Guide) in the M241 PLCSystem Library Guide.

The cartridge firmware is delivered in *.bin* files.

Description

When the controller starts, it verifies whether there is a file named *cart1.bin* or *cart2.bin* in the */sys/OS* directory of the internal file system. If such a file is found, and if a cartridge is installed in the controller and configured, the firmware update of the cartridge starts.

NOTE: The firmware is only updated if the firmware file is different from the firmware of the cartridge.

The firmware update operation lasts approximately 10 seconds per cartridge.

Procedure

Follow this procedure to update the cartridge firmware:

Step	Action
1	Copy the <i>.bin</i> file onto the SD card (see Modicon M241 Logic Controller, Programming Guide).
2	Generate a script using the SD Card Mass Storage (see Modicon M241 Logic Controller, Programming Guide) editor and the Download command to store the <i>cart1.bin</i> file into the <i>/sys/OS</i> directory of the controller.
3	Insert the SD card into the controller and wait until the end of the download: • If the download ended successfully, the SD LED (green) is ON, and the ERR LED (red) flashes regularly. • If an error is detected, the SD LED (green) is OFF, and the ERR and I/O LEDs (red) flash regularly.
4	Remove the SD card and restart the controller. NOTE: The PWR LED of the cartridge is OFF to indicate that the firmware update is in progress.
5	Wait until the PWR LED of the cartridge illuminates or flashes, indicating that the firmware update is complete.

TMC4 Standard Cartridges

TMC4AI2

Introduction

The TMC4AI2 cartridge features 2 analog voltage or current input channels with 12-bit resolution.

The channel input types are:

- 0...10 V
- 0...20 mA
- 4...20 mA

For further hardware information, refer to TMC4AI2 (see Modicon TMC4, Cartridges, Hardware Guide).

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert, you may damage the analog circuit.

NOTICE

INOPERABLE EQUIPMENT

Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel.

Failure to follow these instructions can result in equipment damage.

I/O Mapping Tab

Refer to [Configuring Cartridges](#), page 10 for a description of how to configure the inputs and outputs of the module.

Variables can be defined and named in the **I/O Mapping** tab. Additional information such as topological addressing is also provided in this tab.

This table describes the **I/O Mapping** tab:

Variable	Channel	Type	Description
Inputs	iiTMC4AI2_IWO	INT	Value of the input 0
	iiTMC4AI2_IW1	INT	Value of the input 1
Diagnostic	ibTMC4AI2_IW2	BYTE	Status of the cartridge
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved
	24VFault	BOOL	+24 V power supply disabled
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved
	OutOfRange0	BOOL	Input out of range (channel 0)
	OutOfRange1	BOOL	Input out of range (channel 1)
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved

For further generic descriptions, refer to [I/O Mapping Tab Description](#), page 11.

I/O Configuration Tab

For each input, you can define:

Parameter		Value	Default Value	Description
Type		Not used 0 - 10 V 0 - 20 mA 4 - 20 mA	Not used	Select the mode of the channel.
Min.	0 - 10 V	-32768...32767	0	Specifies the lower measurement limit.
	0 - 20 mA		0	
	4 - 20 mA		4000	
Max.	0 - 10 V	-32768...32767	10000	Specifies the upper measurement limit.
	0 - 20 mA		20000	
	4 - 20 mA		20000	
Filter Level		No Filter Filter1 (Shortest) ... Filter6 (Longest)	No Filter	Specifies the digital filtering level to apply on this channel.

TMC4TI2

Introduction

The TMC4TI2 cartridge features 2 analog input channels with 14-bit resolution.

The channel input types are:

- K thermocouple
- J thermocouple
- R thermocouple
- S thermocouple
- B thermocouple
- E thermocouple
- T thermocouple
- N thermocouple
- PT100
- PT1000
- NI100
- NI1000

For further hardware information, refer to TMC4TI2 (see Modicon TMC4, Cartridges, Hardware Guide).

I/O Mapping Tab

Refer to [Configuring Cartridges](#), page 10 for a description of how to configure the inputs and outputs of the module.

Variables can be defined and named in the **I/O Mapping** tab. Additional information such as topological addressing is also provided in this tab.

This table describes the **I/O Mapping** tab:

Variable	Channel	Type	Description
Inputs	iiTMC4TI2_IW0	INT	Value of the input 0
	iiTMC4TI2_IW1	INT	Value of the input 1
	iiTMC4TI2_IW2	INT	Cold-junction (channel 0)
	iiTMC4TI2_IW3	INT	Cold-junction (channel 1)
Diagnostic	ibTMC4TI2_IW4	BYTE	Status of the cartridge
	BrokenWire0	BOOL	Input broken wire alert (channel 0)
	BrokenWire1	BOOL	Input broken wire alert (channel 1)
	24VFault	BOOL	+24 V power supply disabled
	ADCreinitialization	BOOL	0: input values are valid. 1: input values are not valid.
	Reserved	BOOL	Reserved
	OutOfRange0	BOOL	Input out of range (channel 0)
	OutOfRange1	BOOL	Input out of range (channel 1)
	Reserved	BOOL	Reserved

For further generic descriptions, refer to [I/O Mapping Tab Description](#), page 11.

I/O Configuration Tab

For each input, you can define:

Parameter	Value	Default Value	Description
Type	K Thermocouple J Thermocouple R Thermocouple S Thermocouple B Thermocouple E Thermocouple T Thermocouple N Thermocouple C Thermocouple PT100 PT1000 NI100 NI1000	K Thermocouple	Select the mode of the channel.
Scope	Customized Celsius (0.1°C) Fahrenheit (0.1°F)	Celsius (0.1°C)	Select the temperature units for a channel.
Minimum	See the table below		Specifies the lower measurement limit.
Maximum	See the table below		Specifies the upper measurement limit.
WireBrakeDetection	No Yes	No	Activates/deactivates broken wire detection on this channel.
ColdJunctionEnable	No Yes	Yes	For thermocouple inputs, activates/deactivates internal cold junction compensation on this channel. Cold junction compensation automatically corrects for temperature variations at the thermocouple reference junction.
RTD Wire Mode	2-wire 3-wire 4-wire	3-wire	For PT100, PT100, NI100, and NI1000 input types, select the resistor temperature detector (RTD) wiring mode.

Type	Celsius (0.1 °C)		Customized		Fahrenheit (0.1 °F)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
K Thermocouple	-2000	13000	-32768	32767	-3280	23720
J Thermocouple	-2000	10000	-32768	32767	-3280	18320
R Thermocouple	0	17600	-32768	32767	320	32000
S Thermocouple	0	17600	-32768	32767	320	32000
T Thermocouple	-2000	4000	-32768	32767	-3280	7520
B Thermocouple	0	18200	-32768	32767	7520	32720
E Thermocouple	-2000	8000	-32768	32767	-3280	14720
N Thermocouple	-2000	13000	-32768	32767	-3280	23720
PT100	-2000	8500	-32768	32767	-3280	15620
PT1000	-2000	8500	-32768	32767	-3280	15620
NI100	-600	1800	-32768	32767	-760	3560
NI1000	-600	1800	-32768	32767	-760	3560

TMC4AQ2

Introduction

The TMC4AQ2 cartridge features 2 voltage or current analog output channels with 16-bit resolution.

The channel output types are:

- 0...10 V
- 4...20 mA

For further hardware information, refer to TMC4AQ2 (see Modicon TMC4, Cartridges, Hardware Guide).

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert, you may damage the analog circuit.

NOTICE

INOPERABLE EQUIPMENT

Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel.

Failure to follow these instructions can result in equipment damage.

I/O Mapping Tab

Refer to [Configuring Cartridges](#), page 10 for a description of how to configure the inputs and outputs of the module.

Variables can be defined and named in the **I/O Mapping** tab. Additional information such as topological addressing is also provided in this tab.

This table describes the **I/O Mapping** tab:

Variable	Channel	Type	Description
Outputs	qiTMC4AQ2_QWO	INT	Value of the output 0
	qiTMC4AQ2_QW1	INT	Value of the output 1
Diagnostic	ibTMC4AQ2_IWO	BYTE	Status of the cartridge
	BrokenWire0	BOOL	Output broken wire alert (channel 0)
	BrokenWire1	BOOL	Output broken wire alert (channel 1)
	24VFault	BOOL	+24 V power supply disabled
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved

For further generic descriptions, refer to *I/O Mapping Tab Description*, page 11.

I/O Configuration Tab

For each output, you can define:

Parameter		Value	Default Value	Description
Type		Not Used 0 - 10 V 4 - 20 mA	Not Used	The mode of the channel.
Min.	0 - 10 V	-32768...32767	0	Specifies the lower measurement limit.
	4 - 20 mA	-32768...32767	4000	
Max.	0 - 10 V	-32768...32767	10000	Specifies the upper measurement limit.
	4 - 20 mA	-32768...32767	20000	

TMC4 Application Cartridges

TMC4HOIS01

Introduction

The TMC4HOIS01 cartridge features 2 analog voltage or current input channels with 12-bit resolution.

The channel input types are:

- 0...10 V
- 0...20 mA
- 4...20 mA

For further hardware information, refer to TMC4HOIS01 (see Modicon TMC4, Cartridges, Hardware Guide).

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert, you may damage the analog circuit.

NOTICE

INOPERABLE EQUIPMENT

Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel.

Failure to follow these instructions can result in equipment damage.

I/O Mapping Tab

Refer to [Configuring Cartridges](#), page 10 for a description of how to configure the inputs and outputs of the module.

Variables can be defined and named in the **I/O Mapping** tab. Additional information such as topological addressing is also provided in this tab.

This table describes the **I/O Mapping** tab:

Variable	Channel	Type	Description
Inputs	iiTMC4HOIS01_IW0	INT	Value of the input 0
	iiTMC4HOIS01_IW1	INT	Value of the input 1
Diagnostic	ibTMC4HOIS01_IW2	BYTE	Status of the cartridge
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved
	24VFault	BOOL	+24 V power supply disabled
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved
	OutOfRange0	BOOL	Input out of range (channel 0)
	OutOfRange1	BOOL	Input out of range (channel 1)
	Reserved	BOOL	Reserved

For further generic descriptions, refer to [I/O Mapping Tab Description](#), page 11.

I/O Configuration Tab

For each input, you can define:

Parameter		Value	Default Value	Description
Type		Not used 0 - 10 V 0 - 20 mA 4 - 20 mA	Not used	Select the mode of the channel.
Min.	0 - 10 V	-32768...32767	0	Specifies the lower measurement limit.
	0 - 20 mA		0	
	4 - 20 mA		4000	
Max.	0 - 10 V	-32768...32767	10000	Specifies the upper measurement limit.
	0 - 20 mA		20000	
	4 - 20 mA		20000	
Filter Level		No Filter Filter1 (Shortest) ... Filter6 (Longest)	No Filter	Specifies the digital filtering level to apply on this channel.

TMC4PACK01

Introduction

The TMC4PACK01 cartridge module features 2 analog voltage or current input channels with 12-bit resolution.

The channel input types are:

- 0...10 V
- 0...20 mA
- 4...20 mA

For further hardware information, refer to TMC4PACK01 (see Modicon TMC4, Cartridges, Hardware Guide).

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal in EcoStruxure Machine Expert, you may damage the analog circuit.

NOTICE

INOPERABLE EQUIPMENT

Verify that the physical wiring of the analog circuit is compatible with the software configuration for the analog channel.

Failure to follow these instructions can result in equipment damage.

I/O Mapping Tab

Refer to [Configuring Cartridges](#), page 10 for a description of how to configure the inputs and outputs of the module.

Variables can be defined and named in the **I/O Mapping** tab. Additional information such as topological addressing is also provided in this tab.

This table describes the **I/O Mapping** tab:

Variable	Channel	Type	Description
Inputs	iiTMC4PACK01_IW0	INT	Value of the input 0
	iiTMC4PACK01_IW1	INT	Value of the input 1
Diagnostic	ibTMC4PACK01_IW2	BYTE	Status of the cartridge
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved
	24VFault	BOOL	+24 V power supply disabled
	Reserved	BOOL	Reserved
	Reserved	BOOL	Reserved
	OutOfRange0	BOOL	Input out of range (channel 0)
	OutOfRange1	BOOL	Input out of range (channel 1)
	Reserved	BOOL	Reserved

For further generic descriptions, refer to [I/O Mapping Tab Description](#), page 11.

I/O Configuration Tab

For each input, you can define:

Parameter		Value	Default Value	Description
Type		Not used 0 - 10 V 0 - 20 mA 4 - 20 mA	Not used	Select the mode of the channel.
Min.	0 - 10 V	-32768...32767	0	Specifies the lower measurement limit.
	0 - 20 mA		0	
	4 - 20 mA		4000	
Max.	0 - 10 V	-32768...32767	10000	Specifies the upper measurement limit.
	0 - 20 mA		20000	
	4 - 20 mA		20000	
Filter Level		No Filter Filter1 (Shortest) ... Filter6 (Longest)	No Filter	Specifies the digital filtering level to apply on this channel.

Glossary

A

analog input:

Converts received voltage or current levels into numerical values. You can store and process these values within the logic controller.

analog output:

Converts numerical values within the logic controller and sends out proportional voltage or current levels.

application:

A program including configuration data, symbols, and documentation.

B

BOOL:

(*boolean*) A basic data type in computing. A `BOOL` variable can have one of these values: 0 (`FALSE`), 1 (`TRUE`). A bit that is extracted from a word is of type `BOOL`; for example, `%MW10 . 4` is a fifth bit of memory word number 10.

byte:

A type that is encoded in an 8-bit format, ranging from 00 hex to FF hex.

C

configuration:

The arrangement and interconnection of hardware components within a system and the hardware and software parameters that determine the operating characteristics of the system.

controller:

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

E

equipment:

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

expansion bus:

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

F

firmware:

Represents the BIOS, data parameters, and programming instructions that constitute the operating system on a controller. The firmware is stored in non-volatile memory within the controller.

I

I/O:

(*input/output*)

IEC:

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

INT:

(integer) A whole number encoded in 16 bits.

L

LED:

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

N

node:

An addressable device on a communication network.

O

OS:

(operating system) A collection of software that manages computer hardware resources and provides common services for computer programs.

P

program:

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

S

symbol:

A string of a maximum of 32 alphanumeric characters, of which the first character is alphabetic. It allows you to personalize a controller object to facilitate the maintainability of the application.

V

variable:

A memory unit that is addressed and modified by a program.

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