

# Modicon TMC4

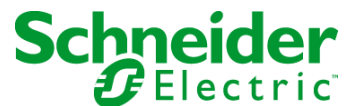
## Cartridges

### Programming Guide

04/2017

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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

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## Important Information

### NOTICE

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

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## PLEASE NOTE

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

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

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# About the Book

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## At a Glance

### Document Scope

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

### Validity Note

This document has been updated for the release of SoMachine V4.3.

### Related Documents

Title of Documentation	Reference Number
SoMachine Programming Guide	<a href="#"><u>EIO0000000067 (ENG)</u></a> <a href="#"><u>EIO0000000069 (FRE)</u></a> <a href="#"><u>EIO0000000068 (GER)</u></a> <a href="#"><u>EIO0000000071 (SPA)</u></a> <a href="#"><u>EIO0000000070 (ITA)</u></a> <a href="#"><u>EIO0000000072 (CHS)</u></a>
Modicon M241 Logic Controller - Programming Guide	<a href="#"><u>EIO0000001432 (ENG)</u></a> <a href="#"><u>EIO0000001433 (FRE)</u></a> <a href="#"><u>EIO0000001434 (GER)</u></a> <a href="#"><u>EIO0000001435 (SPA)</u></a> <a href="#"><u>EIO0000001436 (ITA)</u></a> <a href="#"><u>EIO0000001437 (CHS)</u></a>
Modicon TMC4 Cartridges - Hardware Guide	<a href="#"><u>EIO0000001776 (ENG)</u></a> <a href="#"><u>EIO0000001777 (FRE)</u></a> <a href="#"><u>EIO0000001778 (GER)</u></a> <a href="#"><u>EIO0000001779 (SPA)</u></a> <a href="#"><u>EIO0000001780 (ITA)</u></a> <a href="#"><u>EIO0000001781 (CHS)</u></a>
Modicon M241 Logic Controller - Hardware Guide	<a href="#"><u>EIO0000001456 (ENG)</u></a> <a href="#"><u>EIO0000001457 (FRE)</u></a> <a href="#"><u>EIO0000001458 (GER)</u></a> <a href="#"><u>EIO0000001459 (SPA)</u></a> <a href="#"><u>EIO0000001460 (ITA)</u></a> <a href="#"><u>EIO0000001461 (CHS)</u></a>

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## Product Related Information

### WARNING

#### LOSS OF CONTROL

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

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

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

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

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

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



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## Terminology Derived from Standards

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

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

Among others, these standards include:

Standard	Description
EN 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2008	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 1088:2008 ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2006	Safety of machinery - Emergency stop - Principles for design
EN/IEC 62061:2005	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2008	Digital data communication for measurement and control: Functional safety field buses.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

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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.

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# Chapter 1

## Cartridge Configuration General Information

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### Introduction

This chapter provides general information to help you configure TMC4 cartridges for SoMachine.

### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
I/O Configuration General Practices	12
General Description	13
Adding Cartridges to a Configuration	15
Configuring Cartridges	16
Updating Cartridges Firmware	19

## 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 will no longer function while the embedded I/O that may be present in your controller will continue to operate.

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

## 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

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

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

## Cartridge Configuration General Information

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Reference	Cartridge Slots
TM241C40U	2
TM241CE40U	2

## 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 SoMachine, Programming Guide*)
- Using the Contextual Menu or Plus Button (*see SoMachine, 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 <b>Devices tree</b> , double-click the <b>Cartridge_<i>n</i></b> subnode of the controller, where <i>n</i> is a unique identifier of the cartridge. The <b>I/O Mapping</b> tab appears.
2	Edit the parameters of the <b>I/O Mapping</b> tab to configure the addresses used by the cartridge module and diagnostic information.
3	Click the <b>I/O Configuration</b> tab to configure the cartridge. For details on the <b>I/O Configuration</b> 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 current status of the cartridge.

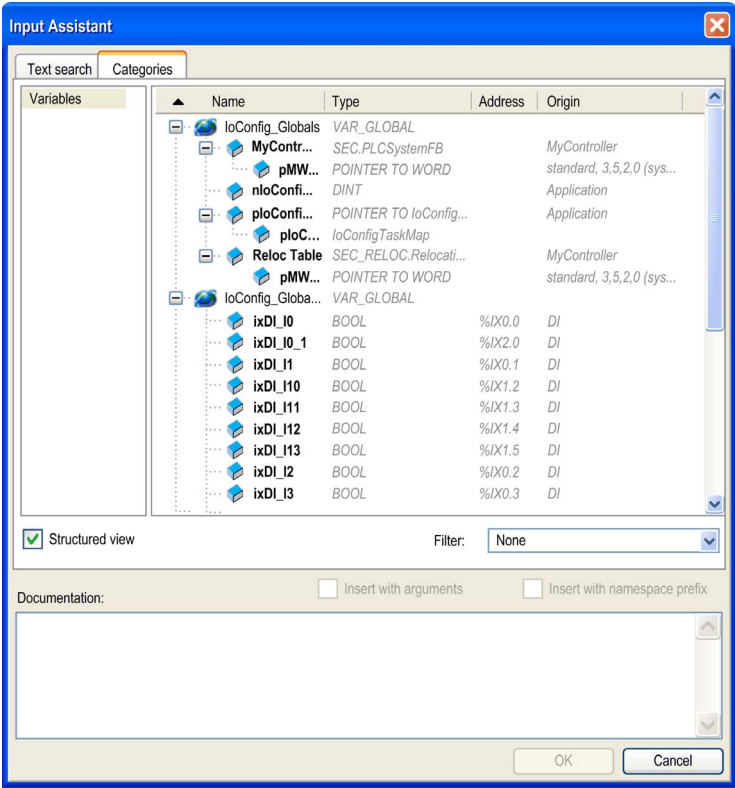
This figure shows an example of the **I/O Mapping** tab:

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
<b>Variable</b>	<p>Allows you to map the channel on a variable.</p> <p><b>NOTE:</b> Expand the list of variables from the category <b>Inputs</b> or <b>Outputs</b>.</p> <p>You can map a channel by either creating a new variable or mapping to an existing variable.</p> <p><b>Create new variable:</b> Double-click the variable to enter the new variable name. A new variable is created if the variable does not already exist.</p> <p><b>Map to existing variable:</b> Double-click the variable and click [...] to open the <b>Input Assistant</b> window. Select the variable from the list and press <b>OK</b>. This figure shows the <b>Input Assistant</b> window:</p>  <p>The screenshot shows the 'Input Assistant' dialog box with a 'Categories' tab selected. It displays a tree view of variables under 'IoConfig_Globals'. The tree includes sub-categories like 'MyContr...', 'nIoConf...', 'ploConf...', 'Reloc Table', and 'pMW...'. Under 'IoConfig_Globals', there is a list of variables: 'ixDI_10' through 'ixDI_13'. Each variable has a 'Type' (e.g., BOOL) and an 'Address' (e.g., %IX0.0). The 'Origin' column shows 'DI' for all. At the bottom, there are checkboxes for 'Structured view' (checked), 'Insert with arguments', and 'Insert with namespace prefix'. There are 'OK' and 'Cancel' buttons at the bottom right.</p>
<b>Mapping</b>	Indicates whether the channel is mapped on a new variable or an existing variable.

Parameter	Description
Channel	Displays the channel name of the device.
Address	Displays the address of the channel. <b>NOTE:</b> If the channel is mapped to an existing variable, 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 <b>STOPPED</b> or <b>HALT</b> 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 checks if 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 current firmware of the cartridge. The firmware file is not automatically deleted from the `/sys/OS` directory.

The firmware update operation lasts approximately 10 seconds per cartridge.

### Procedure

Follow this procedure to update the cartridge firmware:

Step	Action
1	Copy the <code>.bin</code> file onto the SD card (see <i>Modicon M241 Logic Controller, Programming Guide</i> ).
2	Generate a script using the SD Card Mass Storage (see <i>Modicon M241 Logic Controller, Programming Guide</i> ) editor and the <b>Download</b> command to store the <code>cart1.bin</code> file into the <code>/sys/OS</code> directory of the controller.
3	Insert the SD card into the controller.
4	Restart the controller. <b>NOTE:</b> The <b>PWR</b> LED of the cartridge is OFF to indicate that the firmware update is in progress.
5	Wait until the <b>PWR</b> LED of the cartridge is ON or flashing, indicating that the firmware update is complete.



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# Chapter 2

## TMC4 Standard Cartridges

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### What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
TMC4AI2	22
TMC4TI2	24
TMC4AQ2	27

## 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 SoMachine, 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 (*see page 16*) 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	Current value of the input 0
	iiTMC4AI2_IW1	INT	Current value of the input 1

Variable	Channel	Type	Description
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

For further generic descriptions, refer to I/O Mapping Tab Description ([see page 16](#)).

### I/O Configuration Tab

For each input, you can define:

Parameter		Value	Default Value	Description
<b>Type</b>		<b>Not used</b> 0 - 10 V 0 - 20 mA 4 - 20 mA	<b>Not used</b>	Choose the mode of the channel.
<b>Min.</b>	0 - 10 V	-32768...32767	0	Specifies the lower measurement limit.
	0 - 20 mA		0	
	4 - 20 mA		4000	
<b>Max.</b>	0 - 10 V	-32768...32767	10000	Specifies the upper measurement limit.
	0 - 20 mA		20000	
	4 - 20 mA		20000	
<b>Filter Level</b>		<b>No Filter</b> <b>Filter1 (Shortest)</b> ... <b>Filter6 (Longest)</b>	<b>No Filter</b>	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 (*see page 16*) 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_IWO	INT	Current value of the input 0
	iiTMC4TI2_IW1	INT	Current value of the input 1
	iiTMC4TI2_IW2	INT	Cold-junction (channel 0)
	iiTMC4TI2_IW3	INT	Cold-junction (channel 1)



Variable	Channel	Type	Description
Diagnostic	ibTMC4TI2_IW4	BYTE	Status of the cartridge
	BrokenWire0	BOOL	Input broken wire warning (channel 0)
	BrokenWire1	BOOL	Input broken wire warning (channel 1)
	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 ([see page 16](#)).

### I/O Configuration Tab

For each input, you can define:

Parameter	Value	Default Value	Description
<b>Type</b>	K Thermocouple J Thermocouple R Thermocouple S Thermocouple B Thermocouple E Thermocouple T Thermocouple N Thermocouple C Thermocouple PT100 PT1000 NI100 NI1000	K Thermocouple	Choose the mode of the channel.
<b>Scope</b>	Customized Celsius (0.1°C) Fahrenheit (0.1°F)	Celsius (0.1°C)	Choose the temperature units for a channel.
<b>Minimum</b>	See the table below		Specifies the lower measurement limit.
<b>Maximum</b>	See the table below		Specifies the upper measurement limit.
<b>WireBrakeDetection</b>	No Yes	No	Whether to activate broken wire detection on this channel.

Parameter	Value	Default Value	Description
ColdJunctionEnable	No Yes	Yes	For thermocouple inputs, whether to activate 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, choose the resistor temperature detector (RTD) wiring mode to use.

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 SoMachine, 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 (*see page 16*) 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	Current value of the output 0
	qiTMC4AQ2_QW1	INT	Current value of the output 1

Variable	Channel	Type	Description
Diagnostic	ibTMC4AQ2_IWO	BYTE	Status of the cartridge
	BrokenWire0	BOOL	Current output broken wire warning (channel 0)
	BrokenWire1	BOOL	Current output broken wire warning (channel 1)
	24VFault	BOOL	+24 V power supply disabled
	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 (*see page 16*).

### I/O Configuration Tab

For each output, you can define:

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

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# Chapter 3

## TMC4 Application Cartridges

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### What Is in This Chapter?

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## 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 SoMachine, 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 (*see page 16*) 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	Current value of the input 0
	iiTMC4HOIS01_IW1	INT	Current 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
	Reserved	BOOL	Reserved

For further generic descriptions, refer to I/O Mapping Tab Description (*see page 16*).

### I/O Configuration Tab

For each input, you can define:

Parameter		Value	Default Value	Description
<b>Type</b>		<b>Not used</b> 0 - 10 V 0 - 20 mA 4 - 20 mA	<b>Not used</b>	Choose the mode of the channel.
<b>Min.</b>	0 - 10 V	-32768...32767	0	Specifies the lower measurement limit.
	0 - 20 mA		0	
	4 - 20 mA		4000	
<b>Max.</b>	0 - 10 V	-32768...32767	10000	Specifies the upper measurement limit.
	0 - 20 mA		20000	
	4 - 20 mA		20000	
<b>Filter Level</b>		<b>No Filter</b> <b>Filter1 (Shortest)</b> ... <b>Filter6 (Longest)</b>	<b>No Filter</b>	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 SoMachine, 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 (*see page 16*) 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	Current value of the input 0
	iiTMC4PACK01_IW1	INT	Current 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
	Reserved	BOOL	Reserved

For further generic descriptions, refer to I/O Mapping Tab Description (*see page 16*).

### I/O Configuration Tab

For each input, you can define:

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



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# Glossary

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## 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.

## 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

### **expansion bus**

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

## I

### **I/O**

*(input/output)*

## P

### **program**

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





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