Modicon Edge I/O NTS

Analog Modules

User Guide

Original instructions

Schneider Electric

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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.

Before You Begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠ **WARNING**

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.

- Do not reach into machinery during operation.

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

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

> **NOTE:** Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

Start-up and Test

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check are made and that enough time is allowed to perform complete and satisfactory testing.

⚠ **WARNING**

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.

- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.

- Remove tools, meters, and debris from equipment.

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

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

Operation and Adjustments

The following precautions are from the NEMA Standards Publication ICS 7.1-1995:

(In case of divergence or contradiction between any translation and the English original, the original text in the English language will prevail.)

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.

- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.

- Only those operational adjustments required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book

Document Scope

This guide describes the implementation of Modicon Edge I/O NTS analog modules. It provides the description, characteristics, wiring diagrams and configuration details for Modicon Edge I/O NTS analog modules.

Validity Note

This document has been updated for the release of Modicon Edge I/O NTS analog modules firmware V1.0.0.

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

The characteristics of the products described in this document are intended to match the characteristics that are available on www.se.com. As part of our corporate strategy for constant improvement, we may revise the content over time to enhance clarity and accuracy. If you see a difference between the characteristics in this document and the characteristics on www.se.com, consider www.se.com to contain the latest information.

Related Documents

Title of documentation	Reference number
Modicon Edge I/O - System Planning and Installation Guide	EIO0000004786 (ENG)
Modicon Edge I/O - Configurator and Web Interface - User Guide	EIO0000004810 (ENG)
Modicon Edge I/O - Software Integration and Compatibility - User Guide	EIO0000004818 (ENG)
Modicon Edge I/O - Diagnostic Data - User Guide	EIO0000004826 (ENG)
Modicon Edge I/O NTS - Network Interface Modules - User Guide	EIO0000004794 (ENG)
Modicon Edge I/O NTS - Discrete Modules - User Guide	EIO0000005238 (ENG)
Modicon Edge I/O NTS - Counting Modules - User Guide	EIO0000005262 (ENG)
Modicon Edge I/O NTS - Field Device Master Modules - User Guide	EIO0000005270 (ENG)

To find documents online, visit the Schneider Electric download center (www.se.com/ww/en/download/).

Product Related Information

⚠⚡⚠ **DANGER**
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH
• Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
• Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
• Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the equipment.
• 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.

⚠ **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.

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.

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 61496-1:2020	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 62061:2021	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.

General Overview

The range of Modicon Edge I/O NTS analog modules includes:

- Input modules, page 13
- Output modules, page 14

NOTE: References with an H are hardened devices, suitable for harsh environments.

NOTE: The terminal blocks are purchased separately. The compatible terminal block reference is printed on the front of the module.

Analog Input Modules

The following table shows the analog input modules, with the corresponding description and terminal type:

Reference	Number of Channels	Channel Type	Accuracy at 25 °C (77 °F)	Mode	Terminal Type / Pitch
NTSAMI0210, page 16/ NTSAMI0210H, page 16	2	Isolated inputs with loop power	0.05 %	± 10 Vdc 0...10 Vdc ± 5 Vdc 0...5 Vdc 1...5 Vdc ± 20 mA 0...20 mA 4...20 mA	Removable screw/spring terminal block / 5 mm
NTSAMI0400, page 35	4	Single-ended inputs	0.3 %	± 10 Vdc 0...10 Vdc ± 5 Vdc 0...5 Vdc 1...5 Vdc ± 20 mA 0...20 mA 4...20 mA	Removable screw/spring terminal block / 5 mm
NTSACI0802X, page 48/ NTSACI0802XH, page 48	8	Single-ended inputs with loop power	0.1 %	± 20 mA 0...20 mA 4...20 mA	Removable screw/spring terminal block / 5 mm

Analog Output Modules

The following table shows the analog output modules, with the corresponding description and terminal type:

Reference	Number of Channels	Channel Type	Accuracy at 25 °C (77 °F)	Mode	Terminal Type / Pitch
NTSAMO0400, page 65/ NTSAMO0400H, page 65	4	Outputs	0.1 %	± 10 Vdc 0...10 Vdc ± 5 Vdc 0...5 Vdc 1...5 Vdc 0...20 mA 4...20 mA	Removable screw/spring terminal block / 5 mm

Analog Input Modules

What's in This Part

Analog Modules

NTSAMI0210/NTSAMI0210H Analog Input Module, 2
Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power,
Standard/Hardened

NTSAMI0210/NTSAMI0210H Analog Input Module, 2 Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power, Standard/Hardened

What's in This Chapter

NTSAMI0210/NTSAMI0210H Presentation

Overview

This section provides a presentation of the NTSAMI0210/NTSAMI0210H input modules.

Main Characteristics

The following table describes the main characteristics of the NTSAMI0210/NTSAMI0210H input modules:

Main Characteristics	Value
Product or component type	Analog current and voltage input module
Number of channels	2
Channel property	Channel isolated
Channel signal	Current or voltage
Operating mode	Synchronous, isochronous and asynchronous

NTSAMI0210/NTSAMI0210H Analog Input Module, 2 Isolated
Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power, Standard/
Hardened

Analog Modules

Purchasing Information

The following figures show the elements of the Modicon Edge I/O NTS
NTSAMI0210/NTSAMI0210H input modules:

NTSAMI0210

Number	Reference	Description
1	NTSAMI0210K	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSAMI0210	Analog Input Module, 2 Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power
4	NTSXTB12200H	Spring Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12201H	Spring Terminal Block, 12 Points, 5 mm Pitch, With Cover, use on Low Height Module, Hardened
	NTSXTB12000H	Screw Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12001H	Screw Terminal Block, 12 Points, 5 mm Pitch, With cover, use on Low Height Module, Hardened **NOTE:** The terminal blocks are purchased separately.

NOTE: For more information on accessories and spare parts, refer to Modicon
Edge I/O - System Planning and Installation Guide.

Analog Modules

NTSAMI0210/NTSAMI0210H Analog Input Module, 2
Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power,
Standard/Hardened

NTSAMI0210H

Number	Reference	Description
1	NTSAMI0210HK	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0200H	Spare Base, 2 Slots, for Input/Output Common/Expert/Safety Module, Hardened
3	NTSAMI0210H	Analog Input Module, 2 Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power, Hardened
4	NTSXTB12200H	Spring Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12201H	Spring Terminal Block, 12 Points, 5 mm Pitch, With Cover, use on Low Height Module, Hardened
	NTSXTB12000H	Screw Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12001H	Screw Terminal Block, 12 Points, 5 mm Pitch, With cover, use on Low Height Module, Hardened
		NOTE: The terminal blocks are purchased separately.

NOTE: For more information on accessories and spare parts, refer to Modicon Edge I/O - System Planning and Installation Guide.

NTSAMI0210/NTSAMI0210H Analog Input Module, 2 Isolated
Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power, Standard/
Hardened

Analog Modules

Physical Description

NTSAMI0210

The following figure presents the elements of the module:
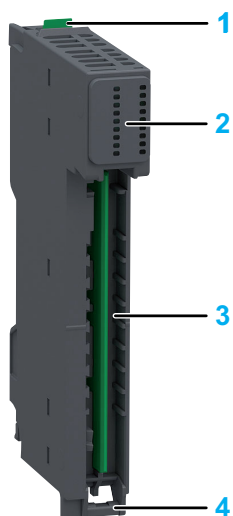
1: Release button for disengaging the module from the base
2: Status LEDs
3: Slot for the terminal block
4: Hinge for the terminal block installation

NTSAMI0210H

The following figure presents the elements of the module:

1: Release button for disengaging the module from the base
2: Status LEDs
3: Slot for the terminal block
4: Hinge for the terminal block installation

Analog Modules

NTSAMI0210/NTSAMI0210H Analog Input Module, 2
Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power,
Standard/Hardened

Status LEDs

The following figure presents the status LEDs:

The following table describes the system status of LEDs:

R (Green)	E (Red)	Channel (Green)	Description
Initialization and non-operational states			
OFF	OFF	OFF	Indicates that the module is not energized.
OFF	Fast Flash	-	Indicates that the module has detected a system error.
Regular Flash	OFF	-	Indicates that the firmware is being updated.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the channel is activated.
ON	-	OFF	Indicates that the channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates that an error is detected in the 24 Vdc field power.
ON	Regular Flash	Regular Flash	Indicates: • Broken wire detection. • 24 Vdc loop power error detection. • Overflow/underflow error detection.
ON	Regular Flash	OFF	Indicates an internal error detection.

The following graphic shows the system status of LEDs during module operation:

NTSAMI0210/NTSAMI0210H Analog Input Module, 2 Isolated
Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power, Standard/
Hardened

Analog Modules

NTSAMI0210/NTSAMI0210H Characteristics

Overview

This section provides a general description of the characteristics of the module.

⚠ **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.

For more information on environmental characteristics, refer to Modicon Edge I/O - System Planning and Installation Guide.

Dimensions

NTSAMI0210

The following figure presents the external dimensions of the assembled module:

a: 15 mm (0.59 in)
b: 116.6 mm (4.57 in)
c: 107.5 mm (4.21 in)
c1: 88.2 mm (3.46 in)
c2: 5.6 mm (0.2 in)

Analog Modules

NTSAMI0210/NTSAMI0210H Analog Input Module, 2
Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power,
Standard/Hardened
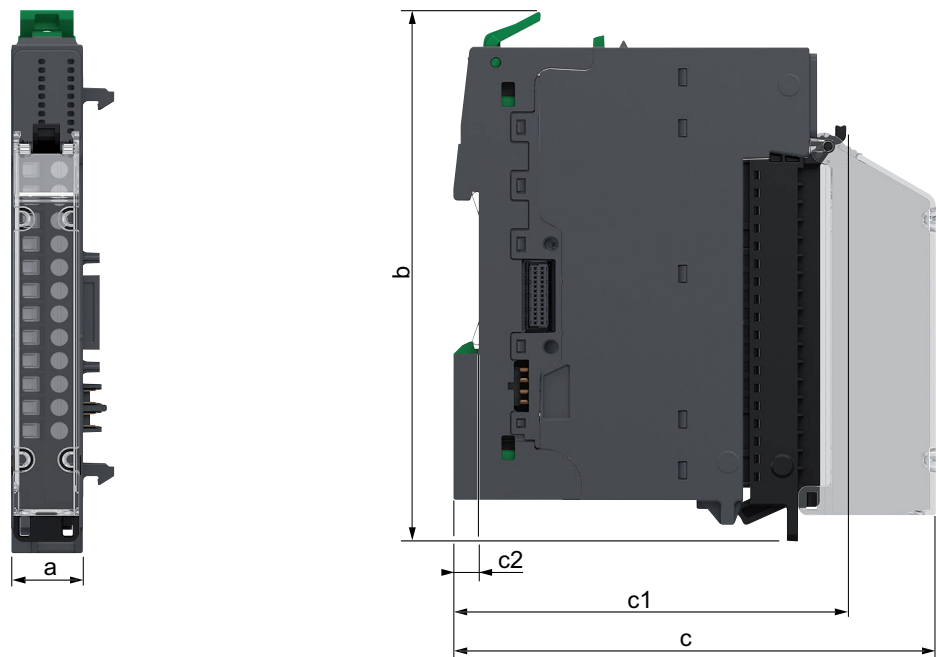
NTSAMI0210H

The following figure presents the external dimensions of the assembled module:
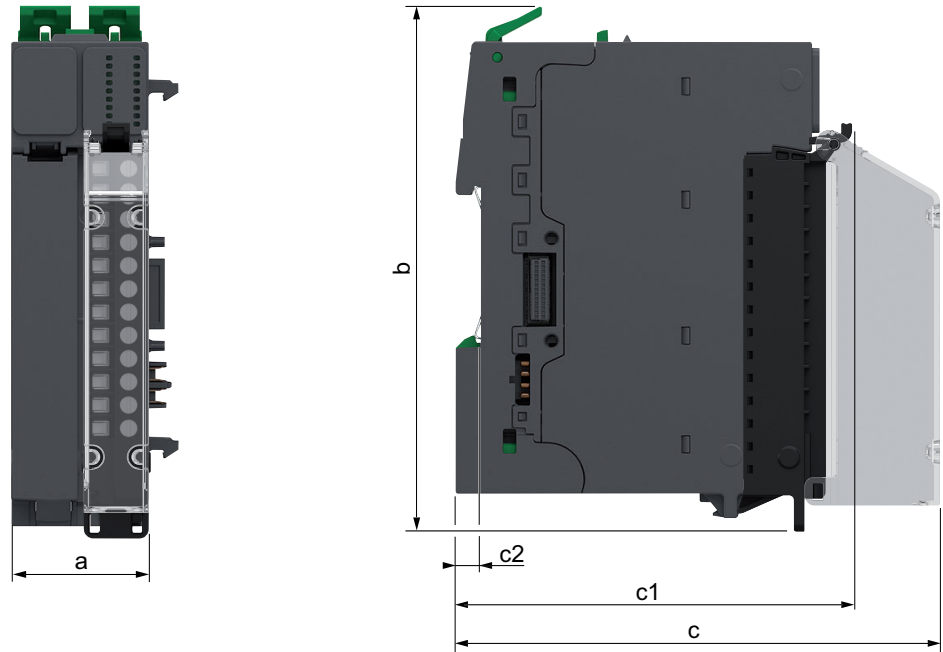
a: 30 mm (1.18 in)
b: 116.6 mm (4.57 in)
c: 107.5 mm (4.21 in)
c1: 88.2 mm (3.46 in)
c2: 5.6 mm (0.2 in)

Weight

- NTSAMI0210: 48 g (1.69 oz)
- NTSAMI0210K: 73 g (2.58 oz)
- NTSAMI0210H: 79 g (2.79 oz)
- NTSAMI0210HK: 125 g (4.40 oz)

NTSAMI0210/NTSAMI0210H Analog Input Module, 2 Isolated
Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power, Standard/
Hardened

Analog Modules

General Characteristics

The following table shows the general characteristics of the NTSAMI0210/
NTSAMI0210H input modules:

Characteristics		Value
Rated supplied voltage		24 Vdc
Power supplied voltage range		20.4...28.8 Vdc
Isolation	Between channels	530 Vac
	Between channels and bus	1,500 Vac
	Between channels and field power	1,000 Vac for 2-wire sensor supplied by loop power. No isolation for 3-wire or 4-wire sensor supplied by sensor power.
	Between field power and bus	1,500 Vac
Protection and detection		Overcurrent and short circuit on loop/sensor power by channel.
Power dissipation		2.28 W

Analog Modules

NTSAMI0210/NTSAMI0210H Analog Input Module, 2
Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power,
Standard/Hardened

Input Characteristics

The following table describes the input characteristics of the NTSAMI0210/ NTSAMI0210H input modules:

Characteristics		Value	
		Voltage input	**Current input**
Input range		±10 Vdc 0...10 Vdc ±5 Vdc 0...5 Vdc 1...5 Vdc	±20 mA 0...20 mA 4...20 mA
Input impedance		10 MΩ minimum	250 Ω + 10 Ω internal current protector
Input response time	Per enabled channel	300 µs	
	Per module	Internal I/O bus exchange cycle time[1] 1 ms minimum	
Input type		Differential, single-ended input	
Conversion mode		Sigma-Delta	
Maximum accuracy at ambient 25 °C (77 °F) / maximum allowed temperature		±0.05 % / ±0.1 % of full scale	
Temperature drift		±0.002 %/°C of full scale	
Repeatability after stabilization time		±0.005 % of full scale	±0.007 % of full scale
Nonlinearity		±0.01 % of full scale	
Monotonicity		Yes	
Resolution		16 bits, or 15 bits plus sign bit	
Input value of LSB		0.31 mV (range ±10 Vdc) 0.31 mV (range 0...10 Vdc) 0.16 mV (range ±5 Vdc) 0.16 mV (range 0...5 Vdc) 0.13 mV (range 1...5 Vdc)	0.61 µA (range ±20 mA) 0.61 µA (range 0...20 mA) 0.49 µA (range 4...20 mA)
Data type in application program		Scalable from -32,768 to 32,767	
Input data out of range detection		Yes	
Resistance to electromagnetic interference	Crosstalk between channels	80 dB minimum	
	Common mode rejection	90 dB	
Cable		Shielded, 200 m (656 ft) maximum	Shielded, 1,000 m (3,281 ft) maximum
Input filter		Software run-time configurable filter. Refer to Measurement Filter, page 80.	
HART compliance		Tolerant	
HART communication		No	
NAMUR NE43 compliance	Applicable nominal range	—	4...20 mA
	Convertible range	—	0...22 mA
	Safety margin **IFM,Low / IFM,High**	—	0.1 mA / 0.2 mA
	Failure signal detection time	—	4 s
Supply voltage		24 Vdc	

Characteristics		Value	
		Voltage input	**Current input**
Sensor power	Output voltage	24 Vdc nominal from field power bus using the power supply module	
	Output current	100 mA per channel	
	Protection	Overcurrent and short circuit protection, channel based	
Loop power	Output voltage	24 Vdc nominal from internal isolated power	
	Output current	25 mA maximum per channel	
	Protection	Overcurrent and short circuit protection, channel based	
Maximum continuous allowed overload (no damage)		30 Vdc	30 Vdc / 50 mA
(1) For more information, refer to Configurable Parameters in Modicon Edge I/O NTS Network Interface Module – User Guide			

Analog Modules

NTSAMI0210/NTSAMI0210H Analog Input Module, 2
Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power,
Standard/Hardened

NTSAMI0210/NTSAMI0210H Wiring

Overview

This section provides the wiring diagrams for the NTSAMI0210/NTSAMI0210H
input modules.

Wiring Rules

For more information on the wiring, refer to Modicon Edge I/O - System Planning
and Installation Guide.

Wiring Diagram

The sensor may be malfunctioning due to the loop power limited load capacity of
25 mA per channel, whereas the sensor may require more than 25 mA.

Further, as the sensor power could be misused as loop power, the input value may
be abnormal due to a broken current loop. Additionally, the isolation between
channels is not effective if the same miswiring is applied to the two channels.

NOTICE
INOPERABLE EQUIPMENT
Do not connect the 24 Vdc output sensor power supply with the 24 Vdc loop power supply of the module.
Failure to follow these instructions can result in equipment damage.

The sensors may require an external power supply.

NTSAMI0210/NTSAMI0210H Analog Input Module, 2 Isolated
Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power, Standard/
Hardened

Analog Modules

Current and Voltage Measurement 2-Wire Diagram

The following figures illustrate the connection between the inputs and the sensors:
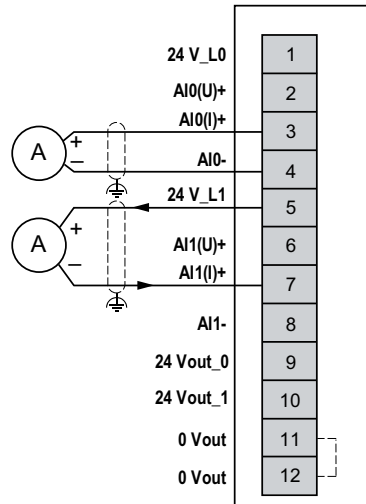
24 V_L•: Loop power
24 Vout_•: Sensor power
A: Current
(U): Voltage
(I): Current
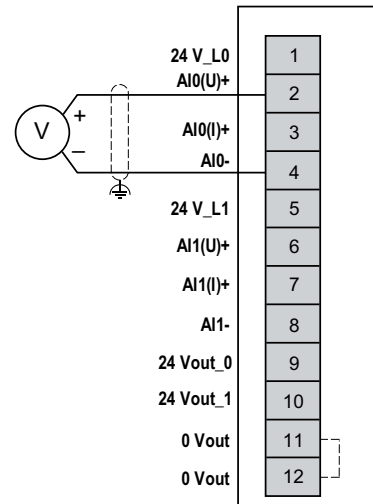
24 V_L•: Loop power
24 Vout_•: Sensor power
V: Voltage
(U): Voltage
(I): Current

Analog Modules

NTSAMI0210/NTSAMI0210H Analog Input Module, 2
Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power,
Standard/Hardened

Current and Voltage Measurement 3-Wire Diagram

The following figure illustrates the connection between the inputs and the sensors:

24 V_L•: Loop power
24 Vout_•: Sensor power
V: Voltage
A: Current
(U): Voltage
(I): Current

> **NOTE:** For 3-wire sensors, connect externally **AI-** to **0 Vout**.

NTSAMI0210/NTSAMI0210H Analog Input Module, 2 Isolated
Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power, Standard/
Hardened

Analog Modules

Current and Voltage Measurement 4-Wire Diagram

The following figure illustrates the connection between the inputs and the sensors:
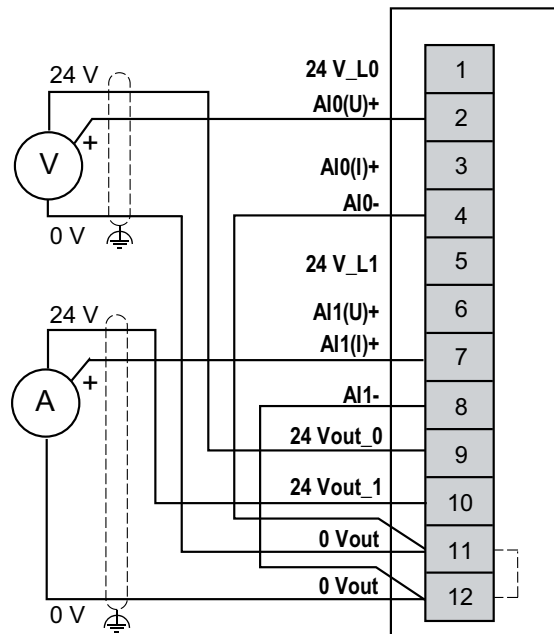

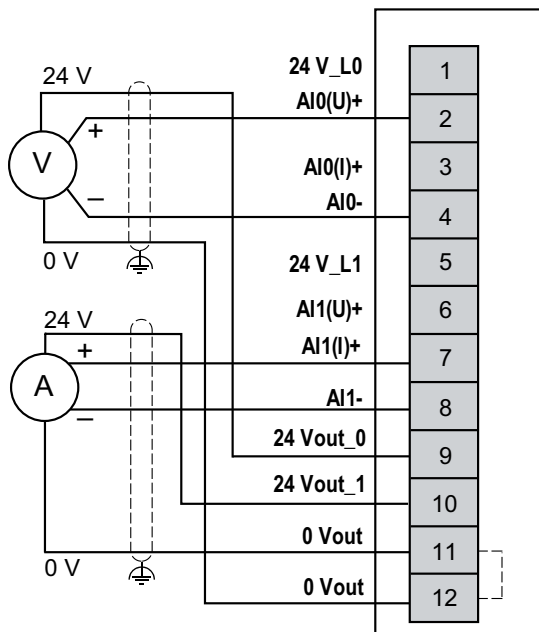**24 V_L•**: Loop power
24 Vout_•: Sensor power
V: Voltage
A: Current
(U): Voltage
(I): Current

Analog Modules

NTSAMI0210/NTSAMI0210H Analog Input Module, 2
Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power,
Standard/Hardened

NTSAMI0210/NTSAMI0210H Parameters

Overview

This section provides the parameters of the NTSAMI0210/NTSAMI0210H
modules.

Parameters are the set of values, specific to a module, that can be edited with the
programming software during edition mode.

Software configuration is accomplished with one of the following options:

- The Edge I/O configuration software (refer to the Modicon Edge I/O
Configurator and Web Interface - User Guide).

- The EcoStruxure Automation Expert software (refer to the EcoStruxure
Automation Expert online help).

- The EcoStruxure Automation Expert - Motion software (refer to the
EcoStruxure Automation Expert - Motion online help).

- The embedded Web interface (refer to the Modicon Edge I/O Configurator
and Web Interface - User Guide).

If you have physically wired the analog channel for a voltage signal and you
configure the channel for a current signal, 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.

NTSAMI0210/NTSAMI0210H Analog Input Module, 2 Isolated
Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power, Standard/
Hardened

Analog Modules

Parameters Description

Configurable Parameters

The following table presents the configurable parameters for the module:

Displayed Name *Parameter Name*	Value(s)	Data type	Description
Device Mode *DeviceMode*	**0***: Normal **1**: Optional **2**: Virtual reserved	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically connected on the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed on the cluster. Whether either module is present does not cause a configuration error. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed on the cluster. If the virtual module is physically installed on the cluster, a configuration error is detected.
* Parameter default value			

The following table presents the configurable parameters for the channels of the module:

Displayed Name *Parameter Name*	Value(s)	Data type	Description
Channel Enabled *ChannelEnable*	**FALSE** **TRUE***	BOOL	Determines whether a channel is activated or deactivated.
Range Mode *RangeMode*	**+/-10 V*** **0..10 V** **+/-5 V** **0..5 V** **1..5 V** **+/-20 mA** **0..20 mA** **4..20 mA**	ENUM	Defines the range mode for the input channel. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 81.
Range Maximum *RangeMax*	**-32767...32767**	INT16	Sets the maximum value of the nominal range. The values are computed according to the selected **RangeMode**.
Range Minimum *RangeMin*	**-32768...32766**	INT16	Sets the minimum value of the nominal range. The values are computed according to the selected **RangeMode**.
HART Tolerance Enabled *HartToleranceEnable*	**FALSE*** **TRUE**	BOOL	Enables the slew rate filter to filter out HART signals on the analog current input. **HartToleranceEnable** parameter can be changed to **TRUE** when the **RangeMode** is set to **4..20mA**. For more information on **HartToleranceEnabled** parameter, refer to HartToleranceEnable, page 79.
NE43 Enabled *NE43Enable*	**FALSE*** **TRUE**	BOOL	Enables or disables NE43 compliance. NE43 compliance can be enabled when the **RangeMode** is set to **4..20mA**. When **NE43 Enabled** is set to **TRUE**, the threshold values (**Underflow Threshold/Overflow Threshold**) are not configurable, the fixed threshold values are 3.6 mA / 21 mA.
Overflow Checked *OverflowCheck*	**FALSE** **TRUE***	BOOL	Enables or disables overflow detection. An error is detected if the measurement is greater than **Overflow Threshold**. For more information on **OverflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 82.

Analog Modules

NTSAMI0210/NTSAMI0210H Analog Input Module, 2
Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power,
Standard/Hardened

Displayed Name *Parameter Name*	Value(s)	Data type	Description
Overflow Threshold *OverMax*	**-32767...32767**	INT16	Sets the overflow threshold value. The values are computed according to the selected **RangeMax** value.
Underflow Checked *UnderflowCheck*	**FALSE** **TRUE***	BOOL	Enables or disables underflow detection. An error is detected if the measurement is lower than **Underflow Threshold**. For more information on **UnderflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 82.
Underflow Threshold *OverMin*	**-32768...32766**	INT16	Sets the underflow threshold value. The values are computed according to the selected **RangeMin** value.
Alignment Offset *AlignmentOffset*[1]	**-1500...1500**	INT16	Compensates for a permanent offset observed with a given sensor, around a specific operating point. This operation compensates for an offset linked to the process. Replacing the module does not require a new alignment. However, replacing the sensor or changing the operating point of the sensor does require a new alignment. For more information on **AlignmentOffset** parameter, refer to Alignment Offset, page 81.
Filter *Filter*[1]	No filtering: **0*** Low filtering: **1** **2** Medium filtering: **3** **4** High filtering: **5** **6**	ENUM	Defines the type of filtering for the input channel selected for the analog modules. For more information on Filter parameter, refer to Measurement Filter, page 80.
* Parameter default value [1] Online modification is allowed.			

NTSAMI0210/NTSAMI0210H Analog Input Module, 2 Isolated
Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power, Standard/
Hardened

Analog Modules

Implicit Data

The following table presents the input implicit data for the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
GCS	0...255	BYTE 1	Group Cyclic Status Bit 0: Data quality Bit 1: General module status Bit 2: I/O status Bit 3: N/A Bit 4: N/A Bit 5: Advisory status Bit 6: N/A Bit 7: Data freshness
ChannelHealth0_7[1]	0...255	BYTE 1	Bit 0...7 = Status of channel 0...7 • Bit = FALSE: Channel is invalid or not present. • Bit = TRUE: Channel is valid or disabled.

[1] This parameter is not part of the implicit data in case of the optimized I/O profile is selected.

The following table presents the input implicit data for the channels of the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
IValue	-32,768... 32,767	INT16 2	Input value of the channel.

NTSAMI0210/NTSAMI0210H Analog Input Module, 2
Isolated Inputs, Current, Voltage, 2-/3-/4 wire, Loop Power,
Standard/Hardened

Analog Modules

Explicit Data

The following table presents the explicit data for the channels of the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
ChannelFault1	0...255	BYTE 1	Indicates module channel error catalog. Bit 0: Underflow error detected Bit 1: Overflow error detected Bit 2: Broken wire error detected Bit 3: N/A Bit 4: Hardware error detected Bit 5: Calibration error detected Bit 6: Loop power supply error detected Bit 7: N/A
ChannelFault2	0...255	BYTE 1	Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Bit 0: Lower tolerance alert Bit 1: Upper tolerance alert Bit 2: Non-zero alignment offset configured Bit 3: Channel enabled configured **NOTE:** Bits 4 to 7 are reserved.
MeasureStatus2	0...255	BYTE 1	Bits 0 to 7 are reserved.

NTSAMI0400 Analog Input Module, 4 Inputs, Current, Voltage, 2-wire

What's in This Chapter

NTSAMI0400 Presentation

Overview

This section provides a presentation of the NTSAMI0400 input module.
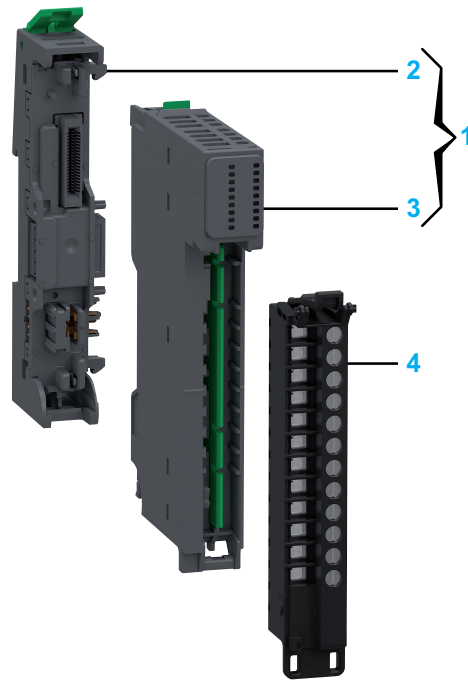
Main Characteristics

The following table describes the main characteristics of the NTSAMI0400 input module:

Main Characteristics	Value
Product or component type	Analog current and voltage input module
Number of channels	4
Channel property	Single-ended
Channel signal	Current or voltage
Operating mode	Isochronous and asynchronous

Purchasing Information

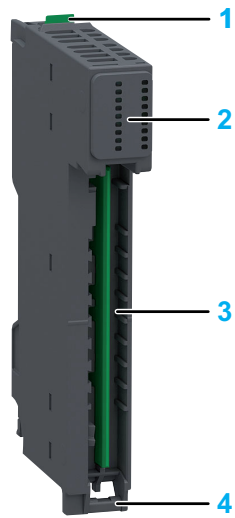The following figure shows the elements of the Modicon Edge I/O NTS NTSAMI0400 input module:

Number	Reference	Description
1	NTSAMI0400K	Base + Module (kit)
		NOTE: The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSAMI0400	Analog Input Module, 4 Inputs, Current, Voltage, 2-wire
4	NTSXTB12200H	Spring Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12201H	Spring Terminal Block, 12 Points, 5 mm Pitch, With Cover, use on Low Height Module, Hardened
	NTSXTB12000H	Screw Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12001H	Screw Terminal Block, 12 Points, 5 mm Pitch, With cover, use on Low Height Module, Hardened
		NOTE: The terminal blocks are purchased separately.

NOTE: For more information on accessories and spare parts, refer to Modicon Edge I/O - System Planning and Installation Guide.

Physical Description
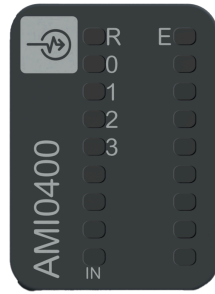
The following figure presents the elements of the module:

1: Release button for disengaging the module from the base
2: Status LEDs
3: Slot for the terminal block
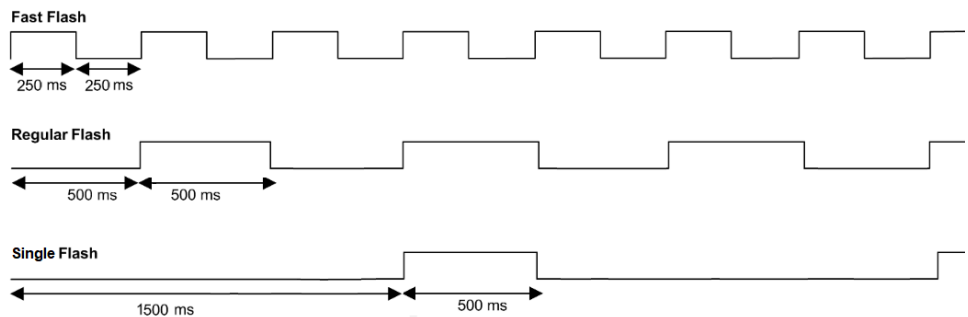**4**: Hinge for the terminal block installation

Status LEDs

The following figure presents the status LEDs:

The following table describes the system status of LEDs:

R (Green)	E (Red)	Channel (Green)	Description
Initialization and non-operational states			
OFF	OFF	OFF	Indicates that the module is not energized.
OFF	Fast Flash	-	Indicates that the module has detected a system error.
Regular Flash	OFF	-	Indicates that the firmware is being updated.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the channel is activated.
ON	-	OFF	Indicates that the channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates that an error is detected in the 24 Vdc field power.
ON	Regular Flash	Regular Flash	Indicates: • Broken wire detection. • Overflow/underflow error detection.
ON	Regular Flash	OFF	Indicates an internal error detection.

The following graphic shows the system status of LEDs during module operation:

NTSAMI0400 Characteristics

Overview

This section provides a general description of the characteristics of the module.

⚠ **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.

For more information on environmental characteristics, refer to Modicon Edge I/O - System Planning and Installation Guide.

Dimensions

The following figure presents the external dimensions of the assembled module:
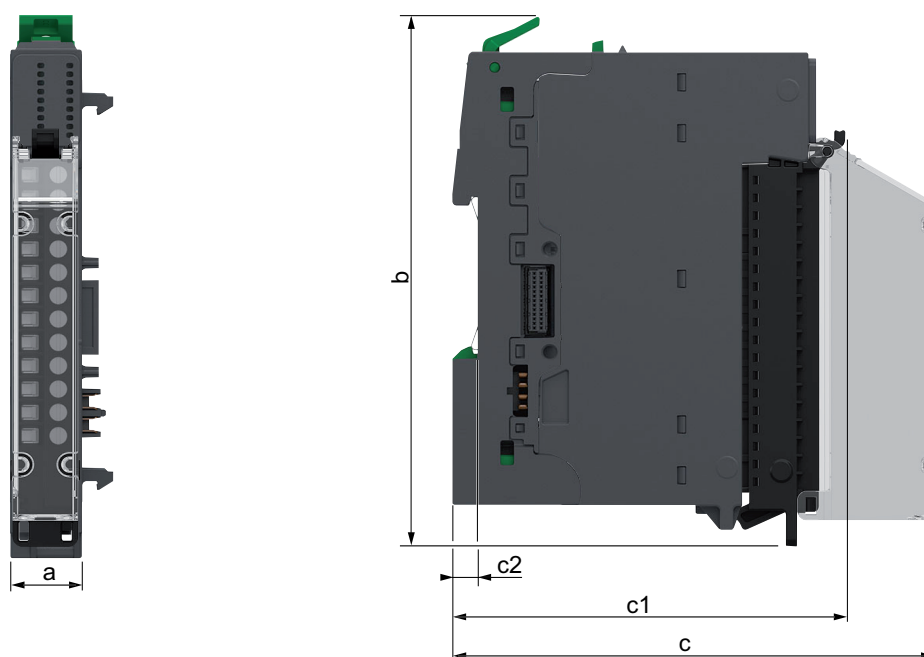
a: 15 mm (0.59 in)
b: 116.6 mm (4.57 in)
c: 107.5 mm (4.21 in)
c1: 88.2 mm (3.46 in)
c2: 5.6 mm (0.2 in)

Weight

- NTSAMI0400: 48 g (1.69 oz)
- NTSAMI0400K: 73 g (2.58 oz)

General Characteristics

The following table shows the general characteristics of the NTSAMI0400 input module:

Characteristics		Value
Rated supplied voltage		24 Vdc
Power supplied voltage range		20.4...28.8 Vdc
Isolation	Between channels	No
	Between channels and bus	1,500 Vac
	Between channels and field power	No
	Between field power and bus	1,500 Vac
Protection and detection		Voltage input: Miswiring protection by channel
		Current input: Overcurrent and miswiring protection by channel
Power dissipation		1.52 W

Input Characteristics

The following table describes the input characteristics of the NTSAMI0400 input module:

Characteristics		Value	
		Voltage input	**Current input**
Input range		±10 Vdc 0...10 Vdc ±5 Vdc 0...5 Vdc 1...5 Vdc	±20 mA 0...20 mA 4...20 mA
Input impedance		10 MΩ minimum	100 Ω + 10 Ω internal current protector
Input response time	Per enabled channel	250 μs	
	Per module	Internal I/O bus exchange cycle time[1] 1 ms minimum	
Maximum accuracy at ambient 25 °C (77 °F) / 60 °C (140 °F)		0.3 % / 0.5 % of full scale	
Temperature drift		±0.0057 %/°C of full scale	
Repeatability after stabilization time		±0.007 % of full scale	
Nonlinearity		±0.01 % of full scale	
Monotonicity		Yes	
Input value of LSB		0.31 mV (range ±10 Vdc) 0.31 mV (range 0...10 Vdc) 0.16 mV (range ±5 Vdc) 0.16 mV (range 0...5 Vdc) 0.13 mV (range 1...5 Vdc)	0.61 μA (range ±20 mA) 0.61 μA (range 0...20 mA) 0.49 μA (range 4...20 mA)
Resolution	Signed signal	±10 V, ±5 V, ±20 mA: 16 bits, or 15 bits plus sign bit	
	Unsigned signal	0...10 V, 0...5 V, 1...5 V, 0...20 mA, 4...20 mA: 15 bits	
Input data out of range detection		Yes	
Resistance to electromagnetic interference	Crosstalk between channels	80 dB minimum	
	Common mode rejection	90 dB	
Cable		Shielded, 200 m (656 ft) maximum	Shielded, 1,000 m (3,281 ft) maximum
Input filter		Software run-time configurable filter. Refer to Measurement Filter, page 80.	
HART compliance		No	
HART communication		No	
NAMUR NE43 compliance	Applicable nominal range	—	4...20 mA
	Convertible range	—	0...22 mA
	Safety margin **IFM , Low / IFM , High**	—	0.1 mA / 0.2 mA
	Failure signal detection time	—	4 s
Supply voltage		24 Vdc	
Maximum continuous allowed overload (no damage)		30 Vdc	30 Vdc / 50 mA
[1] For more information, refer to Configurable Parameters in Modicon Edge I/O NTS Network Interface Module – User Guide			

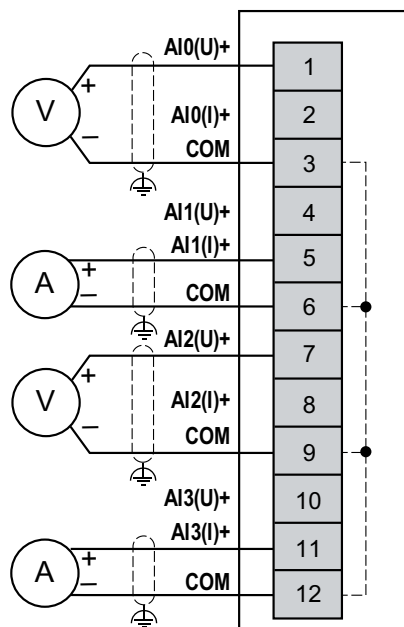# NTSAMI0400 Wiring

Overview

This section provides the wiring diagram for the NTSAMI0400 input module.

Wiring Rules

For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagram

The following figure illustrates the connection between the inputs and the sensors:

(U): Voltage
(I): Current

NTSAMI0400 Parameters

Overview

This section describes the parameters of the NTSAMI0400 module.

Parameters are the set of values, specific to a module, that can be edited with the programming software during edition mode.

Software configuration is accomplished with one of the following options:

- The Edge I/O configuration software (refer to the Modicon Edge I/O Configurator and Web Interface - User Guide).

- The EcoStruxure Automation Expert software (refer to the EcoStruxure Automation Expert online help).

- The EcoStruxure Automation Expert - Motion software (refer to the EcoStruxure Automation Expert - Motion online help).

- The embedded Web interface (refer to the Modicon Edge I/O Configurator and Web Interface - User Guide).

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal, 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.

Parameters Description

Configurable Parameters

The following table presents the configurable parameters for the module:

Displayed Name *Parameter Name*	Value(s)	Data type	Description
Device Mode *DeviceMode*	**0***: Normal **1**: Optional **2**: Virtual reserved	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically connected on the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed on the cluster. Whether either module is present does not cause a configuration error. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed on the cluster. If the virtual module is physically installed on the cluster, a configuration error is detected.
* Parameter default value			

The following table presents the configurable parameters for the channels of the module:

Displayed Name Parameter Name	Value(s)	Data type	Description
Channel Enabled *ChannelEnable*	**FALSE** **TRUE***	BOOL	Determines whether a channel is activated or deactivated.
Range Mode *RangeMode*	**± 10 Vdc** **0...10 Vdc** **± 5 Vdc** **0...5 Vdc** **1...5 Vdc** **± 20 mA** **0...20 mA** **4...20 mA**	ENUM	Defines the range mode for the input channel. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 81.
Range Maximum *RangeMax*	**-32767...32767**	INT16	Sets the maximum value of the nominal range. The values are computed according to the selected **RangeMode**.
Range Minimum *RangeMin*	**-32768...32766**	INT16	Sets the minimum value of the nominal range. The values are computed according to the selected **RangeMode**.
NE43 Enabled *NE43Enable*	**FALSE*** **TRUE**	BOOL	Enables or disables NE43 compliance. NE43 compliance can be enabled when the **RangeMode** is set to **4..20 mA**. When **NE43 Enabled** is set to **TRUE**, the threshold values (**Underflow Threshold**/**Overflow Threshold**) are not configurable, the fixed threshold values are 3.6 mA / 21 mA.
Overflow Checked *OverflowCheck*	**FALSE** **TRUE***	BOOL	Enables or disables overflow detection. An error is detected if the measurement is greater than **Overflow Threshold**. For more information on **OverflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 82.
Overflow Threshold *OverMax*	**-32767...32767**	INT16	Sets the overflow threshold value. The values are computed according to the selected **RangeMax** value.
Underflow Checked *UnderflowCheck*	**FALSE** **TRUE***	BOOL	Enables or disables underflow detection. An error is detected if the measurement is lower than **Underflow Threshold**. For more information on **UnderflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 82.
Underflow Threshold *OverMin*	**-32768...32766**	INT16	Sets the underflow threshold value. The values are computed according to the selected **RangeMin** value.
Alignment Offset *AlignmentOffset*[1]	**-1500...1500**	INT16	Compensates for a permanent offset observed with a given sensor, around a specific operating point. This operation compensates for an offset linked to the process. Replacing the module does not require a new alignment. However, replacing the sensor or changing the operating point of the sensor does require a new alignment. For more information on **AlignmentOffset** parameter, refer to Alignment Offset, page 81.

Displayed Name *Parameter Name*	Value(s)	Data type	Description
Filter *Filter*[1]	No filtering: **0*** Low filtering: **1** **2** Medium filtering: **3** **4** High filtering: **5** **6**	ENUM	Defines the type of filtering for the input channel selected for the analog modules. For more information on Filter parameter, refer to Measurement Filter, page 80.
* Parameter default value			
[1] Online modification is allowed.			

Implicit Data

The following table presents the input implicit data for the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
GCS	0...255	BYTE 1	Group Cyclic Status Bit 0: Data quality Bit 1: General module status Bit 2: I/O status Bit 3: N/A Bit 4: N/A Bit 5: Advisory status Bit 6: N/A Bit 7: Data freshness
ChannelHealth0_7[1]	0...255	BYTE 1	Bit 0...7 = Status of channel 0...7 • Bit = FALSE: Channel is invalid or not present. • Bit = TRUE: Channel is valid or disabled.
[1] This parameter is not part of the implicit data in case of the optimized I/O profile is selected.			

The following table presents the input implicit data for the channels of the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
IValue	-32,768... 32,767	INT16 2	Input value of the channel.

Explicit Data

The following table presents the explicit data for the channels of the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
ChannelFault1	0...255	BYTE 1	Indicates module channel error catalog. Bit 0: Underflow error detected Bit 1: Overflow error detected Bit 2: Broken wire error detected Bit 3: N/A Bit 4: Hardware error detected **NOTE:** Bits 5 to 7 are reserved.
ChannelFault2	0...255	BYTE 1	Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Bit 0: Lower tolerance alert Bit 1: Upper tolerance alert Bit 2: Non-zero alignment offset configured Bit 3: Channel enabled configured **NOTE:** Bits 4 to 7 are reserved.
MeasureStatus2	0...255	BYTE 1	Bits 0 to 7 are reserved.

NTSACI0802X/NTSACI0802XH Analog Input Module, 8 Inputs, Current, 1-/2-wire, Loop Power, Standard/Hardened

What's in This Chapter

NTSACI0802X/NTSACI0802XH Presentation

Overview

This section provides a presentation of the NTSACI0802X/NTSACI0802XH input modules.
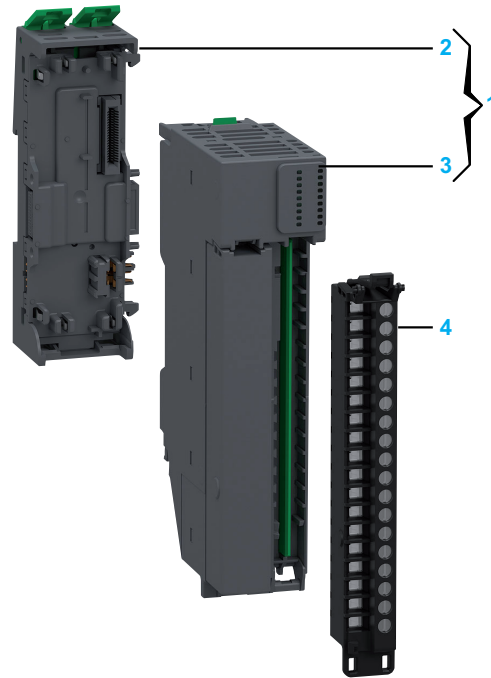
Main Characteristics

The following table describes the main characteristics of the NTSACI0802X/NTSACI0802XH input modules:

Main Characteristics	Value
Product or component type	Analog current input module
Number of channels	8
Channel property	Single-ended
Channel signal	Current
Operating mode	Isochronous and asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS
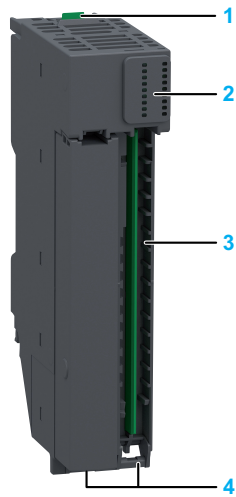NTSACI0802X/NTSACI0802XH input modules:

Number	Reference	Description
1	NTSACI0802XK	Base + Module (kit)
	NTSACI0802XHK	**NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0200H	Spare Base, 2 Slots, for Input/Output Common/Expert/Safety Module, Hardened
3	NTSACI0802X	Analog Input Module, 8 Inputs, Current, 1-/2-wire, Loop Power
	NTSACI0802XH	Analog Input Module, 8 Inputs, Current, 1-/2-wire, Loop Power, Hardened
4	NTSXTB18200XH	Spring Terminal Block, 18 Points, 5 mm Pitch, Without Cover, use on High Height Module (X), Hardened
	NTSXTB18201XH	Spring Terminal Block, 18 Points, 5 mm Pitch, With Cover, use on High Height Module (X), Hardened
	NTSXTB18000XH	Screw Terminal Block, 18 Points, 5 mm Pitch, Without Cover, use on High Height Module (X), Hardened
	NTSXTB18001XH	Screw Terminal Block, 18 Points, 5 mm Pitch, With Cover, use on High Height Module (X), Hardened
		NOTE: The terminal blocks are purchased separately.

NOTE: For more information on accessories and spare parts, refer to Modicon
Edge I/O - System Planning and Installation Guide.

Physical Description

The following figure presents the elements of the module:

1: Release button for disengaging the module from the base
2: Status LEDs
3: Slot for the terminal block
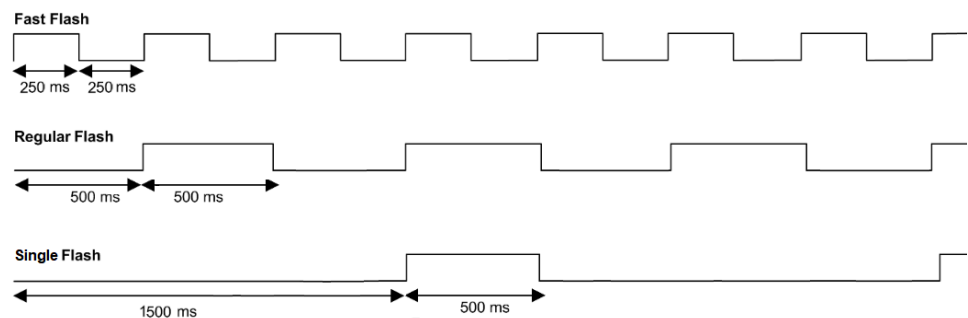**4**: Hinge for the terminal block installation

Status LEDs

The following figure presents the status LEDs:

The following table describes the system status of LEDs:

R (Green)	E (Red)	Channel (Green)	Description
Initialization and non-operational states			
OFF	OFF	OFF	Indicates that the module is not energized.
OFF	Fast Flash	-	Indicates that the module has detected a system error.
Regular Flash	OFF	-	Indicates that the firmware is being updated.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the channel is activated.
ON	-	OFF	Indicates that the channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates that an error is detected in the 24 Vdc field power.
ON	Regular Flash	Regular Flash	Indicates: • Broken wire detection. • 24 Vdc loop power error detection. • Overflow/underflow error detection.
ON	Regular Flash	OFF	Indicates an internal error detection.

The following graphic shows the system status of LEDs during module operation:

NTSACI0802X/NTSACI0802XH Characteristics

Overview

This section provides a general description of the characteristics of the module.

⚠ **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.

For more information on environmental characteristics, refer to Modicon Edge I/O - System Planning and Installation Guide.

Dimensions

The following figure presents the external dimensions of the assembled module:
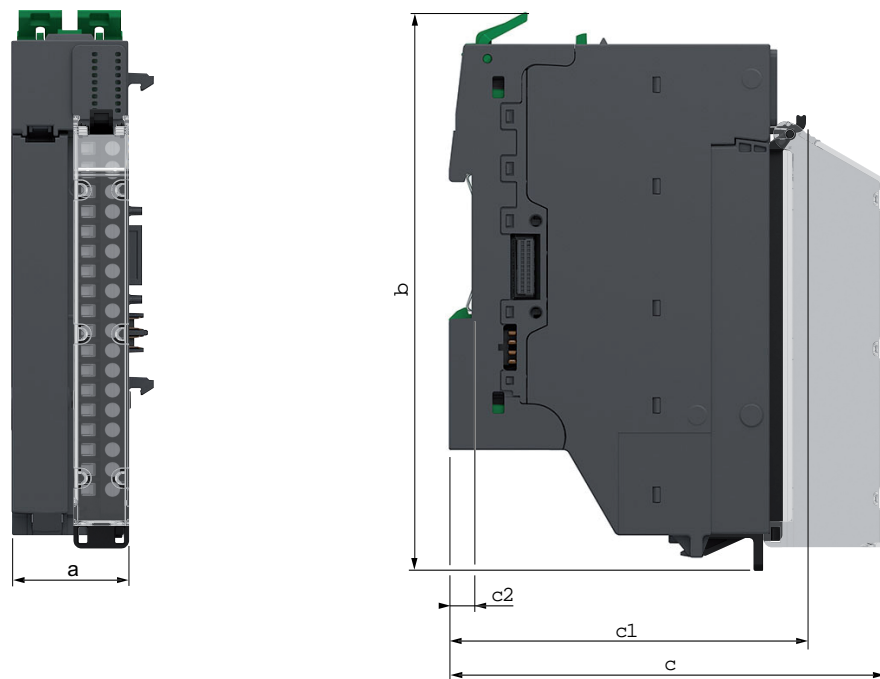
a: 30 mm (1.18 in)
b: 137.6 mm (5.39 in)
c: 107.5 mm (4.21 in)
c1: 88.2 mm (3.46 in)
c2: 5.6 mm (0.2 in)

Weight

- NTSACI0802X/NTSACI0802XH: 85 g (3.00 oz)
- NTSACI0802XK/NTSACI0802XHK: 131 g (4.62 oz)

General Characteristics

The following table shows the general characteristics of the NTSACI0802X/
NTSACI0802XH input modules:

Characteristics		Value
Rated supplied voltage		24 Vdc
Power supplied voltage range		20.4...28.8 Vdc
Isolation	Between channels	No
	Between channels and bus	1,500 Vac
	Between channels and field power	No
	Between field power and bus	1,500 Vac
Protection and detection		Overcurrent and short circuit on loop power by channel.
		Current input: Overcurrent and miswiring protection by channel.
Power dissipation		2.27 W

Input Characteristics

The following table describes the input characteristics of the NTSACI0802X/
NTSACI0802XH input module:

Characteristics		Value
Input range		±20 mA
		0...20 mA
		4...20 mA
Input impedance		250 Ω + 10 Ω internal current protector
Input response time	Per enabled channel	125 µs
	Per module	Internal I/O bus exchange cycle time[1]
		1 ms minimum
Maximum accuracy at ambient 25 °C (77 °F) / maximum allowed temperature		±0.1 % / ±0.3 % of full scale
Temperature drift		±0.004 %/°C of full scale
Repeatability after stabilization time		±0.007 % of full scale
Nonlinearity		±0.01 % of full scale
Monotonicity		Yes
Resolution		16 bits, or 15 bits plus sign bit
Input value of LSB		0.61 µA (range ±20 mA)
		0.61 µA (range 0...20 mA)
		0.49 µA (range 4...20 mA)
Data type in application program		Scalable from -32,768 to 32,767
Input data out of range detection		Yes
Resistance to electromagnetic interference	Crosstalk between channels	80 dB minimum
	Common mode rejection	90 dB
Cable		Shielded, 1,000 m (3,281 ft) maximum
Input filter		Software run-time configurable filter. Refer to Measurement Filter, page 80.
HART compliance		Tolerant
HART communication		No
NAMUR NE43 compliance	Applicable nominal range	4...20 mA
	Convertible range	0...22 mA
	Safety margin **IFM,Low / IFM,High**	0.1 mA / 0.2 mA
	Failure signal detection time	4 s
Supply voltage		24 Vdc
Loop power	Output voltage	24 Vdc nominal from field power
	Output current	25 mA maximum per channel
	Protection	Overcurrent and short circuit protection, channel based
Maximum continuous allowed overload (no damage)		30 Vdc / 50 mA
[1] For more information, refer to Configurable Parameters in Modicon Edge I/O NTS Network Interface Module – User Guide		

NTSACI0802X/NTSACI0802XH Wiring

Overview

This section provides the wiring diagrams for the NTSACI0802X/NTSACI0802XH input modules.

Wiring Rules

For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagram

The sensors may require external power supply.

NOTICE
INOPERABLE EQUIPMENT
Do not connect the 24 Vdc sensor power supply with the 24 Vdc loop power supply of the module.
Failure to follow these instructions can result in equipment damage.

Current Measurement 1-Wire Diagram

The following figure illustrates the 1-wire connection with 0 V on Common module (NTSPCM0016H) between the inputs and the sensors:
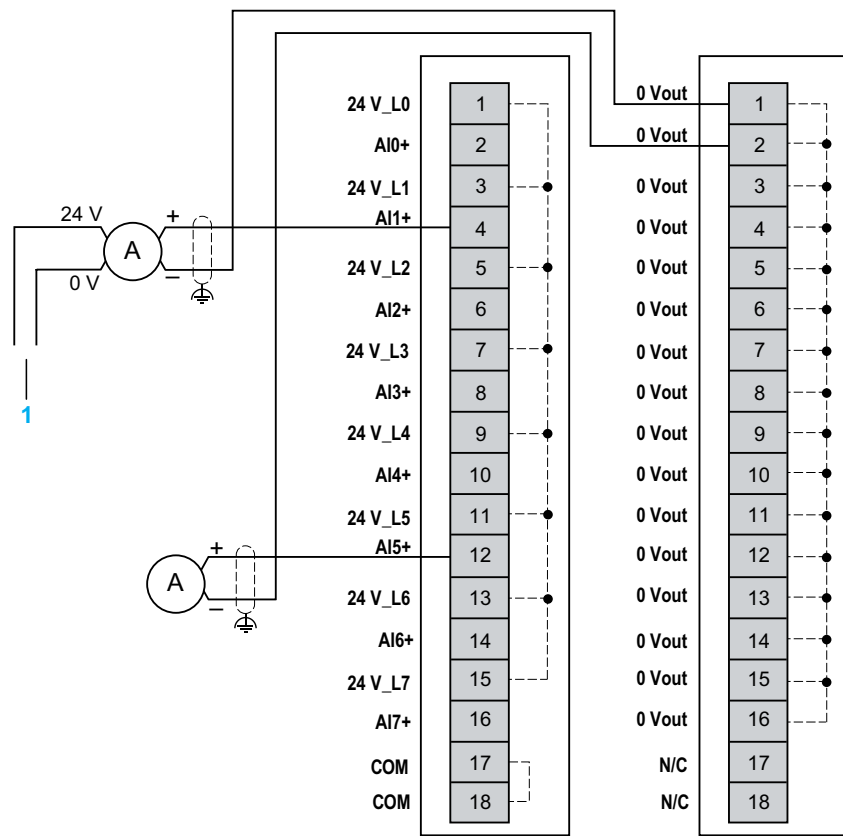
1: External supply
24 V_L•: Loop power
0 Vout: Common module output
A: Current
N/C: Not Connected

⚠ **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.

The following figure illustrates the 1-wire connection with 24 V on Common
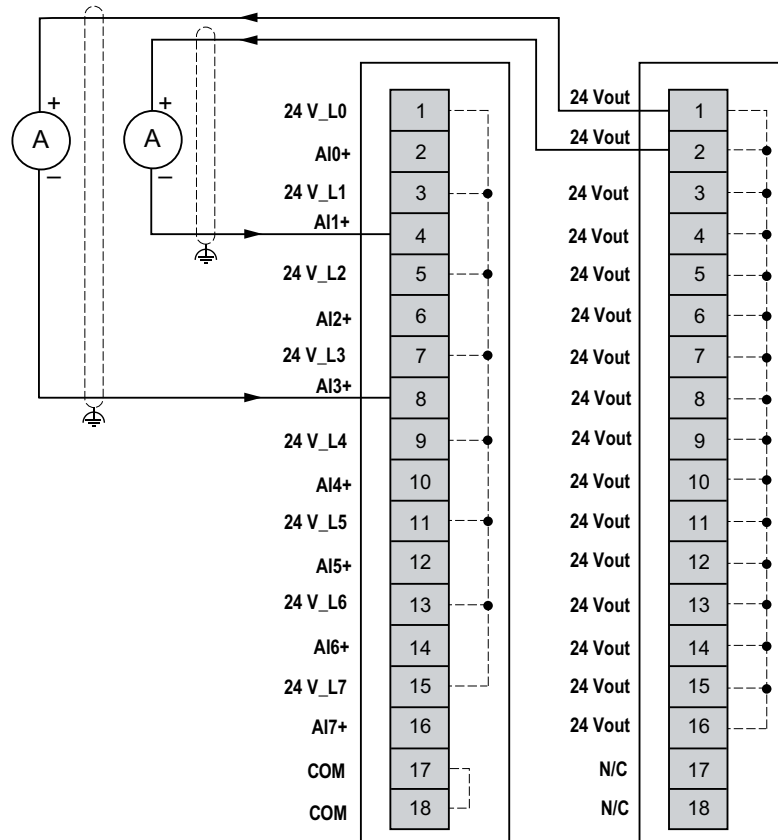module (NTSPCM1600H) between the inputs and the sensors:

24 V_L•: Loop power
24 Vout: Common module output
A: Current
N/C: Not Connected

⚠ **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.**

Current Measurement 2-Wire Diagram

The following figure illustrates the connection between the inputs and the sensors using two common modules (NTSPCM1600H and NTSPCM0016H):

24 V_L•: Loop power
24 Vout: Common module output
0 Vout: Common module output
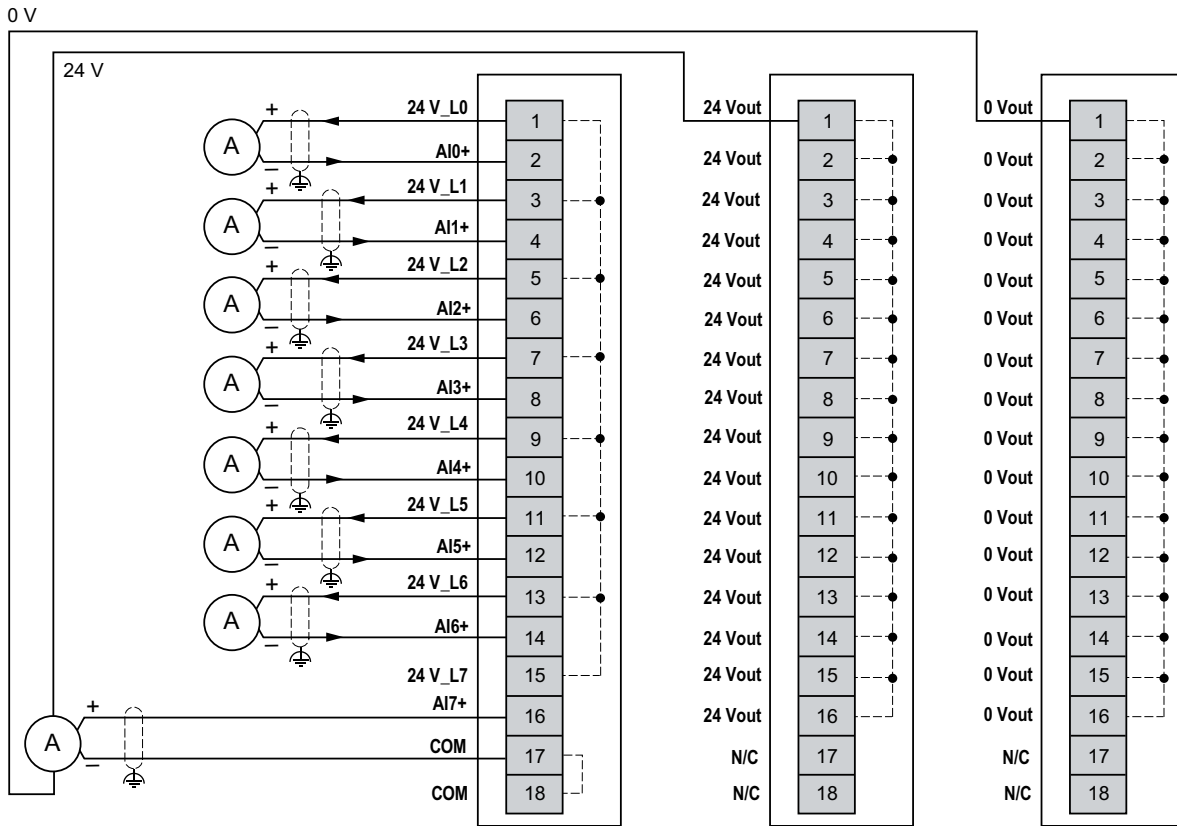**A**: Current
N/C: Not Connected

⚠ **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.

NTSACI0802X/NTSACI0802XH Parameters

Overview

This section describes the parameters of the NTSACI0802X/NTSACI0802XH modules.

Parameters are the set of values, specific to a module, that can be edited with the programming software during edition mode.

Software configuration is accomplished with one of the following options:

- The Edge I/O configuration software (refer to the Modicon Edge I/O Configurator and Web Interface - User Guide).

- The EcoStruxure Automation Expert software (refer to the EcoStruxure Automation Expert online help).

- The EcoStruxure Automation Expert - Motion software (refer to the EcoStruxure Automation Expert - Motion online help).

- The embedded Web interface (refer to the Modicon Edge I/O Configurator and Web Interface - User Guide).

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal, 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.

Parameters Description

Configurable Parameters

The following table presents the configurable parameters for the module:

Displayed Name *Parameter Name*	Value(s)	Data type	Description
Fast Mode *FastMode*	**FALSE*** **TRUE**	BOOL	Enables or disables **Fast Mode**: • Disabled: The sampling time of the module is fixed. • Enabled: The sampling time of the module is optimized according to the number of channels enabled.
Device Mode *DeviceMode*	**0***: Normal **1**: Optional **2**: Virtual reserved	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically connected on the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed on the cluster. Whether either module is present does not cause a configuration error. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed on the cluster. If the virtual module is physically installed on the cluster, a configuration error is detected.
* Parameter default value			

The following table presents the configurable parameters for the channels of the module:

Displayed Name *Parameter Name*	Value(s)	Data type	Description
Channel Enabled *ChannelEnable*	**FALSE** **TRUE***	BOOL	Determines whether a channel is activated or deactivated.
Range Mode *RangeMode*	**+/-20 mA*** **0..20 mA** **4..20 mA**	ENUM	Defines the range mode for the input channel. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 81.
Range Maximum *RangeMax*	**-32767...32767**	INT16	Sets the maximum value of the nominal range. The values are computed according to the selected **RangeMode**.
Range Minimum *RangeMin*	**-32768...32766**	INT16	Sets the minimum value of the nominal range. The values are computed according to the selected **RangeMode**.
HART Tolerance Enabled *HartToleranceEnable*	**FALSE*** **TRUE**	BOOL	Enables the slew rate filter to filter out HART signals on the analog current input. **HartToleranceEnable** parameter can be changed to **TRUE** when the **RangeMode** is set to **4..20 mA**. For more information on **HartToleranceEnabled** parameter, refer to HartToleranceEnable, page 79.
NE43 Enabled *NE43Enable*	**FALSE*** **TRUE**	BOOL	Enables or disables NE43 compliance. NE43 compliance can be enabled when the **RangeMode** is set to **4..20 mA**. When **NE43 Enabled** is set to **TRUE**, the threshold values (**Underflow Threshold**/**Overflow Threshold**) are not configurable, the fixed threshold values are 3.6 mA / 21 mA.
Overflow Checked *OverflowCheck*	**FALSE** **TRUE***	BOOL	Enables or disables overflow detection. An error is detected if the measurement is greater than **Overflow Threshold**. For more information on **OverflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 82.
Overflow Threshold *OverMax*	**-32767...32767**	INT16	Sets the overflow threshold value. The values are computed according to the selected **RangeMax** value.

Displayed Name *Parameter Name*	Value(s)	Data type	Description
Underflow Checked *UnderflowCheck*	**FALSE** **TRUE***	BOOL	Enables or disables underflow detection. An error is detected if the measurement is lower than **Underflow Threshold**. For more information on **UnderflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 82.
Underflow Threshold *OverMin*	**-32768...32766**	INT16	Sets the underflow threshold value. The values are computed according to the selected **RangeMin** value.
Alignment Offset *AlignmentOffset*[1]	**-1500...1500**	INT16	Compensates for a permanent offset observed with a given sensor, around a specific operating point. This operation compensates for an offset linked to the process. Replacing the module does not require a new alignment. However, replacing the sensor or changing the operating point of the sensor does require a new alignment. For more information on **AlignmentOffset** parameter, refer to Alignment Offset, page 81.
Filter *Filter*[1]	No filtering: **0*** Low filtering: **1** **2** Medium filtering: **3** **4** High filtering: **5** **6**	ENUM	Defines the type of filtering for the input channel selected for the analog modules. For more information on Filter parameter, refer to Measurement Filter, page 80.
* Parameter default value [1] Online modification is allowed.			

Implicit Data

The following table presents the input implicit data for the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
GCS	0...255	BYTE 1	Group Cyclic Status Bit 0: Data quality Bit 1: General module status Bit 2: I/O status Bit 3: N/A Bit 4: N/A Bit 5: Advisory status Bit 6: N/A Bit 7: Data freshness
ChannelHealth0_7[1]	0...255	BYTE 1	Bit 0...7 = Status of channel 0...7 • Bit = FALSE: Channel is invalid or not present. • Bit = TRUE: Channel is valid or disabled.
[1] This parameter is not part of the implicit data in case of the optimized I/O profile is selected.			

The following table presents the input implicit data for the channels of the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
IValue	-32,768... 32,767	INT16 2	Input value of the channel.

Explicit Data

The following table presents the explicit data for the channels of the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
ChannelFault1	0...255	BYTE 1	Indicates module channel error catalog. Bit 0: Underflow error detected Bit 1: Overflow error detected Bit 2: Broken wire error detected Bit 3: N/A Bit 4: Hardware error detected Bit 5: Calibration error detected Bit 6: Loop power supply error detected Bit 7: N/A
ChannelFault2	0...255	BYTE 1	Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Bit 0: Lower tolerance alert Bit 1: Upper tolerance alert Bit 2: Non-zero alignment offset configured Bit 3: Channel enabled configured **NOTE:** Bits 4 to 7 are reserved.
MeasureStatus2	0...255	BYTE 1	Bits 0 to 7 are reserved.

Analog Output Modules

What's in This Part

NTSAMO0400/NTSAMO0400H Analog Output Module, 4 Outputs, Current, Voltage, Standard/Hardened

What's in This Chapter

NTSAMO0400/NTSAMO0400H Presentation

Overview

This section provides a presentation of the NTSAMO0400/NTSAMO0400H output modules.

Main Characteristics

The following table describes the main characteristics of the NTSAMO0400/NTSAMO0400H output modules:

Main Characteristics	Value
Product or component type	Analog current and voltage output module
Number of channels	4
Channel property	Single-ended
Channel signal	Current or voltage
Operating mode	Isochronous and asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS
NTSAMO0400/NTSAMO0400H output modules:
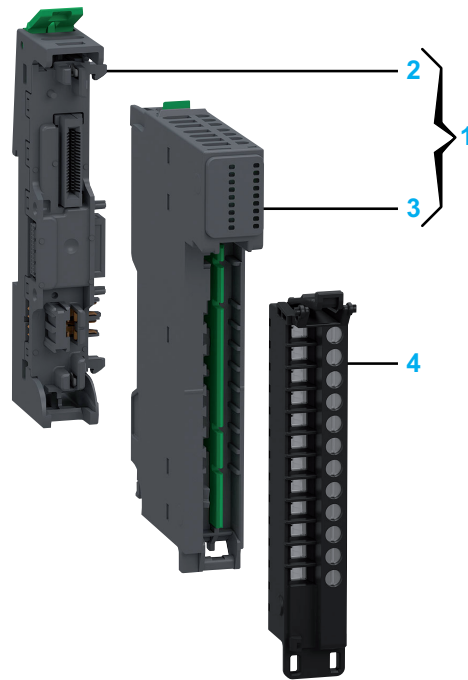
Number	Reference	Description
1	NTSAMO0400K	Base + Module (kit)
	NTSAMO0400HK	**NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSAMO0400	Analog Output Module, 4 Outputs, Current, Voltage
	NTSAMO0400H	Analog Output Module, 4 Outputs, Current, Voltage, Hardened
4	NTSXTB12200H	Spring Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12201H	Spring Terminal Block, 12 Points, 5 mm Pitch, With Cover, use on Low Height Module, Hardened
	NTSXTB12000H	Screw Terminal Block, 12 Points, 5 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB12001H	Screw Terminal Block, 12 Points, 5 mm Pitch, With cover, use on Low Height Module, Hardened
		NOTE: The terminal blocks are purchased separately.

NOTE: For more information on accessories and spare parts, refer to Modicon
Edge I/O - System Planning and Installation Guide.

Physical Description

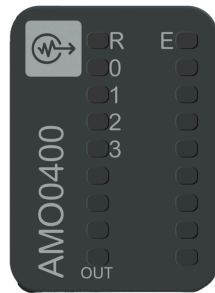The following figure presents the elements of the module:

1: Release button for disengaging the module from the base
2: Status LEDs
3: Slot for the terminal block
**4**: Hinge for the terminal block installation

Status LEDs

The following figure presents the status LEDs:

The following table describes the system status of LEDs:

R (Green)	E (Red)	Channel (Green)	Description
Initialization and non-operational states			
OFF	OFF	OFF	Indicates that the module is not energized.
OFF	Fast Flash	-	Indicates that the module has detected a system error.
Regular Flash	OFF	-	Indicates that the firmware is being updated.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the channel is activated.
ON	-	OFF	Indicates that the channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates that an error is detected in the 24 Vdc field power.
ON	Regular Flash	-	Module in fallback state.
ON	Regular Flash	Regular Flash	Indicates: • Broken wire detection. • Short circuit detection. • Overflow/underflow error detection. • DAC power error detection.
ON	Regular Flash	OFF	Indicates an internal error detection.

The following graphic shows the system status of LEDs during module operation:
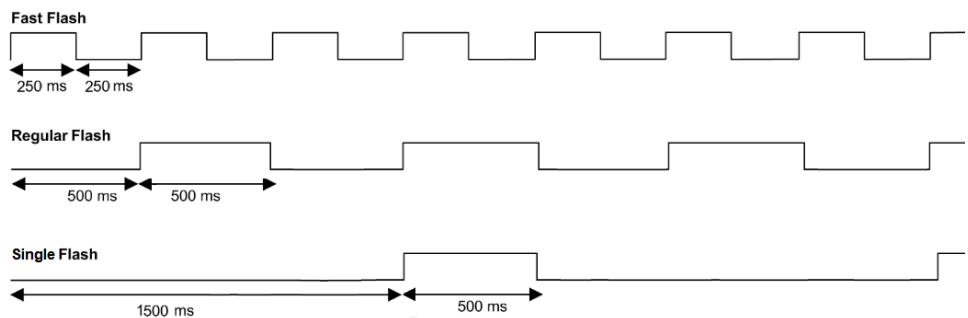
NTSAMO0400/NTSAMO0400H Characteristics

Overview

This section provides a general description of the characteristics of the module.

<table>
<tr><td align="center">⚠ WARNING</td></tr>
<tr><td>UNINTENDED EQUIPMENT OPERATION</td></tr>
<tr><td>Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.</td></tr>
<tr><td>Failure to follow these instructions can result in death, serious injury, or equipment damage.</td></tr>
</table>

For more information on environmental characteristics, refer to Modicon Edge I/O - System Planning and Installation Guide.

Dimensions

The following figure presents the external dimensions of the assembled module:

a: 15 mm (0.59 in)
b: 116.6 mm (4.57 in)
c: 107.5 mm (4.21 in)
c1: 88.2 mm (3.46 in)
c2: 5.6 mm (0.2 in)

Weight

- NTSAMO0400/NTSAMO0400H: 48 g (1.69 oz)
- NTSAMO0400K/NTSAMO0400HK: 74 g (2.61 oz)

General Characteristics

The following table shows the general characteristics of the NTSAMO0400/
NTSAMO0400H output modules:

Characteristics		Value
Rated supplied voltage		24 Vdc
Power supplied voltage range		20.4...28.8 Vdc
Isolation	Between channels	No
	Between channels and bus	1500 Vac
	Between channels and field power	No
	Between field power and bus	1500 Vac
Protection and detection		Overcurrent or short-circuit on voltage output Broken wire on current output
Power dissipation		1.64 W

Output Characteristics

The following table describes the output characteristics of the NTSAMO0400/ NTSAMO0400H output modules:

Characteristics		Value	
Module		NTSAMO0400	NTSAMO0400H
Output type		Single end	
Logic type		High level output	
Wiring type Actuator connection		2-wire	
Output range		±10 Vdc 0...10 Vdc ±5 Vdc 0...5 Vdc 1...5 Vdc 0...20 mA 4...20 mA	
Load impedance	Voltage output	- 20 °C...60 °C (- 4 °F...140 °F): up to 4 channels with a load of 1 kΩ minimum.	- 40 °C...60 °C (- 40 °F...140 °F): up to 4 channels with a load of 1 kΩ minimum. 60 °C...70 °C (140 °F...158 °F): the module needs derating as follows: • 1 channel maximum with a load of 1 kΩ minimum. • 2 channels maximum with a load of 2 kΩ minimum.
	Current output	600 Ω maximum	
Resolution		16 bits, or 15 bits plus sign bit: ±10 Vdc, ±5 Vdc 15 bits: 0...10 Vdc, 0...5 Vdc, 1...5 Vdc, 0...20 mA, 4...20 mA	
Maximum accuracy at ambient 25 °C (77 °F) / maximum allowed temperature		0.1 % / 0.2 % of full scale	
Response time		1 ms at 600 Ω	
Temperature drift		0.002 %/°C of full scale	
Repeatability after stabilization time		0.05 % of full scale	
Nonlinearity		0.02 % of full scale	
Cable	Type	Shielded	
	Length	Voltage output: 200 m (656 ft) Current output: 1,000 m (3,280 ft)	

NTSAMO0400/NTSAMO0400H Wiring

Overview

This section provides the wiring diagram for the NTSAMO0400/NTSAMO0400H output modules.

Wiring Rules

For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagram

The following figure illustrates the connection between the outputs and the actuators:
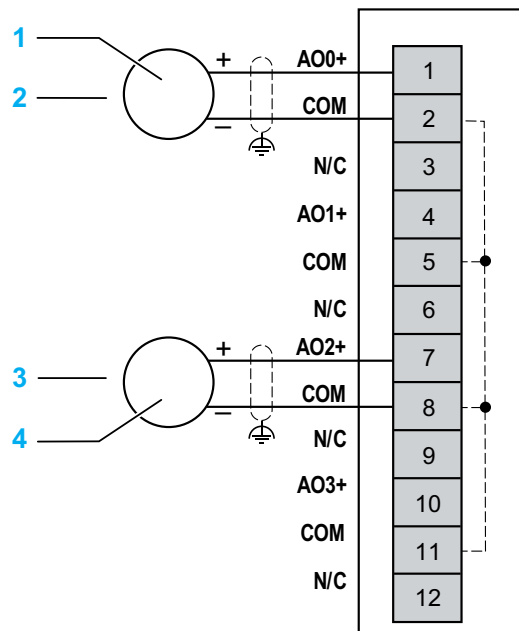
1: Actuator
2: 2-wire connection for Voltage output
3: 2-wire connection for Current output
4: Actuator
N/C: Not Connected

⚠ **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.

NTSAMO0400/NTSAMO0400H Parameters

Overview

This section describes the parameters of the NTSAMO0400/NTSAMO0400H modules.

Parameters are the set of values, specific to a module, that can be edited with the programming software during edition mode.

Software configuration is accomplished with one of the following options:

- The Edge I/O configuration software (refer to the Modicon Edge I/O Configurator and Web Interface - User Guide).

- The EcoStruxure Automation Expert software (refer to the EcoStruxure Automation Expert online help).

- The EcoStruxure Automation Expert - Motion software (refer to the EcoStruxure Automation Expert - Motion online help).

- The embedded Web interface (refer to the Modicon Edge I/O Configurator and Web Interface - User Guide).

If you have physically wired the analog channel for a voltage signal and you configure the channel for a current signal, 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.

Parameters Description

Configurable Parameters

The following table presents the configurable parameters for the module:

Displayed Name Parameter Name	Value(s)	Data type	Description
Device Mode *DeviceMode*	**0***: Normal **1**: Optional **2**: Virtual reserved	ENUM	Allows you to select the device mode: **Normal**: The module is part of the software configuration and is physically connected on the cluster. **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed on the cluster. Whether either module is present does not cause a configuration error. **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed on the cluster. If the virtual module is physically installed on the cluster, a configuration error is detected.
* Parameter default value			

The following table presents the configurable parameters for the channels of the module:

Displayed Name Parameter Name	Value(s)	Data type	Description
Channel Enabled *ChannelEnable*	**FALSE** **TRUE***	BOOL	Determines whether a channel is activated or deactivated.
Range Mode *RangeMode*	**+/-10 V*** **0..10 V** **+/-5 V** **0..5 V** **1..5 V** **+/-0..20 mA** **4..20 mA**	ENUM	Defines the range mode for the output channel. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 81.
Range Maximum *RangeMax*	**-32767...32767**	INT16	Sets the high threshold value of the normal range. The values are computed according to the selected **RangeMode**.
Range Minimum *RangeMin*	**-32768...32766**	INT16	Sets the low threshold value of the normal range. The values are computed according to the selected **RangeMode**.
Fallback Mode *OutputFallBackMode*	**Predefined Fallback Value*** **Maintain**	ENUM	Chooses the output Fallback mode function.
Predefined Fallback Value *OutputFallbackValue*	**-32768...32767**	INT16	Sets the value of the predefined Fallback value.
Hart Tolerance Enabled *HartToleranceEnable*	**FALSE*** **TRUE**	BOOL	Enables the slew rate filter to filter out HART signals on the analog current output. Current output does not affect original HART signal in current loop, it slows the output slew rate. **HartToleranceEnable** parameter can be changed to **TRUE** when the **RangeMode** is set to **4..20 mA**. For more information on **HartToleranceEnable** parameter, refer to HartToleranceEnable, page 79.

Displayed Name *Parameter Name*	Value(s)	Data type	Description
Overflow Checked *OverflowCheck*	**FALSE** **TRUE***	BOOL	Enables or disables overflow detection. An error is detected if the measurement is greater than **Overflow Threshold**. For more information on **OverflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 82.
Overflow Threshold *OverMax*	-32767...32767	INT16	Sets the overflow threshold value. The values are computed according to the selected **RangeMax** value.
Underflow Checked *UnderflowCheck*	**FALSE** **TRUE***	BOOL	Enables or disables underflow detection. An error is detected if the measurement is lower than **Underflow Threshold**. For more information on **UnderflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 82.
Underflow Threshold *OverMin*	-32768...32766	INT16	Sets the underflow threshold value. The values are computed according to the selected **RangeMin** value.
Shorted Wire Checked *ShortedWireCheck*	**FALSE** **TRUE***	BOOL	Enables or disables shorted wire detection on voltage output.
Broken Wire Checked *BrokenWireCheck*[1]	**FALSE** **TRUE***	BOOL	Enables or disables broken wire detection on current output.
AlignmentOffset *AlignmentOffset*[1]	-1500...1500	INT16	Compensates for a permanent offset observed with a given sensor, around a specific operating point. This operation compensates for an offset linked to the process. Replacing the module does not require a new alignment. However, replacing the sensor or changing the operating point of the sensor does require a new alignment. For more information on **AlignmentOffset** parameter, refer to Alignment Offset, page 81.
* Parameter default value [1] Online modification is allowed.			

Implicit Data

The following table presents the input implicit data for the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
GCS	0...255	BYTE 1	Group Cyclic Status Bit 0: Data quality Bit 1: General module status Bit 2: I/O status Bit 3: Receive status Bit 4: Output status Bit 5: Advisory status Bit 6: N/A Bit 7: Data freshness
ChannelHealth0_7[1]	0...255	BYTE 1	Bit 0...7 = Status of channel 0...7 • Bit = FALSE: Channel is invalid or not present. • Bit = TRUE: Channel is valid or disabled.
[1] This parameter is not part of the implicit data in case of the optimized I/O profile is selected.			

The following table shows the output implicit data on channel scope:

Parameter Name	Value(s)	Data type Size in bytes	Description
QValue	-32,768... 32,767	INT16 2	Output value of the channel.

Explicit Data

The following table presents the explicit data for the channels of the module:

Parameter Name	Value(s)	Data type Size in bytes	Description
ChannelFault1	0...255	BYTE 1	Indicates module channel error catalog. Bit 0: Underflow error detected Bit 1: Overflow error detected Bit 2: Broken wire error detected Bit 3: Short circuit error detected Bit 4: Hardware error detected Bit 5: Calibration error detected Bit 6: N/A Bit 7: N/A
ChannelFault2	0...255	BYTE 1	Bit 0: DAC power error detected Bit 7: Power supply error detected **NOTE:** Bits 1 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Bit 0: N/A Bit 1: N/A Bit 2: Non-zero alignment offset configured Bit 3: Channel enabled configured **NOTE:** Bits 4 to 7 are reserved.
MeasureStatus2	0...255	BYTE 1	Bits 0 to 7 are reserved.

Appendices

What's in This Part

What's in This Part

Parameters Description

What's in This Chapter

General Parameters

HartToleranceEnable

HartToleranceEnable parameter enables the slew rate filter on an analog current channel.

For analog input modules, this function is achieved by setting the Analog to Digital Converter (ADC) internal digital filter to filter out HART signals.

For analog output modules, the current output does not affect the original HART signal in the current loop, but the output slew rate is slower. This function is achieved by setting the Digital to Analog Converter (DAC) output slew rate.

> **NOTE:**
> - To enable HART tolerance, one channel needs at least 20 ms with 50 Hz ADC data rate.
> - When HART tolerance is enabled, the relative channel sampling time is increased.
> - HART signal has limitation on the analog current input rate of change.
> - When HART tolerance is enabled for NTSACI0802X and NTSACI0802XH, the module is switched to asynchronous mode, requiring at least 20 ms per channel.
> - When HART tolerance is enabled for NTSAMI0210 and NTSAM10210H, the module is switched to asynchronous mode, with a 55 ms delay of the ADC per channel.

HartToleranceEnable can be changed to **TRUE** when the **RangeMode** is set to **4..20mA**.

Measurement Filter

This parameter defines the type of filtering for the input channel selected for the analog modules. The type of filtering performed by the system is called "first order filtering". The filtering coefficient can be modified from a programming console or through the program.

The mathematical formula used is as follows:

$$\text{Meas}_{f(n)} = \alpha \times \text{Meas}_{f(n-1)} + (1 - \alpha) \times \text{Val}_{b(n)}$$

Where:

- α = efficiency of the filter
- $\text{Meas}_{f(n)}$ = filtered measurement at moment n
- $\text{Meas}_{f(n-1)}$ = filtered measurement at moment n-1
- $\text{Val}_{b(n)}$ = internal value at moment n

You can configure the filtering value even when the application is in RUN mode:

| Desired Efficiency	Required Value	Corresponding α	Filter Response Time at 63%	Cutoff Frequency (Hz)
No filtering	0	0	0	0
Low filtering	1	0.750	$4 \times T_{cycle}$	$0.040 / T_{cycle}$
	2	0.875	$8 \times T_{cycle}$	$0.020 / T_{cycle}$
Medium filtering	3	0.937	$16 \times T_{cycle}$	$0.010 / T_{cycle}$
	4	0.969	$32 \times T_{cycle}$	$0.005 / T_{cycle}$
High filtering	5	0.984	$64 \times T_{cycle}$	$0.0025 / T_{cycle}$
	6	0.992	$128 \times T_{cycle}$	$0.0012 / T_{cycle}$
T_{cycle} = sampling period of the channel.				

Alignment Offset

The process of alignment offset compensates for a permanent offset observed with a given sensor, around a specific operating point.

This operation compensates for an offset linked to the process.

Replacing the module does not require a new alignment. However, replacing the sensor or changing the operating point of the sensor does require a new alignment.

Conversion lines are as follows:
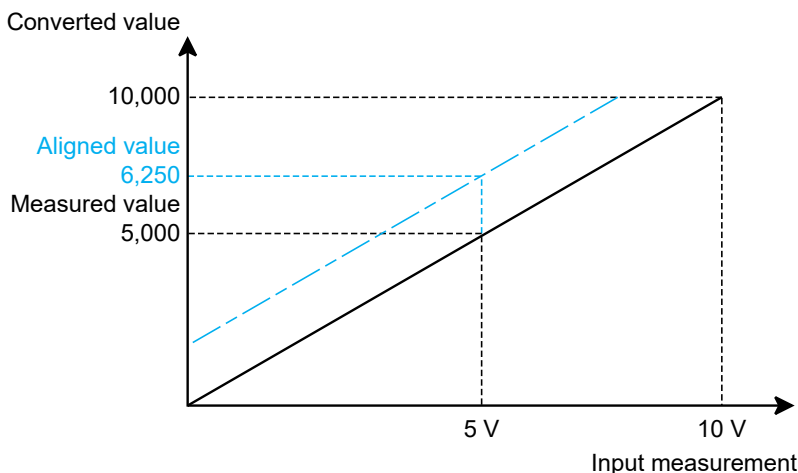
Channel alignment is performed on the channel in standard operating mode, without any effect on the operating modes of the channel.

The maximum offset between measured value and desired (aligned) value must not exceed +/-1,500.

> **NOTE:** To align several analog channels, proceed channel by channel. Test each channel after alignment before moving to the next channel to apply the parameters correctly.

RangeMode Parameters

The following table enumerates range modes for input and output modules:

Enumeration Value	Value Meaning
0	**± 10 Vdc**
1	**0...10 Vdc**
2	**± 5 Vdc**
3	**0...5 Vdc**
4	**1...5 Vdc**
5	**± 20 mA**
6	**0...20 mA**
7	**4...20 mA**

Overflowcheck/Underflowcheck and ScalingRange Parameters

Overflowcheck/Underflowcheck

Depending on the range selected, the module verifies that the measurement falls between two thresholds. A tolerance area can be set around each threshold.

The following table describes the types of areas:

Designation	Description
Nominal Area	No advisory or error indicator in this area: Measurement range corresponds to the chosen range.
Upper Tolerance Area	Advisory indicator in this area: Measurement range varies between the values included between the upper advisory threshold (**Range Maximum**) and upper error threshold (**Overflow Threshold**).
Lower Tolerance Area	Advisory indicator in this area: Measurement range varies between the values included between the lower advisory threshold (**Range Minimum**) and lower error threshold (**Underflow Threshold**).
Overflow Area	Error indicator in this area: Measurement range is located beyond the upper error threshold.
Underflow Area	Error indicator in this area: Measurement range is located under the lower error threshold.

NOTE: For voltage/current input ranges, the resolution is different depending on scaling range used.

To set a tolerance area, you can configure **Range Maximum** and **Range Minimum** in the configuration software or embedded web page. The **Overflow Threshold** and **Underflow Threshold** parameters are computed by setting **Range Maximum** and **Range Minimum**.

Input Modules Scaling Range

NTSAMI0210/NTSAMI0210H Scaling Range

Range	Default Underflow Threshold Configurable range	Nominal Area [Range Minimum, Range Maximum]		Default Overflow Threshold Configurable range
		Default Range Minimum Value	Default Range Maximum Value	
± 10 Vdc	-11,000 -11,400...-10,000	-10,000	10,000	11,000 10,000...11,400
	-11 V -11.4...-10 V	-10 V	+10 V	+11 V 10...11.4 V
0...10 Vdc	-1,000 -1,400...0	0	10,000	11,000 10,000...11,400
	-1 V -1.4...0 V	0 V	+10 V	+11 V 10...11.4 V
± 5 Vdc	-11,000 -15,000...-10,000	-10,000	10,000	11,000 10,000...15,000
	-5.5 V -7.5...-5 V	-5 V	+5 V	+5.5 V 5...7.5 V
0...5 Vdc	-1,000 -5,000...0	0	10,000	11,000 10,000...15,000
	-0.5 V -2.5...0 V	0 V	+5 V	+5.5 V 0...7.5 V
1...5 Vdc	-800 -4,000...0	0	10,000	10,800 10,000...14,000
	+0.68 V -0.6...+1 V	+1 V	+5 V	+5.32 V 5...6.6 V
± 20 mA	-11,000 -12,000...-10,000	-10,000	10,000	11,000 10,000...12,000
	-22 mA -24...-20 mA	-20 mA	20 mA	22 mA 20...24 mA
0...20 mA	-1,000 -5,000...0	0	10,000	11,000 10,000...12,000
	-2 mA -10...0 mA	0 mA	20 mA	22 mA 20...24 mA
4...20 mA	-800 -4,000...0	0	10,000	10,800 10,000...12,000
	2.72 mA -2.4...4 mA	4 mA	20 mA	21.28 mA 20...23.2 mA

NTSACI0802X/NTSACI0802XH Scaling Range

Range	Default Underflow Threshold	Nominal Area [Range Minimum, Range Maximum]		Default Overflow Threshold
	Configurable range	Default Range Minimum Value	Default Range Maximum Value	Configurable range
± 20 mA	-10,500 -11,000, -10,000	-10,000	10,000	10,500 10,000, 11,250
	-21 mA -22 mA, -20 mA	-20 mA	20 mA	21 mA 20 mA, 22.5 mA
0...20 mA	-1,000 -5,000, 0	0	10,000	10,500 10,000, 11,250
	-2 mA -10 mA, 0 mA	0 mA	20 mA	21 mA 20 mA, 22.5 mA
4...20 mA	-800 -4,000, 0	0	10,000	10,500 10,000, 11,250
	2.72 mA -2.4 mA, 4 mA	4 mA	20 mA	20.8 mA 20 mA, 22 mA

NTSAMI0400 Scaling Range

Range	Default Underflow Threshold Configurable range	Nominal Area [Range Minimum, Range Maximum]		Default Overflow Threshold Configurable range
		Default Range Minimum Value	Default Range Maximum Value	
± 10 Vdc	-11,000 -11,400, -10,000	-10,000	10,000	11,000 10,000, 11,400
	-11 V -11.4 V, -10 V	-10 V	+10 V	+11 V +10 V, +11.4 V
0...10 Vdc	-1,000 -1,400, 0	0	10,000	11,000 10,000, 11,400
	-1 V -1.4 V, 0 V	0 V	+10 V	+11 V +10 V, +11.4 V
± 5 Vdc	-11,000 -15,000, -10,000	-10,000	10,000	11,000 10,000, 15,000
	-5.5 V -7.5 V, -5V	-5 V	+5 V	+5.5 V +5 V, +7.5 V
0...5 Vdc	-1,000 -5,000, 0	0	10,000	11,000 10,000, 15,000
	-0.5 V -2.5 V, 0 V	0 V	+5 V	+5.5 V 0 V, +7.5 V
1...5 Vdc	-800 -4,000, 0	0	10,000	10,800 10,000, 14,000
	+0.68 V -0.6 V, +1 V	+1 V	+5 V	+5.32 V +5 V, +6.6 V
± 20 mA	-10,500 -12,000, -10,000	-10,000	10,000	10,500 10,000, 11,250
	-21 mA -22.5 mA, -20 mA	-20 mA	20 mA	21 mA 20 mA, 22.5 mA
0...20 mA	-1,000 -5,000, 0	0	10,000	10,500 10,000, 11,250
	-2 mA -10 mA, 0 mA	0 mA	20 mA	21 mA 20 mA, 22.5 mA
4...20 mA	-800 -4,000, 0	0	10,000	10,500 10,000, 11,250
	2.72 mA -2.4 mA, 4 mA	4 mA	20 mA	20.8 mA 20 mA, 22 mA

Output Modules Scaling Range

NTSAMO0400/NTSAMO0400H Scaling Range

Range	Default Underflow Threshold Configurable range	Nominal Area [Range Minimum, Range Maximum]		Default Overflow Threshold Configurable range
		Default Range Minimum Value	Default Range Maximum Value	
± 10 Vdc	-10,300 -10,500, -10,000	-10,000	10,000	10,300 10,000, 10,500
	-10.3 V -10.5 V, -10 V	-10 V	+10 V	+10.3 V +10 V, +10.5 V
0...10 Vdc	-1,000 -2,000, 0	0	10,000	10,300 10,000, 10,500
	-1 V -2 V, 0 V	0 V	+10 V	+10.3 V +10 V, +10.5 V
± 5 Vdc	-10,300 -10,500, -10,000	-10,000	10,000	10,300 10,000, 10,500
	-5.15 V -5.25 V, -5 V	-5 V	+5 V	+5.15 V +5 V, +5.25 V
0...5 Vdc	-1,000 -2,000, 0	0	10,000	10,300 10,000, 10,500
	-0.5 V -1 V, 0 V	0 V	+5 V	+5.15 V +5 V, +5.25 V
1...5 Vdc	-800 -1,600, 0	0	10,000	10,300 10,000, 10,500
	0.68 V 0.36 V, 1 V	1 V	+5 V	+5.12 V +5 V, +5.2 V
0...20 mA	-1,000 -2,000, 0	0	10,000	10,300 10,000, 10,500
	-2 mA -4 mA, 0 mA	0 mA	20 mA	20.6 mA 20 mA, 21 mA
4...20 mA	-800 -1,600, 0	0	10,000	10,300 10,000, 10,500
	2.72 mA 1.44 mA, 4 mA	4 mA	20 mA	20.48 mA 20 mA, 20.8 mA

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.

C

CA:

(*Certificate Authority*) An entity that issues digital certificates to certify the ownership of a public key by the named subject of the certificate.

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

electronic module:

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

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*).

Ethernet:

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

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.

H

hex:

(*hexadecimal*)

I

I/O:

(*input/output*)

ID:

(*identifier/identification*)

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.

input/output:

The index of the ARRAY.

Island: : Group of remote or distributed clusters.

L

LED:

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

M

ms:

(*millisecond*)

N

NAMUR NE43:

NAMUR NE43 provides a guideline on how a sensor fault can be indicated to a control system using the 4...20 mA signal.

network:

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

NTS: (*Network Terminal Slice*)

R

run:

A command that causes the controller to scan the application program, read the physical inputs, and write to the physical outputs according to solution of the logic of the program.

T

terminal block:

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

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A

M

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