Modicon Edge I/O NTS

Analog Modules

User Guide

Original instructions

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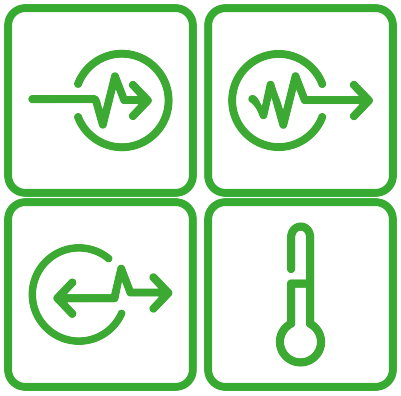

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The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

This document is not intended as a substitute for a detailed study or operational and site-specific development or schematic plan. It is not to be used for determining suitability or reliability of the products/solutions for specific user applications. It is the duty of any such user to perform or have any professional expert of its choice (integrator, specifier or the like) perform the appropriate and comprehensive risk analysis, evaluation and testing of the products/solutions with respect to the relevant specific application or use thereof.

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Table of Contents

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 Document

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 versions available at the publication date of this document.

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.

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.

General Cybersecurity Information

In recent years, the growing number of networked machines and production plants has seen a corresponding increase in the potential for cyber threats, such as unauthorized access, data breaches, and operational disruptions. You must, therefore, consider all possible cybersecurity measures to help protect assets and systems against such threats.

To help keep your Schneider Electric products secure and protected, it is in your best interest to implement the cybersecurity best practices as described in the Cybersecurity Best Practices document.

Schneider Electric provides additional information and assistance:

- Subscribe to the Schneider Electric security newsletter.
- Visit the Cybersecurity Support Portal web page to:
  - Find Security Notifications.
  - Report vulnerabilities and incidents.
- Visit the Schneider Electric Cybersecurity and Data Protection Posture web page to:
  - Access the cybersecurity posture.
  - Learn more about cybersecurity in the cybersecurity academy.
  - Explore the cybersecurity services from Schneider Electric.

Environmental Data

For product compliance and environmental information, refer to the Schneider Electric Environmental Data Program.

Available Languages of the Document

The document is available in these languages:

- English (EIO0000005246)
- French (EIO0000005247)
- Chinese (EIO0000005251)

Related Documents

Title of documentation	Reference number
Modicon Edge I/O - System Planning and Installation Guide	EIO0000004786 (ENG) EIO0000004787 (FRE) EIO0000004791 (CHS)
Modicon Edge I/O - Configurator and Web Interface - User Guide	EIO0000004810 (ENG) EIO0000004811 (FRE) EIO0000004815 (CHS)
Modicon Edge I/O - Software Integration and Compatibility - User Guide	EIO0000004818 (ENG) EIO0000004819 (FRE) EIO0000004823 (CHS)
Modicon Edge I/O - Diagnostic Data - User Guide	EIO0000004826 (ENG) EIO0000004827 (FRE) EIO0000004831 (CHS)
Modicon Edge I/O NTS - Network Interface Modules - User Guide	EIO0000004794 (ENG) EIO0000004795 (FRE) EIO0000004799 (CHS)
Modicon Edge I/O NTS - Discrete Modules - User Guide	EIO0000005238 (ENG) EIO0000005239 (FRE) EIO0000005243 (CHS)
Modicon Edge I/O NTS - Motion Expert Modules - User Guide	EIO0000005254 (ENG) EIO0000005255 (FRE) EIO0000005259 (CHS)
Modicon Edge I/O NTS - Counting Modules - User Guide	EIO0000005262 (ENG) EIO0000005263 (FRE) EIO0000005267 (CHS)
Modicon Edge I/O NTS - Field Device Master Modules - User Guide	EIO0000005270 (ENG) EIO0000005271 (FRE) EIO0000005275 (CHS)

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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 19
- Temperature Input modules, page 20
- Output modules, page 20
- Input/Output modules, page 21

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 23/ NTSAMI0210H, page 23	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 40	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
NTSAMI0420, page 52	4	Differential 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
NTSAMI0800, page 64	8	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 / 3.81 mm
NTSACI0802X, page 76/ NTSACI0802XH, page 76	8	Single-ended inputs with loop power	0.1 %	± 20 mA 0...20 mA 4...20 mA	Removable screw/spring terminal block / 5 mm
NTSAHI0412XH, page 91	4	Isolated HART inputs with loop power	0.05 %	4...20 mA	Removable screw/spring terminal block / 5 mm

Temperature Input Modules

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

Reference	Number of Channels	Channel Type	Accuracy	Mode	Terminal Type / Pitch
NTSART0214, page 109/NTSART0214H, page 109	2	Isolated differential inputs	Refer to Input Characteristics, page 115	Voltage Resistance RTD Thermocouple	Removable screw/spring terminal block / 5 mm
NTSART0404, page 123	4	Differential inputs	Refer to Input Characteristics, page 129	Voltage Resistance RTD Thermocouple	Removable screw/spring terminal block / 5 mm
NTSART0404XH, page 137	4	Differential inputs	Refer to Input Characteristics, page 143	Voltage Resistance RTD Thermocouple	Removable screw/spring terminal block / 5 mm
NTSART0603, page 152	6	Differential inputs	Refer to Input Characteristics, page 158	Resistance RTD Thermistor	Removable screw/spring terminal block / 3.81 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
NTSAHO0212H, page 166	2	Isolated HART outputs	0.1 %	4...20 mA	Removable screw/spring terminal block / 5 mm
NTSAMO0210, page 181/NTSAMO0210H, page 181	2	Isolated outputs	0.1 %	± 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
NTSAMO0400, page 193/NTSAMO0400H, page 193	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/Output Modules

The following table shows the analog input/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
NTSAMM0600, page 206	4 2	Single-ended inputs Differential outputs	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 / 3.81 mm

Analog Input Modules

What's in This Part

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

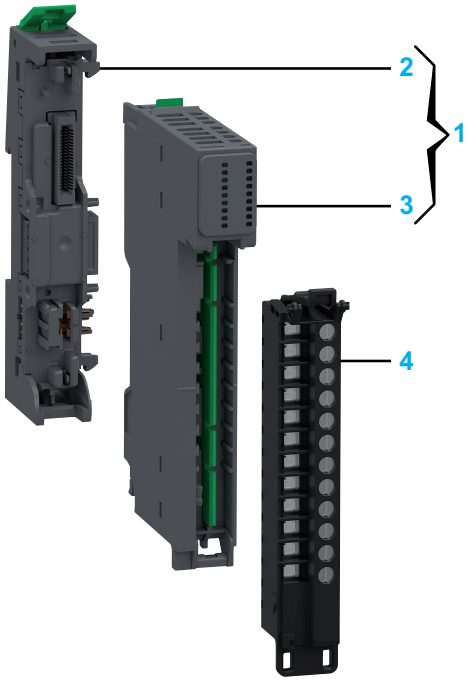
The following table describes the main characteristics of the NTSAMI0210/ NTSAMI0210H input modules:

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

Purchasing Information

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

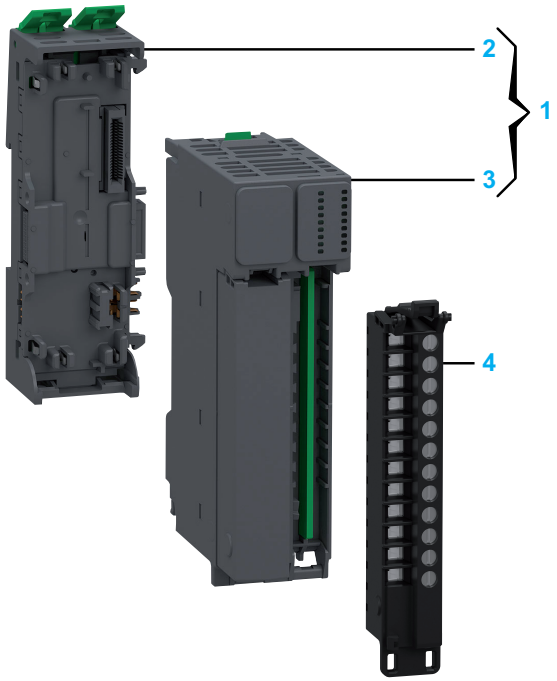
NTSAMI0210



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.

NTSAMI0210H



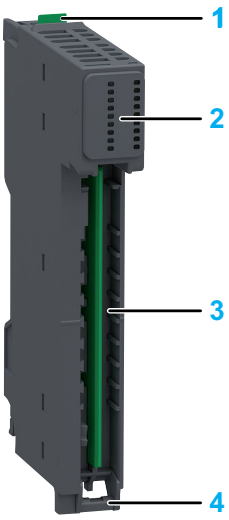
Number	Reference	Description
1	NTSAMI0210HK	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0200H	Spare Base, 2 Slots, for Input/Output Common/Expert/Safety Module, Hardened
3	NTSAMI0210H	Analog Input Module, 2 Isolated Inputs, Current, Voltage, 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.

Physical Description

NTSAMI0210

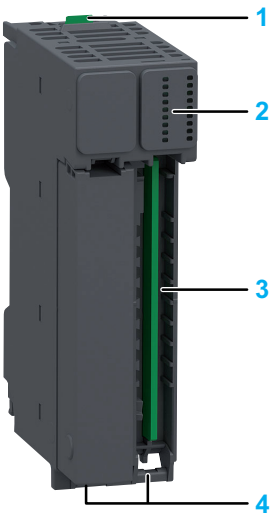
The following figure presents the elements of the module:



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

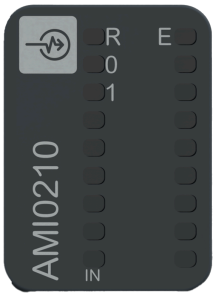
The following figure presents the elements of the module:



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

Status LEDs

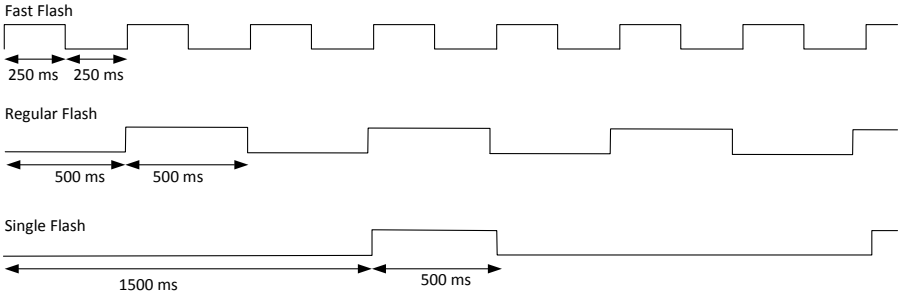
The following figure presents the NTSAMI0210H status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...1 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding input channel is activated.
ON	-	OFF	Indicates that the corresponding input channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • 24 Vdc loop power error detection. • Overflow/underflow error detection.

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



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.

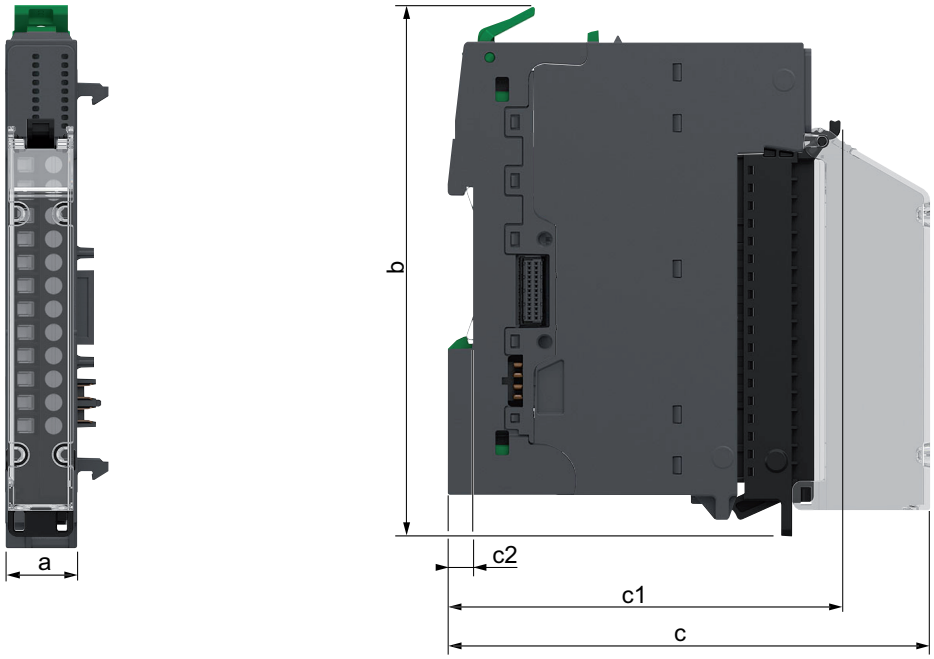
Failure to follow these instructions can result in death, serious injury, or equipment damage.

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

Dimensions

NTSAMI0210

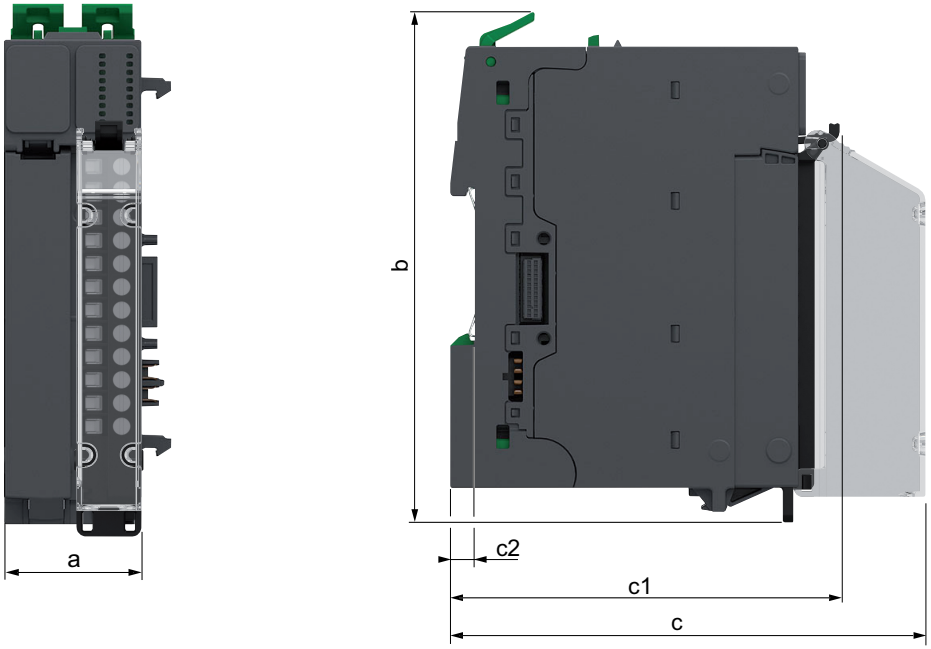
The following figure presents the external dimensions of the assembled module:



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)

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)

General Characteristics

The following table describes 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

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
		Scaling range, refer to NTSAMI0210/NTSAMI0210H Scaling Range, page 233.	
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 operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		±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 226.	
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 Modules - User Guide.			

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 Diagrams

Loop power supply is used with 2-wire 4...20 mA current sensor and provides a maximum current of 25 mA.

Sensor power supply is used with 3-wire or 4-wire current or voltage sensor, and provides a maximum current of 100 mA per channel.

The 3-wire sensor or 4-wire 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.

The isolation between the analog module section and the field sensor power is not effective if a 3-wire sensor or a 4-wire sensor with a non-isolated output is used.

The isolation between channels is not effective if two 3-wire or 4-wire sensors with non-isolated outputs share the same power supply (either 24 Vdc from the analog module or an external power supply connected).

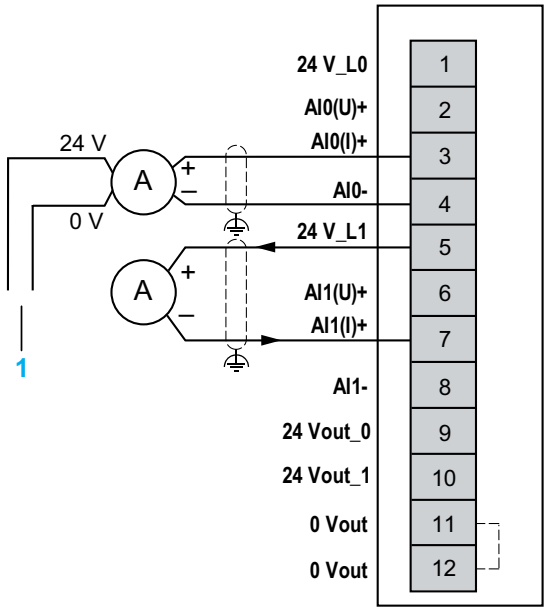
Further, as the sensor power could be misused as loop power, the input value may be abnormal due to a broken current loop. Additionally, the isolation between channels is not effective if the same miswiring is applied to the two channels.

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.**

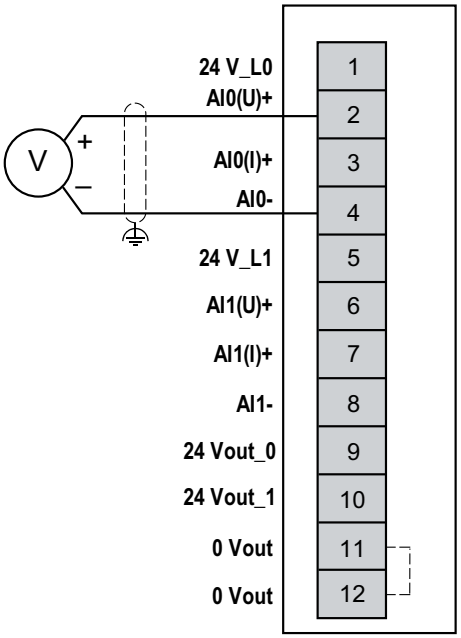
You may choose to use an external power supply to provide sensor power or loop power in case a larger current is required for the sensor.

Current and Voltage Measurement 2-Wire Diagram

The following figures illustrate the connection between the inputs and the current and voltage measurement sensors:



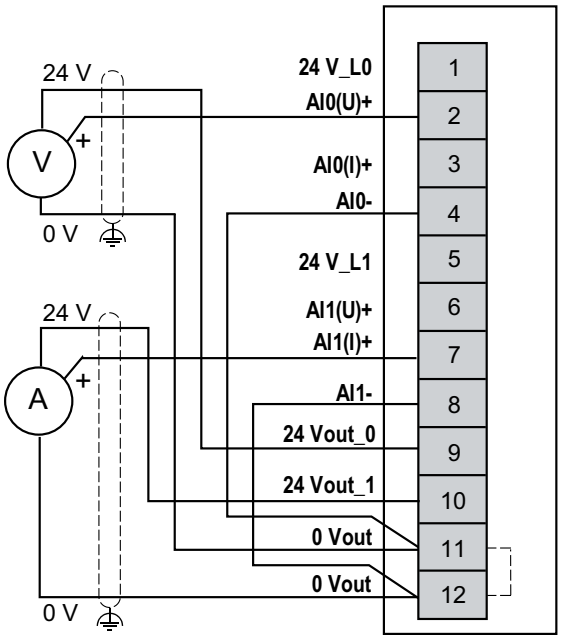
1: External SELV supply
24 V_L•: Loop power
24 Vout_•: Sensor power
A: Current
(U): Voltage
(I): Current



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

Current and Voltage Measurement 3-Wire Diagram

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

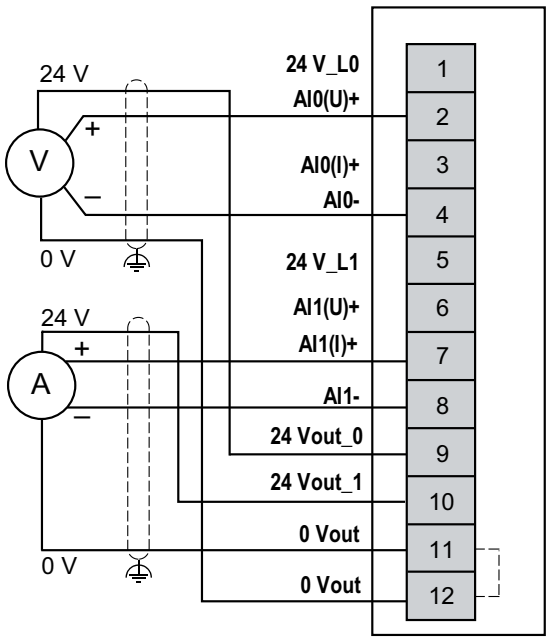


24 V_L•: Loop power
24 Vout_•: Sensor power
V: Voltage
A: Current
(U): Voltage
(I): Current

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

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

NTSAMI0210/NTSAMI0210H Parameters

Overview

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

Parameters Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in 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 228.
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 224.
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 232.

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 232.
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 227.
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 226.
* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input 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	Provides the following detected error for the channel: 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	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

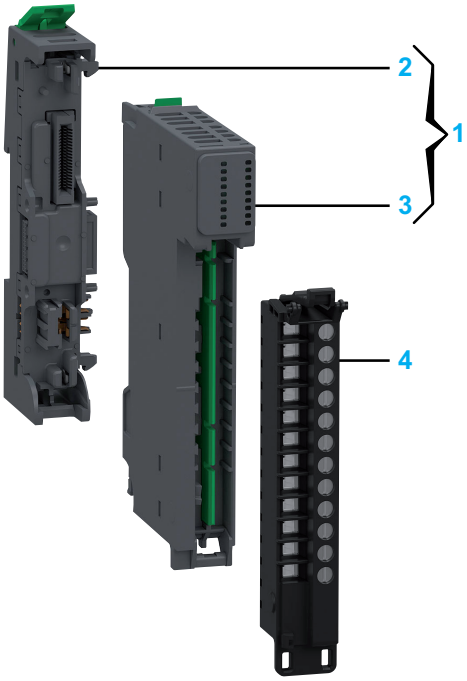
Main Characteristics

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:

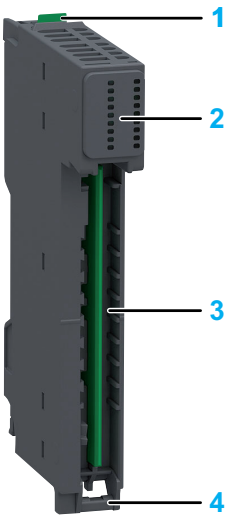


Number	Reference	Description
1	NTSAMI0400K	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSAMI0400	Analog Input Module, 4 Inputs, Current, Voltage, 2-wire
4	NTSXTB12200H	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

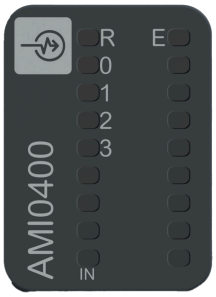
The following figure presents the elements of the module:



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

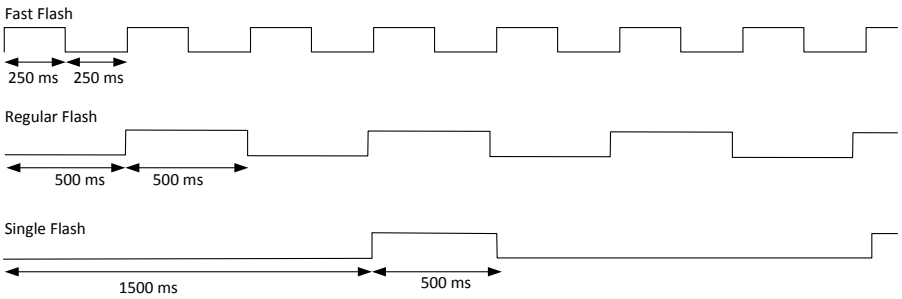
The following figure presents the NTSAMI0400 status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...3 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding input channel is activated.
ON	-	OFF	Indicates that the corresponding input channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • Overflow/underflow error detection.

The following graphic depicts 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

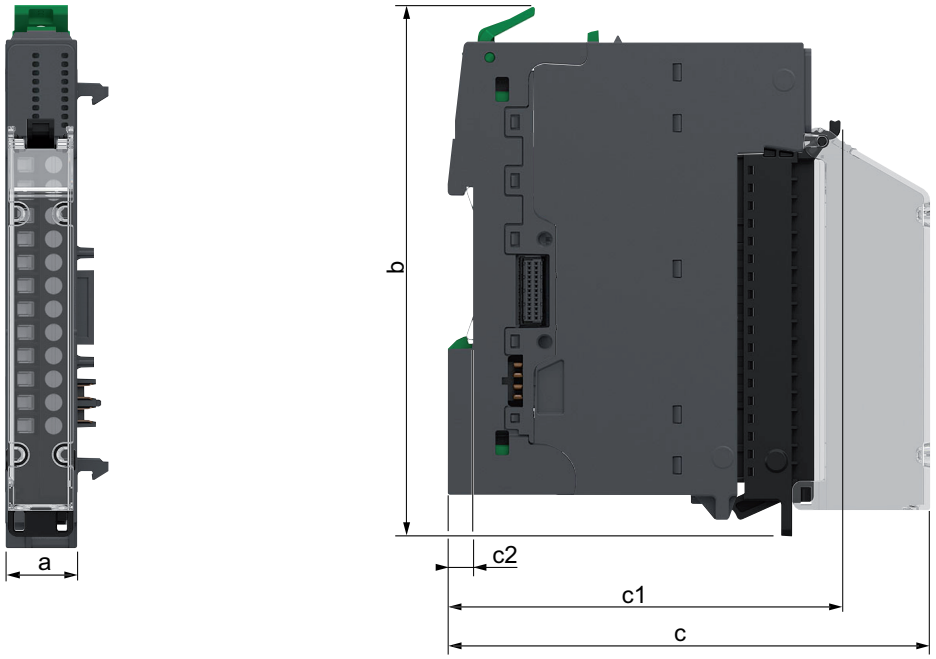
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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 describes 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
		Scaling range, refer to NTSAMI0400/NTSAMI0420/NTSAMI0800/NTSAMM0600 Scaling Range, page 235.	
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 operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		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 226.	
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	

Characteristics	Value	
	Voltage input	Current input
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 Modules - User Guide.		

NTSAMI0400 Wiring

Overview

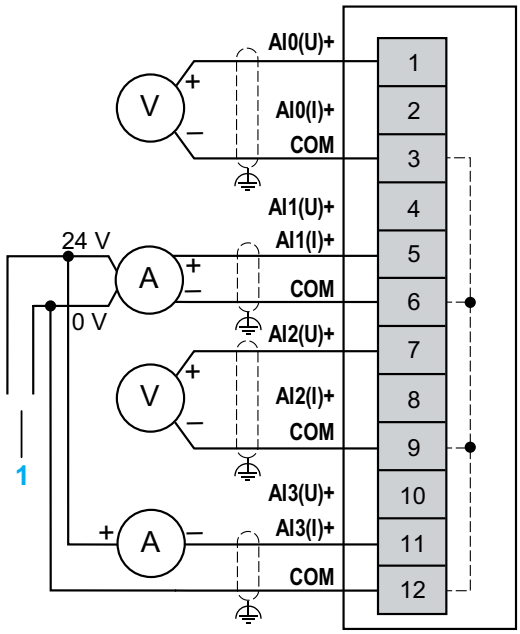
This section provides the wiring diagram for the NTSAMI0400 input module.

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 current and voltage measurement sensors:



1: External SELV supply
(U): Voltage
(I): Current

NTSAMI0400 Parameters

Overview

This section describes the parameters of the NTSAMI0400 module.

Parameters Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in 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 228.
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 232.
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 232.
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 227.

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 226.
* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input 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	Provides the following detected error for the channel: 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	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

NTSAMI0420 Analog Input Module, 4 Differential Inputs, Current, Voltage, 2-wire

What's in This Chapter

NTSAMI0420 Presentation

Overview

This section provides a presentation of the NTSAMI0420 input module.

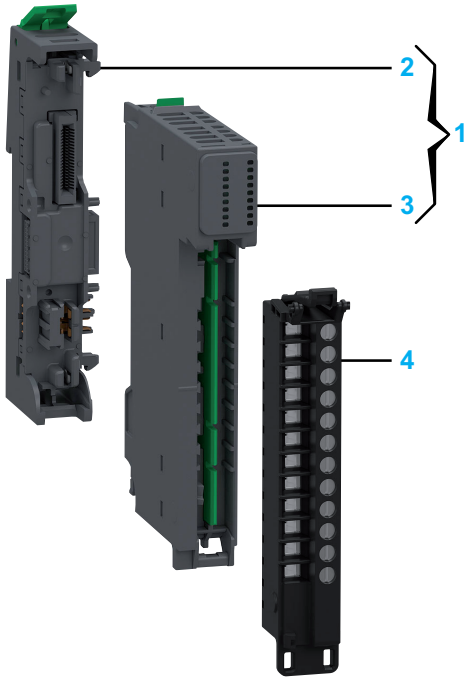
Main Characteristics

The following table describes the main characteristics of the NTSAMI0420 input module:

Main Characteristics	Value
Product or component type	Analog current and voltage input module
Number of channels	4
Channel property	Differential
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 NTSAMI0420 input module:

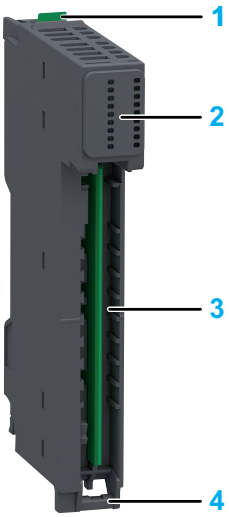


Number	Reference	Description
1	NTSAMI0420K	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSAMI0420	Analog Input Module, 4 Differential Inputs, Current, Voltage, 2-wire
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

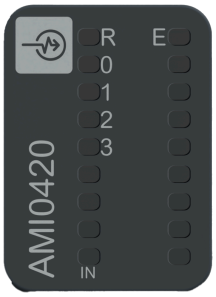
The following figure presents the elements of the module:



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

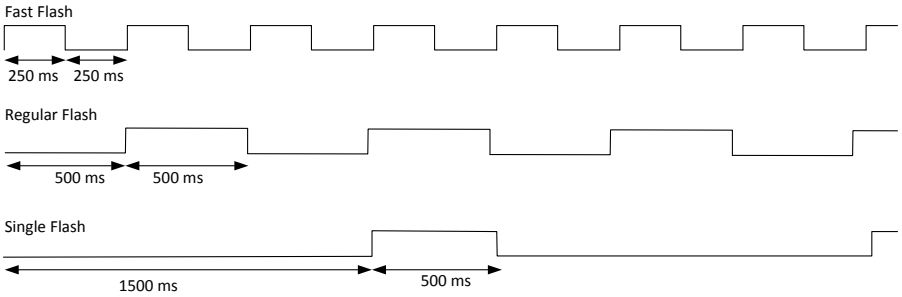
The following figure presents the NTSAMI0420 status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...3 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding input channel is activated.
ON	-	OFF	Indicates that the corresponding input channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • Overflow/underflow error detection.

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



NTSAMI0420 Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

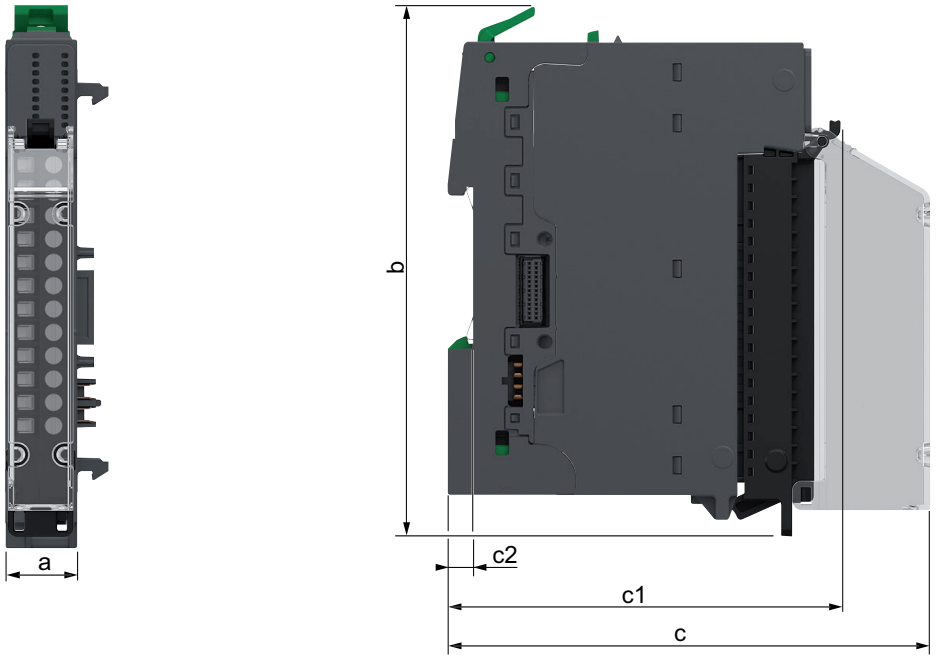
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

- NTSAMI0420: 48 g (1.69 oz)
- NTSAMI0420K: 73 g (2.58 oz)

General Characteristics

The following table describes the general characteristics of the NTSAMI0420 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	1,000 Vac
	Between field power and bus	1,500 Vac
Protection and detection		Module: • Field power from the power supply module detection Analog Input: • Voltage input: Miswiring protection by channel • Current input: Overcurrent and miswiring protection by channel
Power dissipation		1.76 W

Input Characteristics

The following table describes the input characteristics of the NTSAMI0420 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
		Scaling range, refer to NTSAMI0400/NTSAMI0420/NTSAMI0800/NTSAMM0600 Scaling Range, page 235.	
Input impedance		5 MΩ minimum	100 Ω + 10 Ω internal current protector
Input response time	Per enabled channel	70 µs	
	Per module	Internal I/O bus exchange cycle time(1) 1 ms minimum	
Maximum accuracy at ambient operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		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	
Resolution	Signed signal	±10 V, ±5 V, ±20 mA: 16 bits, or 15 bits plus sign bit	
	Unsigned signal	0...10 V, 0...5V, 1...5V, 0...20mA, 4...20mA: 15 bits	
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)
Input data out of range detection		Yes	
Resistance to electromagnetic interference	Crosstalk between channels	80 dB minimum	
	Common mode rejection	70 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 226.	
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 Modules - User Guide.			

NTSAMI0420 Wiring

Overview

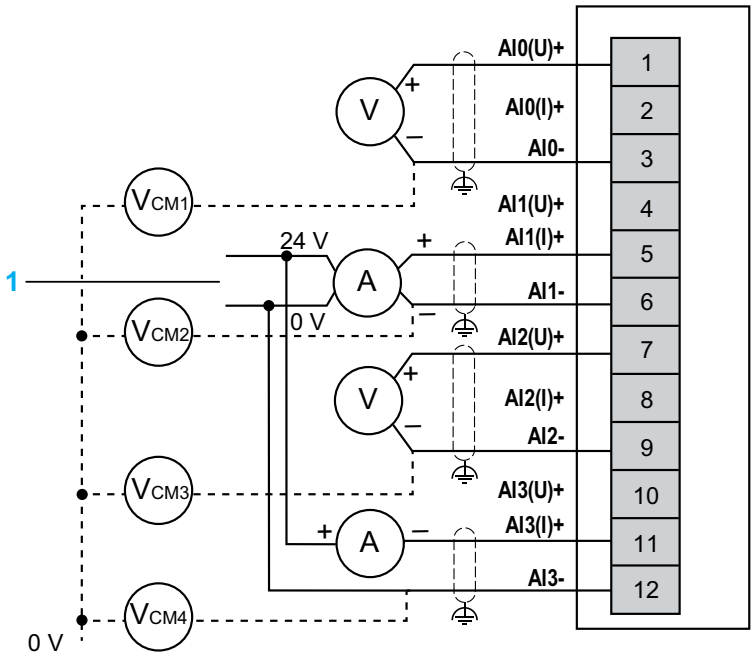
This section provides the wiring diagram for the NTSAMI0420 input module.

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 current and voltage measurement sensors:



1: External SELV supply
(U): Voltage
(I): Current

NOTE: V_{CM} is the common mode voltage relative to 24 Vdc Field power, with maximum allowable common mode voltage between channels of +/- 12 Vdc.

NTSAMI0420 Parameters

Overview

This section describes the parameters of the NTSAMI0420 module.

Parameters Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in the cluster, a configuration error is detected.
* Parameter default value			

For each input channel you can define:

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 228.
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..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 232.
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 232.
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 227.

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** Peak filtering: **7**	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 226.
* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input 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	Provides the following detected error for the channel: 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	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

NTSAMI0800 Analog Input Module, 8 Inputs, Current, Voltage, 2-wire

What's in This Chapter

NTSAMI0800 Presentation

Overview

This section provides a presentation of the NTSAMI0800 input module.

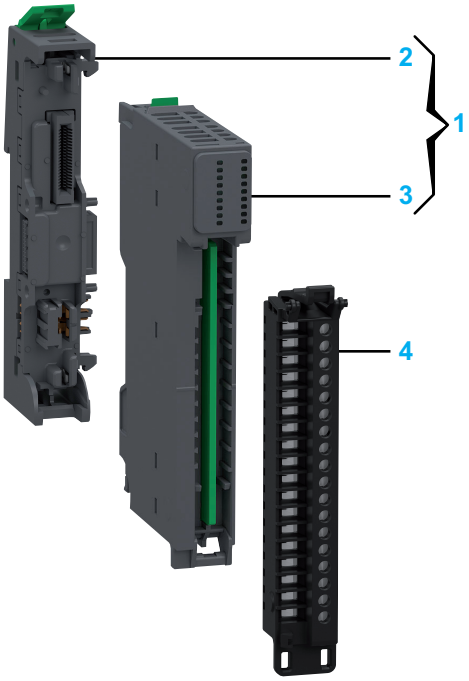
Main Characteristics

The following table describes the main characteristics of the NTSAMI0800 input module:

Main Characteristics	Value
Product or component type	Analog current and voltage input module
Number of channels	8
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 NTSAMI0800 input module:

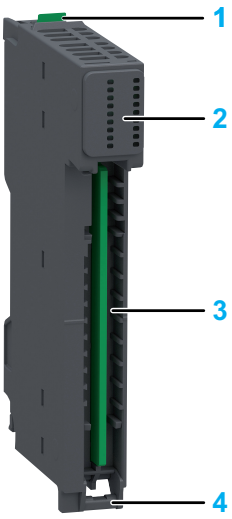


Number	Reference	Description
1	NTSAMI0800K	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSAMI0800	Analog Input Module, 8 Inputs, Current, Voltage, 2-wire
4	NTSXTB18200H	Spring Terminal Block, 18 Points, 3.81 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB18201H	Spring Terminal Block, 18 Points, 3.81 mm Pitch, With Cover, use on Low Height Module, Hardened
	NTSXTB18000H	Screw Terminal Block, 18 Points, 3.81 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB18001H	Screw Terminal Block, 18 Points, 3.81 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

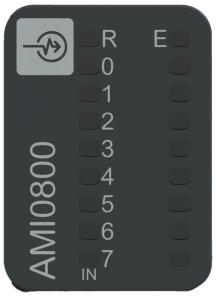
The following figure presents the elements of the module:



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

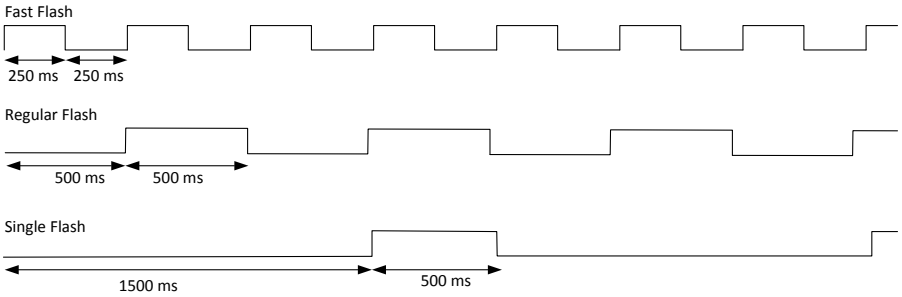
The following figure presents the NTSAMI0800 status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...7 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding input channel is activated.
ON	-	OFF	Indicates that the corresponding input channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • Overflow/underflow error detection.

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



NTSAMI0800 Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

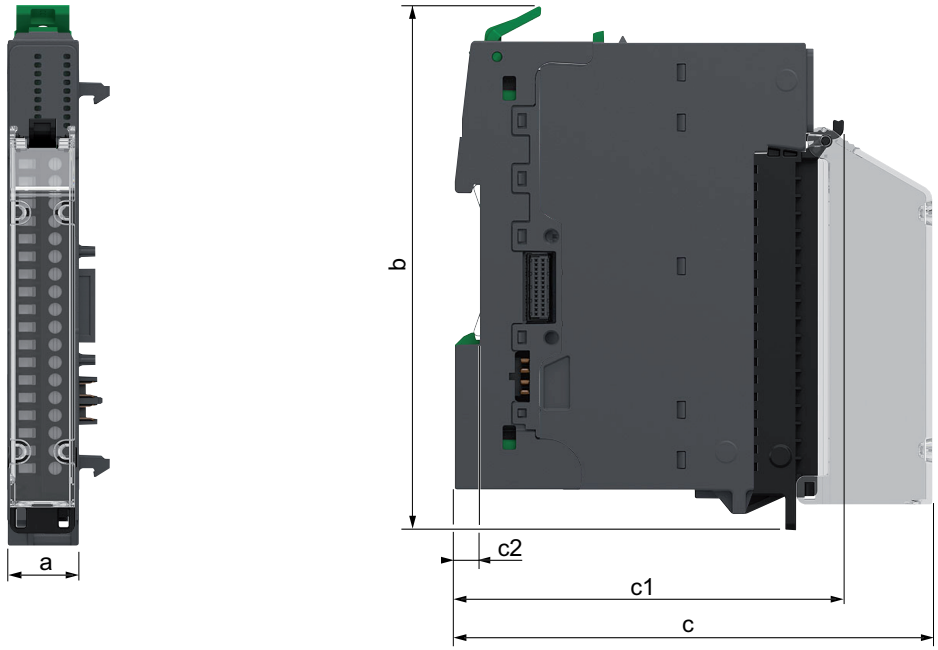
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

- NTSAMI0800: 48 g (1.69 oz)
- NTSAMI0800K: 73 g (2.58 oz)

General Characteristics

The following table describes the general characteristics of the NTSAMI0800 input module:

Characteristics		**Value**
Rated supplied voltage		24 Vac
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		Module: • Field power from the power supply module detection Analog Input: • Voltage input: Miswiring protection by channel • Current input: Overcurrent and miswiring protection by channel
Power dissipation		2.04 W

Input Characteristics

The following table describes the input characteristics of the NTSAMI0800 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
		Scaling range, refer to NTSAMI0400/NTSAMI0420/NTSAMI0800/NTSAMM0600 Scaling Range, page 235.	
Input impedance		7 MΩ minimum	100 Ω and 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 operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		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	
Resolution	Signed signal	±10 Vdc, ±5 Vdc, ±20 mA: 16 bits, or 15 bits plus sign bit	
	Unsigned signal	0...10 Vdc, 0...5 Vdc, 1...5 Vdc, 0...20 mA, 4...20 mA: 15 bits	
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)
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 226.	
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 Modules - User Guide.			

NTSAMI0800 Wiring

Overview

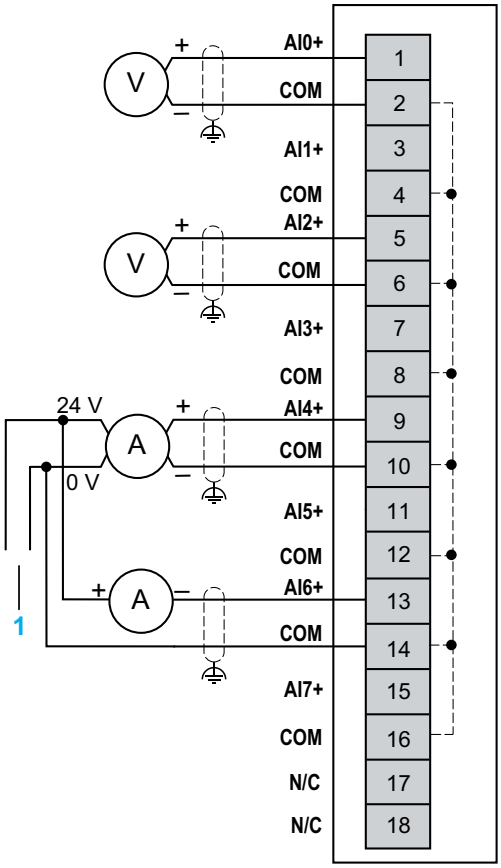
This section provides the wiring diagram for the NTSAMI0800 input module.

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 current and voltage measurement sensors:



1: External SELV supply
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.

NTSAMI0800 Parameters

Overview

This section describes the parameters of the NTSAMI0800 module.

Parameters Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in 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 228.
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..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 232.
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 232.
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 227.

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 226.
* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input 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	Provides the following detected error for the channel: 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	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

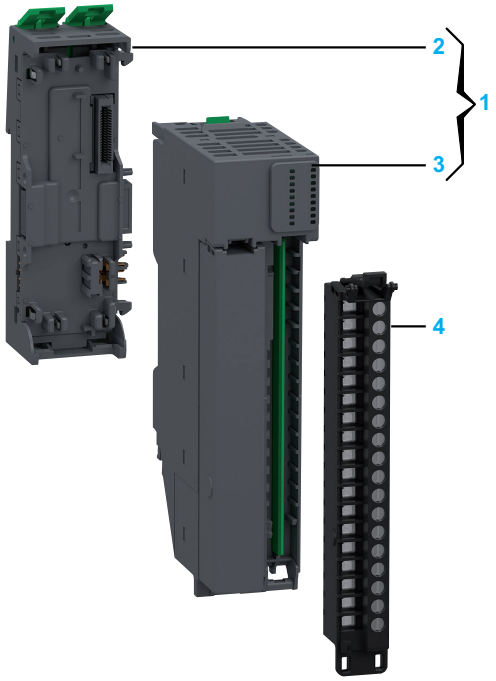
Main Characteristics

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:

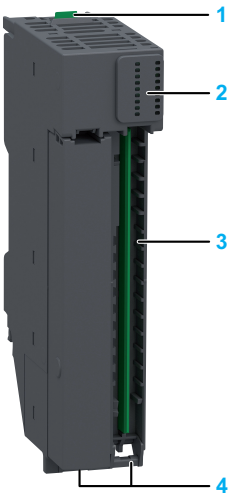


Number	Reference	Description
1	NTSACI0802XK NTSACI0802XHK	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0200H	Spare Base, 2 Slots, for Input/Output Common/Expert/Safety Module, Hardened
3	NTSACI0802X NTSACI0802XH	Analog Input Module, 8 Inputs,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

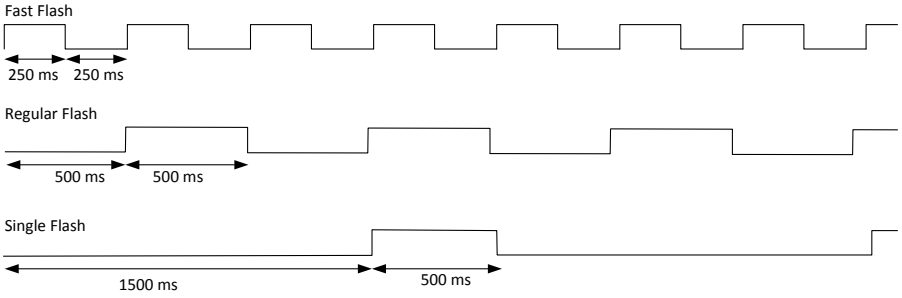
Status LEDs

The following figure presents the NTSACI0802X/NTSACI0802XH status LEDs:

The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...7 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding input channel is activated.
ON	-	OFF	Indicates that the corresponding input channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • 24 Vdc loop power error detection. • Overflow/underflow error detection.

The following graphic depicts 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

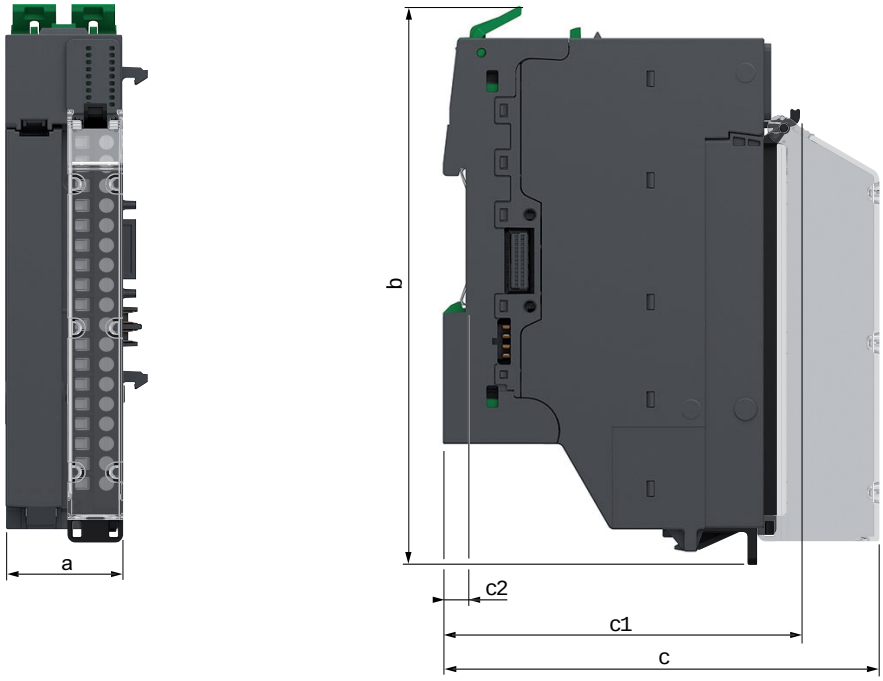
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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 describes 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
		Scaling range, refer to NTSACI0802X/NTSACI0802XH Scaling Range, page 234.
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 operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		±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 226.
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 Modules - 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.

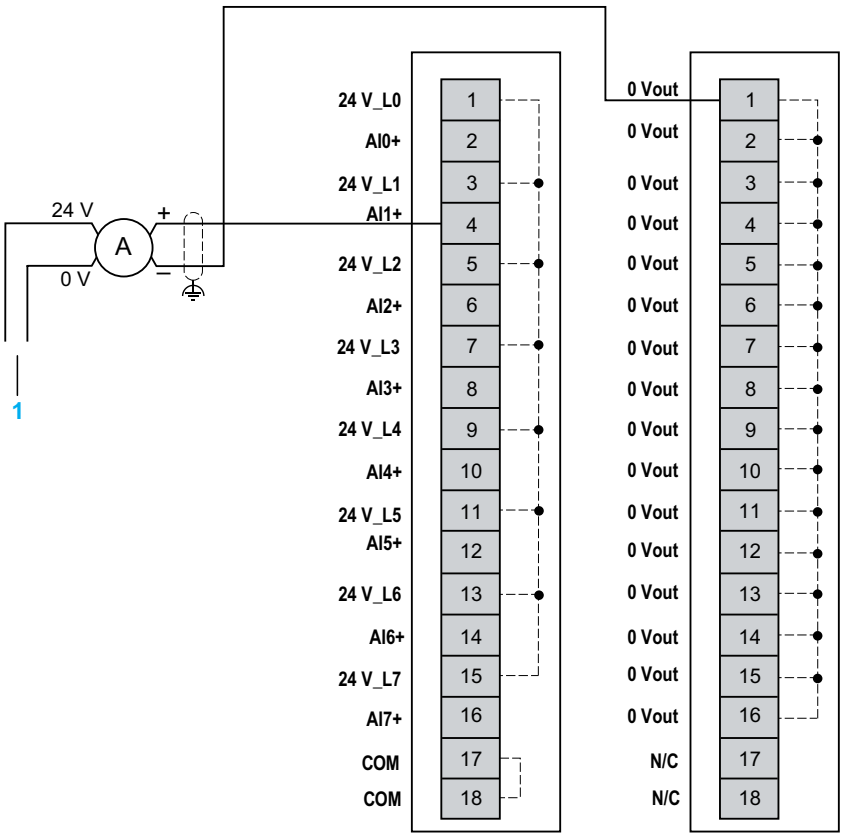
Wiring Diagrams

Loop power supply is used with 2-wire 4...20 mA current sensor and provides a maximum current of 25 mA.

You may choose to use an external power supply to provide loop power.

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

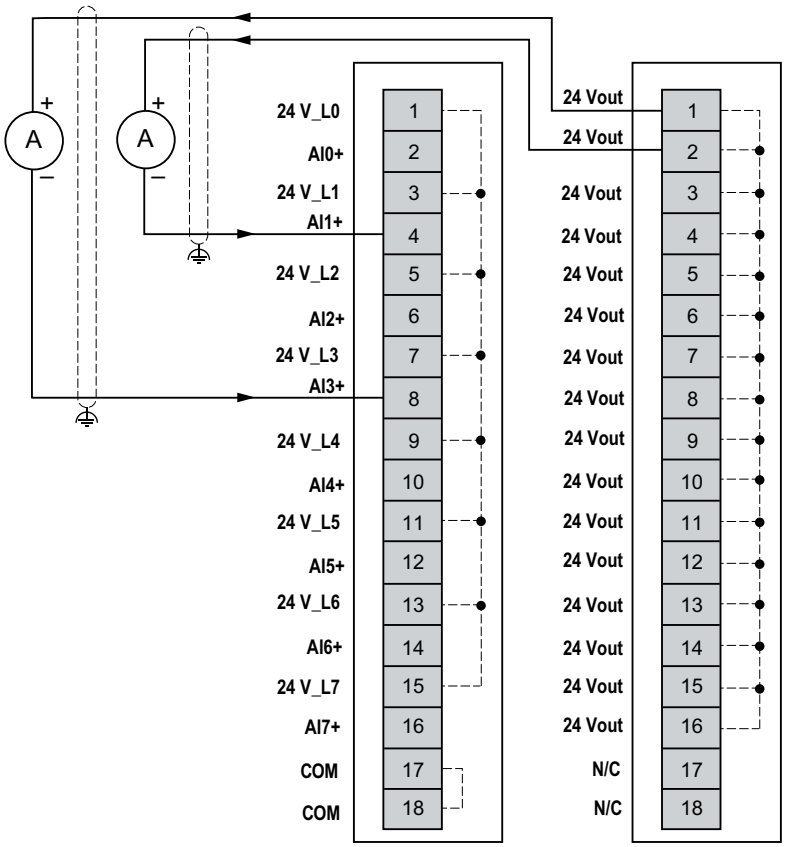
⚠WARNING

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

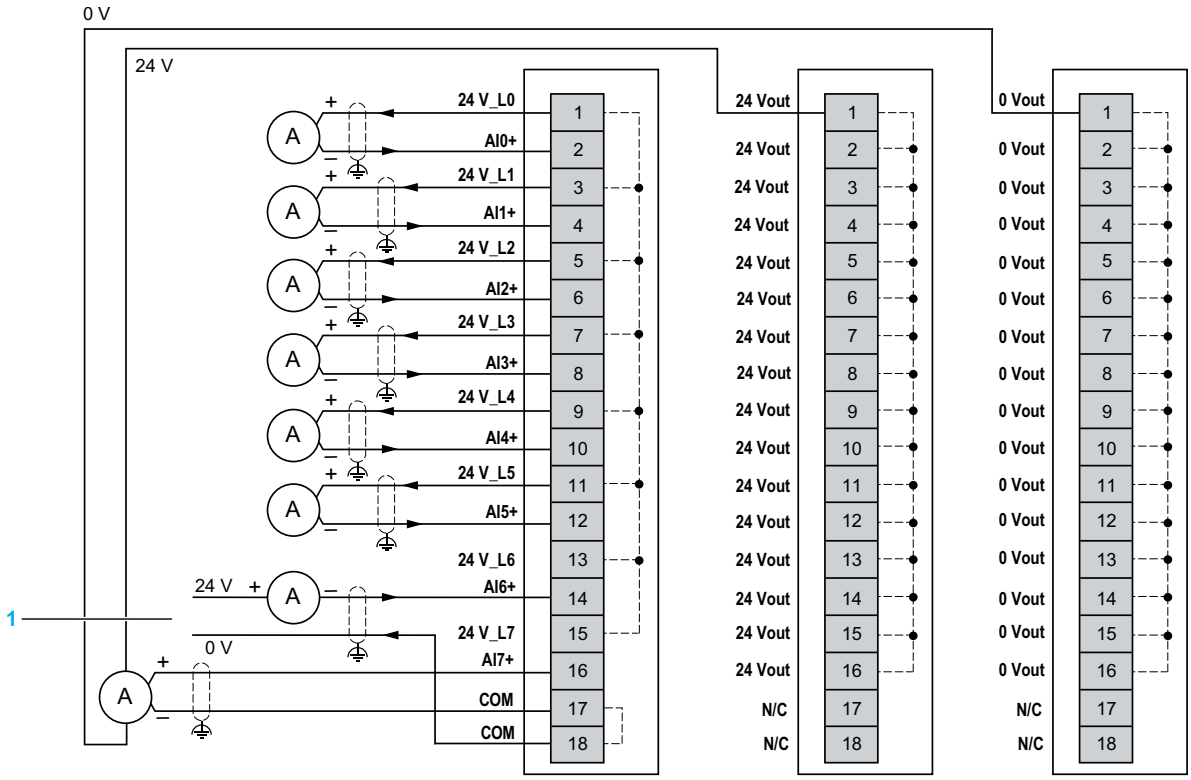
UNINTENDED EQUIPMENT OPERATION

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):



1: External SELV supply
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 Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in 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 228.
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 224.

Displayed Name ***Parameter Name***	**Value(s)**	**Data type**	**Description**
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 232.
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 232.
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 227.
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 226.
* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input 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	Provides the following detected error for the channel: 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	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

NTSAHI0412XH Analog Input Module, 4 Isolated Inputs, Current, HART, 2-wire, Loop Power, Hardened

What's in This Chapter

NTSAHI0412XH Presentation

Overview

This section provides a presentation of the NTSAHI0412XH input module.

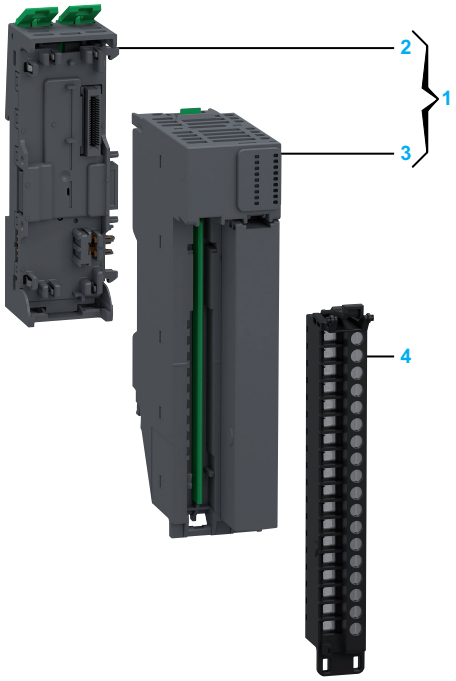
Main Characteristics

The following table describes the main characteristics of the NTSAHI0412XH input module:

Main Characteristics	Value
Product or component type	Analog current input module with HART
HART protocols supported	HART versions 5, 6 and 7
Number of channels	4
Channel property	Single-ended / Differential
Channel signal	Current
Operating mode	Asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS NTSAHI0412XH input module:

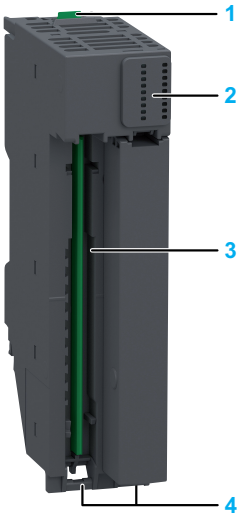


Number	Reference	Description
1	NTSAHI0412XHK	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0200H	Spare Base, 2 Slots, for Input/Output Common/Expert/Safety Module, Hardened
3	NTSAHI0412XH	Analog Input Module, 4 Isolated Inputs, Current, HART, 2-wire, 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

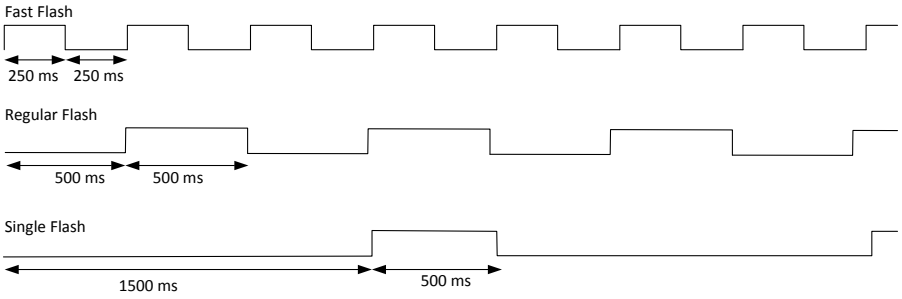
Status LEDs

The following figure presents the NTSAHI0412XH status LEDs:

The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...3 (Green)	H0...3 (Green)	Description
Initialization and non-operational states				
OFF	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.
Regular Flash	ON	-	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	-	Indicates that the module is in commissioning mode.
Operational state				
ON	OFF	-	-	Indicates that the module is energized, configured and operational.
ON	-	ON	-	Indicates that the corresponding input channel is activated.
ON	-	OFF	-	Indicates that the corresponding input 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: • 24 Vdc field power error detection. • 24 Vdc loop power error detection.
ON	Regular Flash	OFF	OFF	Indicates an internal error detection.
ON	Regular Flash	Regular Flash	-	Indicates: • Broken wire detection. • Overflow/underflow error detection.
ON	-	ON	OFF	Indicates that the input channel is activated but the HART Communication Diagnostics Channel is disabled.
ON	Single Flash	ON	Single Flash	Indicates one of the following: • HART Communication Diagnostics Channel is disconnected. • HART Communication Diagnostics Channel is connected and a difference change is detected. For more information on major and minor differences, refer to Major and minor differences, page 106.
ON	-	ON	ON	Indicates that the HART Communication Diagnostics Channel is connected without changing status.

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



NTSAHI0412XH Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

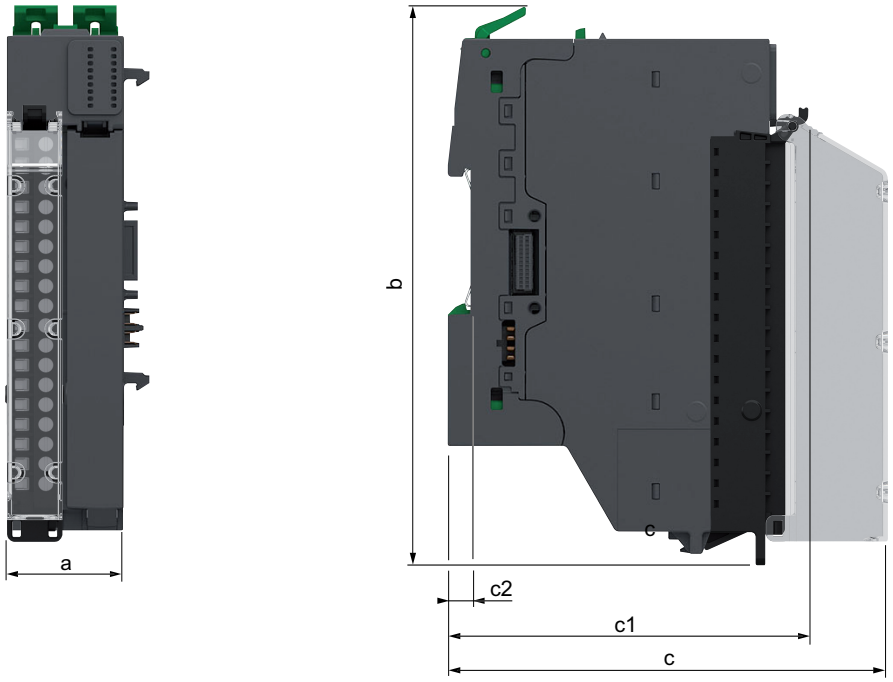
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

- NTSAHI0412XH: 85 g (3.00 oz)
- NTSAHI0412XHK: 131 g (4.62 oz)

General Characteristics

The following table describes the general characteristics of the NTSAHI0412XH input module:

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	1,000 Vac
	Between channels and field power	Channel to field power: • No isolation for 2-wire sensor supplied by external Field power (when power is shared with the power to the module) • 1,000 Vac for 2-wire sensor supplied by Isolated Loop power provided by module
	Between field power and bus	1,500 Vac
Protection and detection		Module: • Field power from the power supply module detection Analog Input: • Current input: Overcurrent and Miswiring protection by channel • Loop power output: Overcurrent and short circuit detection and protection by channel
Power dissipation		3.12 W

Input Characteristics

The following table describes the input characteristics of the NTSAHI0412XH input module:

Characteristics		**Value**
Input type		Single-ended /Differential
Logic type		Current input with HART
Wiring type sensor connection		2-wire
Input range		4...20 mA
		Scaling range, refer to NTSAHI0412XH Scaling Range, page 236.
Input impedance		250 Ω and an internal current protector of 10 Ω typical
HART compliance		Tolerant
HART communication		Yes
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
Resolution		4...20 mA: 16 bit (15 bits plus sign bit)
Maximum accuracy at ambient operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		0.05 % / 0.1 % of full scale
Input response time	Per enabled channel	1 ms
	Per module	Internal I/O bus exchange cycle time(1) 1 ms minimum
Input value of LSB		0.25 µA (range 4...20 mA)
Data type in application program		Scalable from -32,768 to 32,767
Conversion mode		Sigma-Delta
Maximum continuous allowed overload (no damage)		Current input: 30 V / 50 mA
Input filter		Software run-time configurable filter. Refer to Measurement Filter, page 226.
Temperature drift		0.002 %/°C of full scale
Repeatability after stabilization time		0.007 % of full scale
Nonlinearity		0.01 % of full scale
Monotonicity		Yes
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
Common mode rejection (50/60 Hz)		90 dB
Cable	Type	Shielded
	Length	1,000 m (3,280 ft) maximum
Operating ambient temperature derating	Current input	Up to 4 channels
	Loop power output	- 40 °C...60 °C (- 40 °F...140 °F): up to 4 channels. 60 °C...70 °C (140 °F...158 °F): the module needs derating as follow: • 2 channels maximum.
(1) For more information, refer to Configurable Parameters in Modicon Edge I/O NTS - Network Interface Modules - User Guide.		

NTSAHI0412XH Wiring

Overview

This section provides the wiring diagram for the NTSAHI0412XH input module.

Wiring Rules

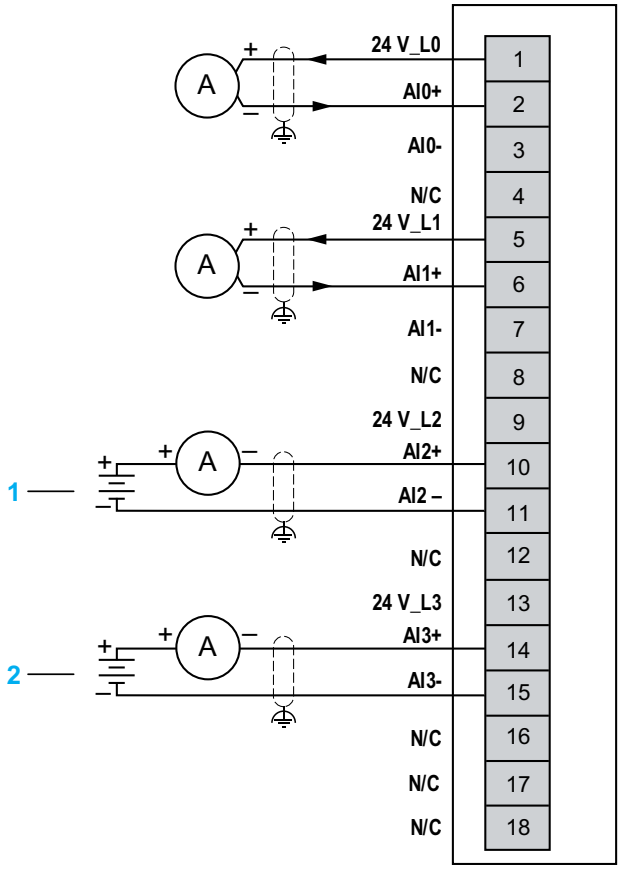
For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagram

Loop power supply is used with 2-wire 4...20 mA current sensor and provides a maximum current of 25 mA.

You may choose to use an external power supply to provide loop power.

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



1, **2**: External SELV supply 24 V
24 V_L•: Loop power
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.

NTSAHI0412XH Parameters

Overview

This section describes the parameters of the NTSAHI0412XH module.

Parameters Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in the cluster, a configuration error is detected.
Gender *Gender*	0: **Primary Master*** 1: **Secondary Master**	ENUM	Allows you to select the master mode in the HART loop: • **Primary Master**: The module is the primary master in the HART loop. • **Secondary Master**: The module is the secondary master in the HART loop. A primary master, such as an asset management system or device configuration tool, already exists in the HART loop.
* 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*	**4..20 mA**	ENUM	Defines the range mode for the input channel. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 228.
Range Maximum *RangeMax*	**-32767...32767**	INT16	Sets the low threshold value of the normal range. The values are computed according to the selected **RangeMode**.
Range Minimum *RangeMin*	**-32768...32766**	INT16	Sets the high threshold value of the normal 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..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 232.
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 232.
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 227.
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 226.
Hart Enabled *HartEnable*	**FALSE*** **TRUE**	BOOL	Enables or disables the HART function. For more information on **Hart Enabled** parameter, refer to HartEnable, page 225.

Displayed Name ***Parameter Name***	**Value(s)**	**Data type**	**Description**
Hart Fallback Mode *HartFallBackMode*	**Return to zero*** **Maintain**	ENUM	Specify the HART values when the HART function is in fallback mode.
Preambles Number *PreamblesNumber*	**5*...20**	BYTE	Sets the length of the start of the HART frame.
Lower Scan Address *LowerScanAddress*	**0*...62**	BYTE	Sets the lower limitation of address for scanning setting. The values are computed according to the selected **Upper Scan Address** value.
Upper Scan Address *UpperScanAddress*	**1...63** **15***	BYTE	Sets the upper limitation of address for scanning setting. The values are computed according to the selected **Lower Scan Address** value.
Communication Retries Number *CommunicationRetries-Number*	**0...5***	BYTE	Sets the number of times the HART module sends a command after a communication interruption with a HART instrument.
Busy Retries Counts *BusyRetriesNumber*	**0...5** **2***	BYTE	Sets the number of times the HART module sends a command after receiving a busy reply from a HART instrument.
Instrument Status Enabled *InstrumentStatusEnable*	**FALSE*** **TRUE**	BOOL	Enables or disables HART Scan command for instrument status.
Primary Variable Enabled *PrimaryVariableEnable*	**FALSE** **TRUE***	BOOL	Enables or disables HART Scan command for primary variable.
Secondary Variable Enabled *SecondaryVariableEnable*	**FALSE** **TRUE***	BOOL	Enables or disables HART Scan command for secondary variable.
Tertiary Variable Enabled *TertiaryVariableEnable*	**FALSE** **TRUE***	BOOL	Enables or disables HART Scan command for tertiary variable.
Quaternary Variable Enabled *QuaternaryVariableEnable*	**FALSE** **TRUE***	BOOL	Enables or disables HART Scan command for quaternary variable.
Current Value Enabled *CurrentValueEnable*	**FALSE*** **TRUE**	BOOL	Enables or disables HART Scan command for current value.
Percent Value Enabled *PercentValueEnable*	**FALSE*** **TRUE**	BOOL	Enables or disables HART Scan command for percent value.
Reset Difference Change *CHResetChanged*(2)	**0*** **1**	BYTE	To accept a connected HART instrument that has either major differences or minor differences from the previously connected instrument, set the value to 1 for the corresponding channel. **NOTE:** For more information on major and minor differences, refer to Major and minor differences, page 106.

* Parameter default value

(1) Online modification is allowed.

(2) Offline modification cannot be performed.

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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input channel.
InstrumentStatus	0...65,535	UINT16 2	Instrument status of channel. First byte (byte 0), response code: • Bit 0..5: Summary of the communication detected error. • Bit 6: N/A. • Bit 7: Communication detected error (1: detected error). **NOTE:** Depending on this bit 7 value, the remaining bits provide information: ◦ on the communication detected error (bit 7 value is 1). ◦ indicating whether the command executed successfully or not (bit 7 value is 0). Second byte (byte 1), device status: • Bit 8: Primary variable out of limits: the value of the instrument Primary Variable (PV) has exceeded its operating limits. • Bit 9: Non-primary variable out of limits: the value of an instrument variable, other than the Primary Variable (PV), has exceeded its operating limits. • Bit 10: Loop current saturated: current on the HART channel has reached its upper or lower limit, and cannot increase or decrease further. • Bit 11: Loop Current Fixed: the Loop Current is being held at a fixed value and is not responding to process variations. • Bit 12: More status available: additional instrument information is available through HART command 48 (Read Additional Status Information). • Bit 13: Cold start: the instrument was reset, or power was cycled off then on. • Bit 14: Configuration changed: an operation occurred that changed the instrument configuration. • Bit 15: Device Malfunction: a detected error rendered the instrument non-operational.
ChannelStatus	0...255	BYTE 1	Connection status of channel: • Value 0: The channel is disabled. • Value 1: The module is searching for, and attempting to connect to, a HART instrument on the channel. • Value 2: The channel is connected to a HART instrument. • Value 3: One or more minor differences exist between the connected HART instrument and the instrument description in the multiplexer configuration. • Value 4: One or more major differences exist between the connected HART instrument and the instrument description in the multiplexer configuration. **NOTE:** For more information on major and minor differences, refer to Major and minor differences, page 106 • Value 5: This state indicates one of the following: ◦ The module did not discover a HART instrument on the channel, after performing two scans on the specified address range. ◦ The module discovered a HART instrument on the channel, but the connection was interrupted. The module continues to search for a HART instrument on this channel. • Values 6...255 are reserved.
PrimaryVariable	3.4×10^{-38}...3.4×10^{38}	FLOAT 4	Primary variable value of HART instrument.
SecondaryVariable	3.4×10^{-38}...3.4×10^{38}	FLOAT 4	Secondary variable value of HART instrument.

Parameter Name	**Value(s)**	**Data type** **Size in bytes**	**Description**
TertiaryVariable	3.4 x 10^{-38}...3.4 x 10^{38}	FLOAT 4	Tertiary variable value of HART instrument.
QuaternaryVariable	3.4 x 10^{-38}...3.4 x 10^{38}	FLOAT 4	Quaternary variable value of HART instrument.
CurrentValue	3.4 x 10^{-38}...3.4 x 10^{38}	FLOAT 4	Reading of loop current, from 4...20 mA.
PercentValue	3.4 x 10^{-38}...3.4 x 10^{38}	FLOAT 4	Reading of loop current, expressed as a percent of the 16 mA range.

Major and minor differences

Differences in the following definitions of a HART field instrument are described as minor:

- HART supported protocol major version
- Hardware revision level
- Device ID

Differences in the following definitions of a HART field instrument are described as major:

- Expanded device type
- Device revision level
- Software revision level
- Flags
- Manufacturer ID (only for HART versions 5 and 6)
- Label (only for HART versions 5 and 6)
- Device profile (only for HART versions 5 and 6)

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	Provides the following detected error for the channel: 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	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

Temperature Input Modules

What's in This Part

NTSART0214/NTSART0214H Temperature Input Module, 2 Isolated Inputs, RTD, Thermocouple, mV, 2-/3-/4-wire, Standard/Hardened

What's in This Chapter

NTSART0214/NTSART0214H Presentation

Overview

This section provides a presentation of the NTSART0214/NTSART0214H input modules.

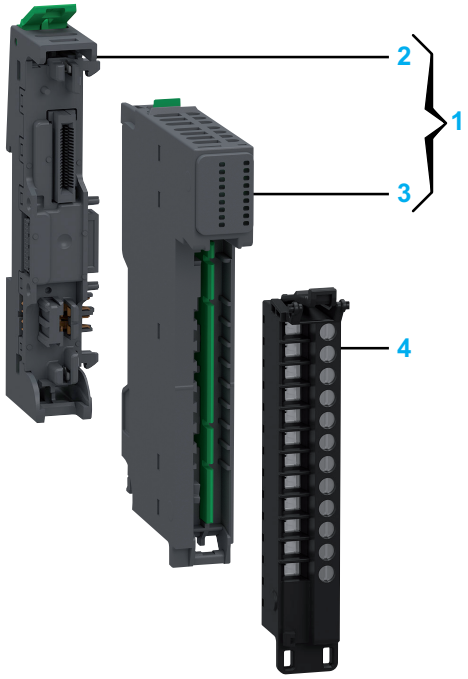
Main Characteristics

The following table describes the main characteristics of the NTSART0214/ NTSART0214H input modules:

Main Characteristics	Value
Product or component type	Analog temperature input module
Number of channels	2
Property of channel	Channel isolated
Channel signal	RTD, thermocouple, voltage and resistive inputs
Operating mode	Asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS NTSART0214/NTSART0214H input modules:

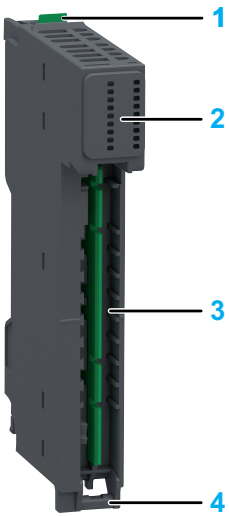


Number	Reference	Description
1	NTSART0214K NTSART0214HK	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSART0214	Temperature Input Module, 2 Isolated Inputs, RTD, Thermocouple, mV, 2-/3-/4-wire
	NTSART0214H	Temperature Input Module, 2 Isolated Inputs, RTD, Thermocouple, mV, 2-/3-/4-wire, 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

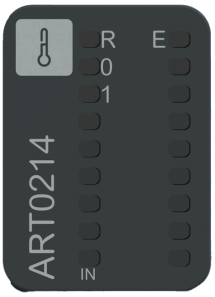
The following figure presents the elements of the module:



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

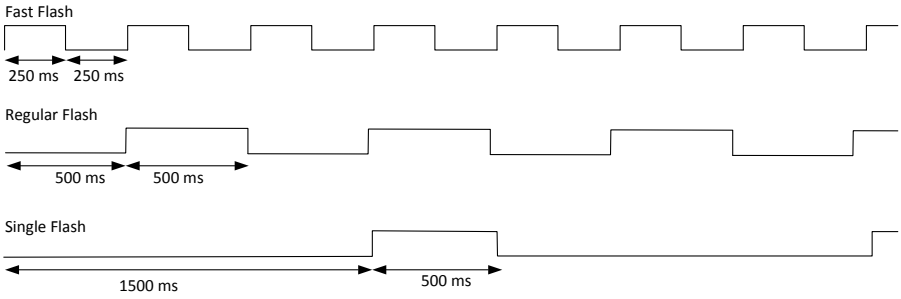
The following figure presents the NTSART0214/NTSART0214H status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...1 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding input channel is activated.
ON	-	OFF	Indicates that the corresponding input channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • Overflow/underflow error detection. • CJC error detection.

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



NTSART0214/NTSART0214H Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

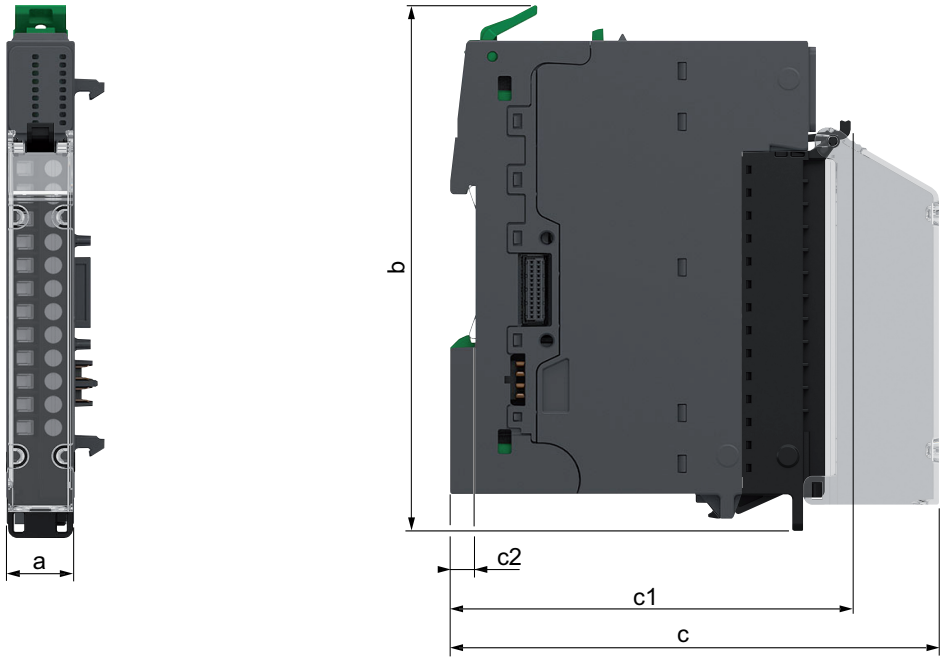
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

- NTSART0214/NTSART0214H: 48 g (1.69 oz)
- NTSART0214K/NTSART0214HK: 73 g (2.58 oz)

General Characteristics

The following table describes the general characteristics of the NTSART0214/ NTSART0214H 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
	Between field power and bus	1,500 Vac
Protection and detection		Protection: Miswiring protection by channel Detection: • Module: ◦ Field power from the power supply module Input: ◦ Broken wire on RTD/TC/Resistance input by channel
Power dissipation		1.35 W

Input Characteristics

The following table describes the input characteristics of the NTSART0214/ NTSART0214H input modules:

Characteristics	Value
Input type	Differential
Logic type	Temperature input
Wiring type Sensor connection	2/3/4 wires for RTD and resistance. 2 wires for TC input and voltage input.
Input range	Resistance: 150 / 300 / 600 / 2,000 / 4,500 Ω
	Voltage: ±40 mV; ±80 mV; ±160 mV; ±320 mV; ±640 mV; ±1.28 V
	RTD (standard mode and high resolution mode): Pt100/1000, Ni100/1000, JPt100/1000, Cu10/50/100
	Thermocoupler: Type J / K / R / S / B / T / N / E / C / L / U
	Scaling range, refer to Temperature Input Modules Scaling Range, page 237.
Input impedance	10 MΩ Typical
Resolution	Resistance: • 0.0048 Ω on 150 Ω • 0.0096 Ω on 300 Ω • 0.0192 Ω on 600 Ω • 0.064 Ω on 2,000 Ω • 0.144 Ω on 4,500 Ω
	Voltage: • 2.4 µV on ±40 mV • 0.01 mV on ±80 mV; ±160 mV; ±320 mV • 0.1 mV on ±640 mV; ±1.28 V
	RTD: • 0.1 °C (0.18 °F) in standard mode • 0.01 °C (0.018 °F) in high resolution mode
	Thermocouple: • 0.1 °C (0.18 °F)
Maximum accuracy at ambient operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range	Resistance: 0.05 % / 0.1 %
	Voltage: 0.05 % / 0.1 %
	RTD: • 0.5 °C (0.9 °F) / 1.3 °C (2.34 °F) in standard mode except Cu10 • 0.1 °C (0.18 °F) / 0.4 °C (0.72 °F) in Pt100/Pt1000 high resolution mode • 0.2 °C (0.36 °F) / 0.6 °C (0.08 °F) in Cu50/Cu100/Ni100/Ni1000 high resolution mode • 1°C (1.8 °F) / 1.5 °C (2.7 °F) in Cu10 mode
	Thermocouple: • 1.5 °C (2.7 °F) / 2.8 °C (5.04 °F) with internal CJC • 1°C (1.8 °F) / 1.7 °C (3.06 °F) + CJC error with fixed CJC value • 1°C (1.8 °F) / 1.7 °C (3.06 °F) + CJC error with external CJC These accuracies apply at the temperatures listed in Thermocouple Accuracy Characteristics, page 244. **NOTE:** The CJC error with external CJC refers to the measurement accuracy of Pt100/ Pt1000 in standard mode.

Characteristics		Value
Input response time		60 ms at 50 Hz rejection + additional processing time 50 ms at 60 Hz rejection + additional processing time
		Additional processing time: • For wire-break check: 4 ms; In ranges Voltage, Thermocouple, Resistor, RTD • For external CJC use: 70 ms at 50 Hz rejection / 60 ms at 60 Hz rejection • For 3 wires: 60 ms at 50 Hz rejection / 50 ms at 60 Hz rejection
Conversion mode		Sigma-Delta
Maximum allowed input voltage no damage		30 Vdc
Input filter		Cutoff frequency 50 Hz / 60 Hz Software run-time configurable filter. Refer to Measurement Filter, page 226.
Temperature drift		< 0.003 %/°C of full scale
Repeatability after stabilization time		0.05 % of full scale
Nonlinearity		Voltage/Resistor input: 0.01 % of full scale TC/RTD: 0.1 % of full scale
Monotonicity		Yes
Differential mode rejection (50/60 Hz)		60 dB
Common mode rejection (50/60 Hz)		100 dB
CJC		Internal: Temperature sensor on board **NOTE:** It takes 30 minutes after power-up for the internal temperature of the module to stabilize. External: Pt100/Pt1000 on terminal block Fixed: reference temperature
Crosstalk		50 dB
Maximum input range		Voltage: over/under range margins: ±2.4 %
Cable	Type	Shielded
	Length	50 m (164 ft) maximum with thermocouples, 200 m (656) ft otherwise.

NTSART0214/NTSART0214H Wiring

Overview

This section provides the wiring diagrams for the NTSART0214/NTSART0214H input modules.

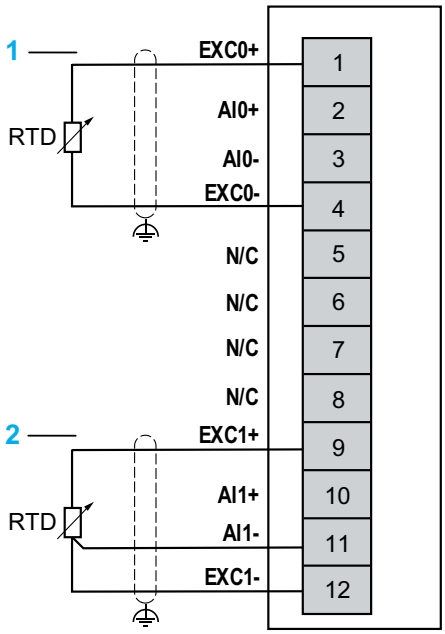
Wiring Rules

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

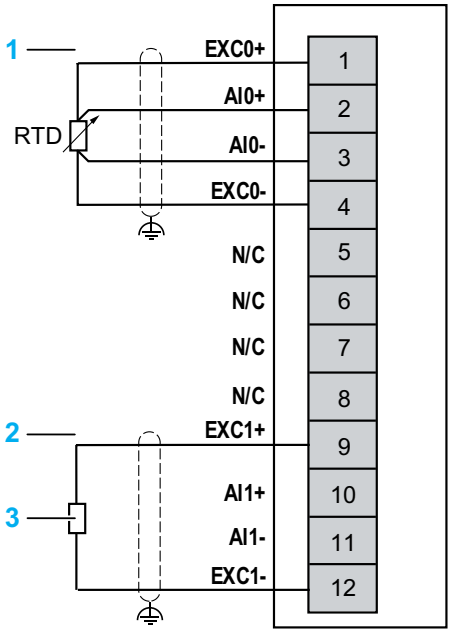
Wiring Diagrams

Use the Power supply Field Distribution module for internal electronics, even if the power supplies for the sensors are provided by external sources.

The following figures illustrate the connection between the inputs and the sensors:



1: 2-wire connection
2: 3-wire connection
N/C: Not Connected



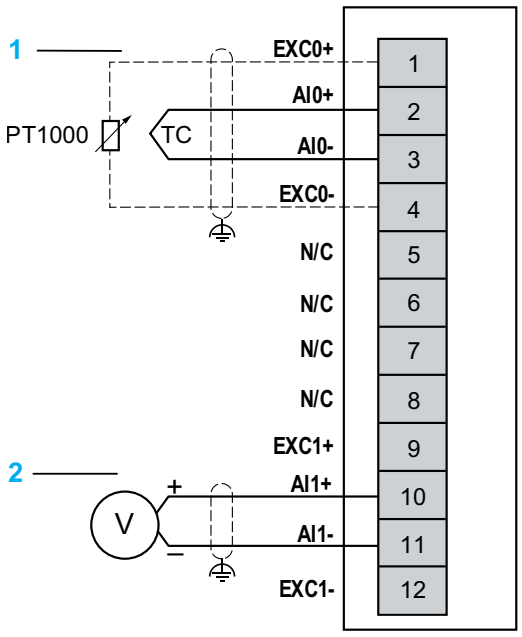
1: 4-wire connection
2: 2-wire connection
3: Resistance
N/C: Not Connected

⚠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.



1: 2-wire connection with external CJC
2: 2-wire connection
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.

NTSART0214/NTSART0214H Parameters

Overview

This section describes the parameters of the NTSART0214/NTSART0214H modules.

Parameters Description

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.

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in the cluster, a configuration error is detected.
Frequency Rejection *Frequency Rejection*	**50 Hz*** **60 Hz**	ENUM	Selects **Frequency Rejection**. Depending on the country, you can configure the frequency rejection of main power harmonics by adapting the speed of sigma delta converter.
* 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*	**Thermocouple** **RTD Ni100** **RTD Ni1000** **RTD PT100** **RTD JPt100** **RTD PT1000** **RTD JPt1000** **RTD Cu10** **RTD Cu50** **RTD Cu100** **Voltage Sensors** **Resistance Sensors**	ENUM	Defines the range mode for the input channel. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 228.
Range Maximum *RangeMax*	**Resistance: 1..32000** **Others: -31999..32000**	INT16	Sets the high threshold value of the normal range. The values are computed according to the selected **RangeMode**.
Range Minimum *RangeMin*	**Resistance: 0..31999** **Others: -32000..31999**	INT16	Sets the low threshold value of the normal range. The values are computed according to the selected **RangeMode**.

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**. You can only configure low threshold and high threshold setting. The Overflow setting is calculated based on high threshold and low threshold settings. For more information on **OverflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 232.
Overflow Threshold *OverMax*	**-31999..32000**	INT16	Overflow threshold value setting for configured range mode. 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**. You can only configure low threshold and high threshold setting. The Underflow setting is calculated based on high threshold and low threshold settings. For more information on **UnderflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 232.
Underflow Threshold *OverMin*	**-32000..31999**	INT16	Underflow threshold value setting for configured range mode. The values are computed according to the selected **RangeMin** value.
Broken Wire Checked *BrokenWireCheck*(1)	**FALSE** **TRUE***	BOOL	Enables or disables broken wire detection. If **RangeMode** is voltage mode, it does not support **BrokenWireCheck**.
CJC Mode *CJCMode*	**Internal CJC** **Fixed CJC Value** **Channel 0 external PT100** **Channel 0 external PT1000** **Channel 1 external PT100** **Channel 1 external PT1000**	ENUM	Selects the Cold junction compensation mode. Cold junction compensation settings are accessible if the **RangeMode** is set to a thermocouple value.
CJC Fixed Value *CJCFixedValue*	**-32768...32767**	INT16	Sets the fixed value of the Cold junction compensation. The range value is set according to the selected **Temperature Unit**: • **-400..700** when the **Temperature Unit** is set to **Celsius**. • **-400..1580** when the **Temperature Unit** is set to **Fahrenheit**. • **2332..3432** when the **Temperature Unit** is set to **Kelvin**. **NOTE:** The value set is 1/10 of the selected **Temperature Unit**.
Temperature Unit *TemperatureUnit*	**Celsius*** **Fahrenheit** **Kelvin**	ENUM	Selects the temperature unit (°C / °F / K). This parameter is used for TC or RTD sensor input.
High resolution enabled *HighRtd*	**FALSE*** **TRUE**	BOOL	Enables or disables RTD high resolution. When RTD high resolution mode is enabled, the code display for RTD type is set to 1/100 °C\°F\K, otherwise it is set to 1/10 °C\°F\K.

Displayed Name ***Parameter Name***	**Value(s)**	**Data type**	**Description**
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 227.
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 226.
* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input 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	Provides the following detected error for the channel: 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: N/A Bit 7: CJC error detected.
ChannelFault2	0...255	BYTE 1	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

NTSART0404 Temperature Input Module, 4 Differential Inputs, RTD, Thermocouple, mV, 2-/3-wire

What's in This Chapter

NTSART0404 Presentation

Overview

This section provides a presentation of the NTSART0404 input module.

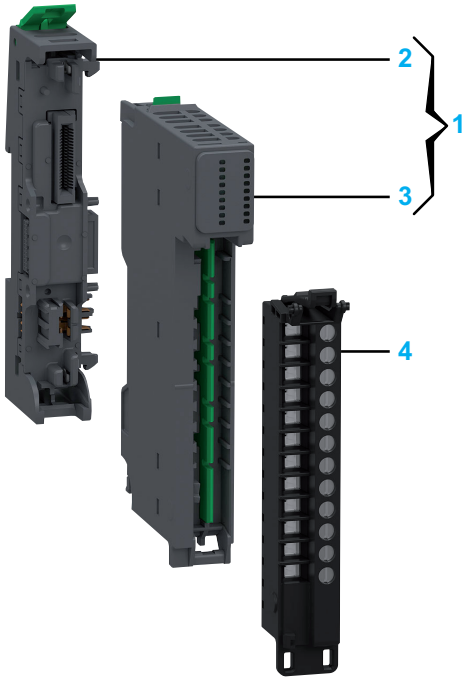
Main Characteristics

The following table describes the main characteristics of the NTSART0404 input module:

Main Characteristics	Value
Product or component type	Analog RTD and TC input module
Number of channels	4
Channel property	Channel not isolated
Channel signal	RTD, thermocouple, voltage and resistive inputs
Operating mode	Asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS NTSART0404 input module:

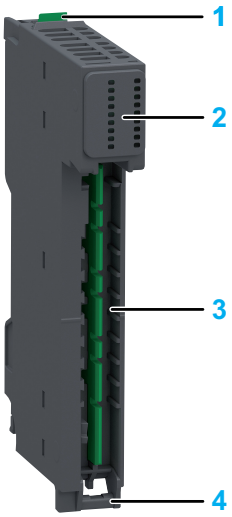


Number	Reference	Description
1	NTSART0404K	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSART0404	Temperature Input Module, 4 Differential Inputs, RTD, Thermocouple, mV, 2-/3-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

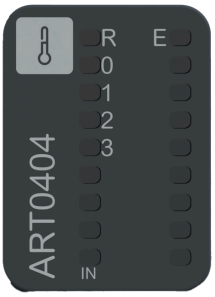
The following figure presents the elements of the module:



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

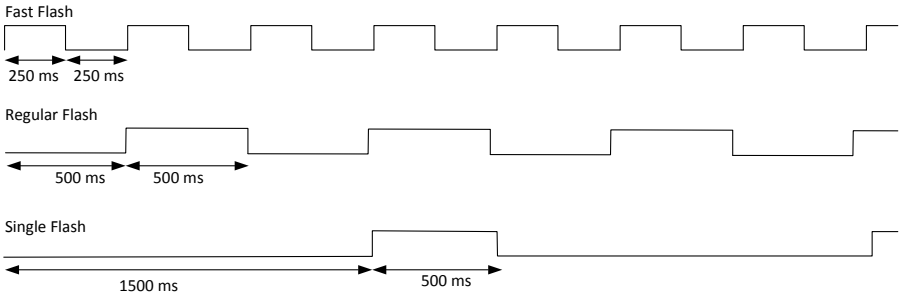
The following figure presents the NTSART0404 status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...3 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding input channel is activated.
ON	-	OFF	Indicates that the corresponding input channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • Overflow/underflow error detection. • CJC error detection.

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



NTSART0404 Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

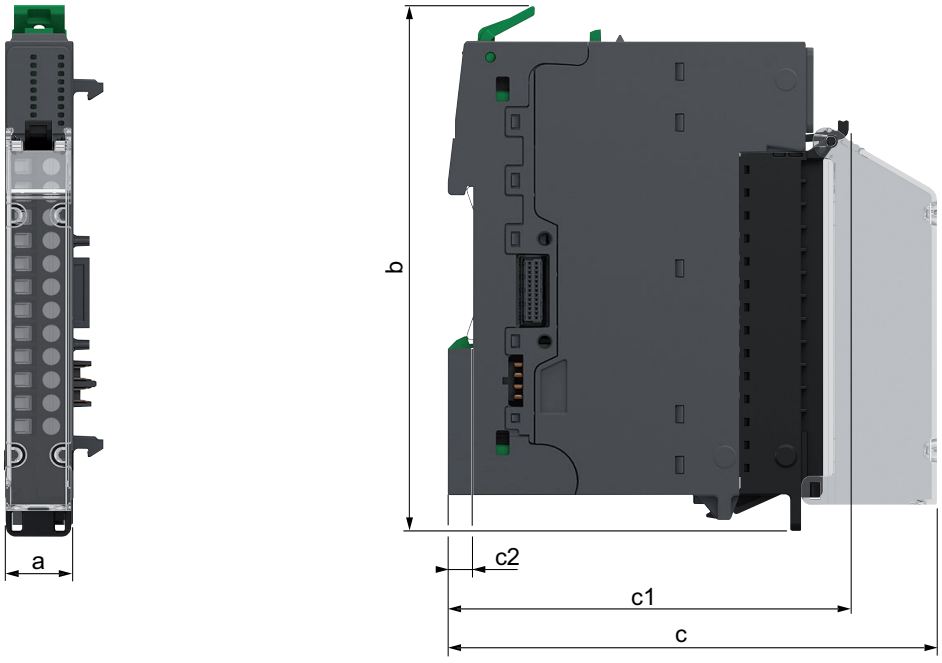
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

- NTSART0404: 48 g (1.69 oz)
- NTSART0404K: 73 g (2.58 oz)

General Characteristics

The following table describes the general characteristics of the NTSART0404 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	1,000 Vac
	Between field power and bus	1,500 Vac
Protection and detection		Protection: Miswiring protection by channel Detection: • Module: ◦ Field power from the power supply module Input: ◦ Broken wire on RTD/TC/Resistance/Voltage input by channel
Power dissipation		1.73 W

Input Characteristics

The following table describes the input characteristics of the NTSART0404 input module:

Characteristics	Value
Input type	Differential
Logic type	Temperature input
Wiring type sensor connection	2/3-wire for RTD, Resistance; 2-wire for TC, mV Voltage
Input range	Resistance: 150 / 300 / 600 / 2,000 / 4,500 Ω
	Voltage: ±40 mV; ±80 mV; ±160 mV; ±320 mV; ±640 mV; ±1.28 V
	RTD (standard mode and high resolution mode): Pt100/1000, Ni100/1000, JPt100/1000, Cu10/50/100
	Thermocouple: Type J / K / R / S / B / T / N / E / C / L / U
	Scaling range, refer to Temperature Input Modules Scaling Range, page 237.
Input impedance	10 MΩ Typical
Resolution	Resistance: • 16 bits with overflow ◦ 0.0048 Ω on 150 Ω ◦ 0.0096 Ω on 300 Ω ◦ 0.0192 Ω on 600 Ω ◦ 0.064 Ω on 2,000 Ω ◦ 0.144 Ω on 4,500 Ω
	Voltage: • 2.4 µV on ±40 mV • 0.01 mV on ±80 mV; ±160 mV; ±320 mV • 0.1 mV on ±640 mV; ±1.28 V
	RTD : • 0.1 °C (0.18 °F) in standard mode • 0.01 °C (0.018 °F) in high resolution mode
	Thermocouple: • 0.1 °C (0.18 °F)

Characteristics		Value
Maximum accuracy at ambient operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		Resistance: • For short time sampling: 0.08 % / 0.14 % • For long time sampling: 0.05 % / 0.11 %
		Voltage: • For short time sampling: 0.065 % / 0.115 % • For long time sampling: 0.05 % / 0.10 %
		RTD: • For short time sampling: ◦ 0.8 °C (1.44 °F) / 1.6 °C (2.88 °F) in standard mode except Cu10 ◦ 0.35 °C (0.63 °F) / 0.65 °C (1.17 °F) in Pt100/Pt1000 high resolution mode ◦ 0.45 °C (0.81 °F) / 0.8 °C (1.44 °F) in Cu50/Cu100/Ni100/Ni1000 high resolution mode ◦ 2.5 °C (4.5 °F) / 2.95 °C (5.31 °F) in Cu10 mode • For long time sampling: ◦ 0.5 °C (0.9 °F) / 1.3 °C (2.34 °F) in standard mode except Cu10 ◦ 0.25 °C (0.45 °F) / 0.55 °C (0.99 °F) in Pt100/Pt1000 high resolution mode ◦ 0.35 °C (0.63 °F) / 0.7 °C (1.26 °F) in Cu50/Cu100/Ni100/Ni1000 high resolution mode ◦ 2 °C (3.6 °F) / 2.45 °C (4.41 °F) in Cu10 mode
		Thermocouple: • For short time sampling: ◦ 2.7 °C (4.86 °F) / 4.7 °C (8.46 °F) with internal CJC ◦ 2.2 °C (3.96 °F) / 3.7 °C (6.66 °F) + CJC error with fixed CJC value ◦ 2.2 °C (3.96 °F) / 3.7 °C (6.66 °F) + CJC error with external CJC • For long time sampling: ◦ 1.7 °C (3.06 °F) / 3.7 °C (6.66 °F) with internal CJC ◦ 1.2 °C (2.16 °F) / 2.7 °C (4.86 °F) + CJC error with fixed CJC value ◦ 1.2 °C (2.16 °F) / 2.7 °C (4.86 °F) + CJC error with external CJC These accuracies apply at the temperatures listed in Thermocouple Accuracy Characteristics, page 244. **NOTE:** The CJC error with external CJC refers to the measurement accuracy of Pt100/Pt1000 in standard mode for long time sampling.
Channel switching time	Fast sampling disabled (by default)	140 ms
	Fast sampling enabled	60 ms
Input response time		At 50 Hz rejection: 60 ms + Channel switch time + additional processing time At 60 Hz rejection: 50 ms + Channel switch time + additional processing time
		Additional processing time: • For external CJC use: 100 ms at 50 Hz rejection / 90 ms at 60 Hz rejection • For 3 wires: 60 ms at 50 Hz rejection / 50 ms at 60 Hz rejection
Conversion mode		Sigma-Delta
Maximum allowable input no damage		Overvoltage protection Maximum 30 Vdc no damage
Input filter		Cutoff frequency 50 Hz / 60Hz Software run-time configurable filter. Refer to Measurement Filter, page 226.
Temperature drift		Within 0.003 %/°C of full scale
Repeatability after stabilization time		0.05 % of full scale
Nonlinearity		Voltage/Resistor input: 0.01 % of full scale TC/RTD: 0.01 % of full scale
Differential mode rejection (50/60 Hz)		60 dB
Common mode rejection (50/60 Hz)		100 dB

Characteristics		Value
CJC		Internal: temperature sensor on board **NOTE:** It takes 30 minutes after power-up for the internal temperature of the module to stabilize. External: Pt100 / Pt1000 on terminal block Fixed : reference temperature
Crosstalk		50 dB
Maximum input range		Voltage: over/under range margins: ±2.4 %
Cable	Type	Shielded
	Length	50 m (164 ft) maximum with thermocouples, 200 m (656) ft otherwise.

NTSART0404 Wiring

Overview

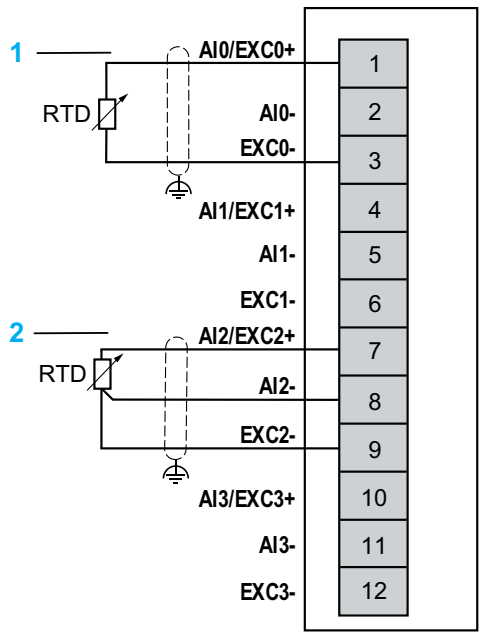
This section provides the wiring diagrams for the NTSART0404 input module.

Wiring Rules

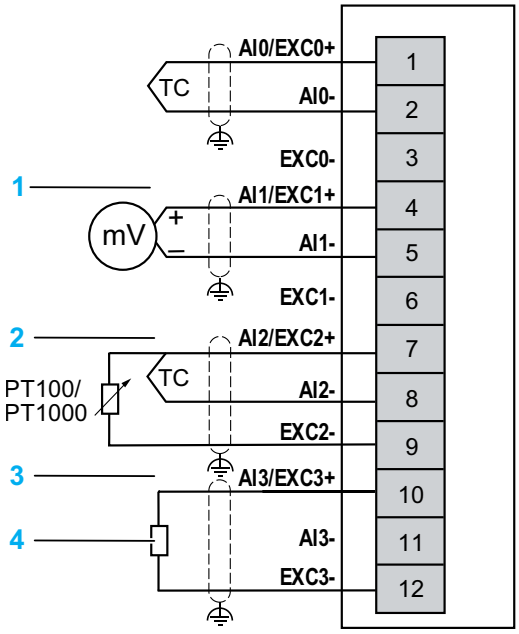
For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagrams

The following figures illustrate the connection between the inputs and the sensors:



1: 2-wire connection
2: 3-wire connection



1, **3**: 2-wire connection
2: 2-wire connection with external CJC
4: Resistance

NTSART0404 Parameters

Overview

This section describes the parameters of the NTSART0404 module.

Parameters Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in the cluster, a configuration error is detected.
Frequency Rejection *Frequency Rejection*	**50 Hz*** **60 Hz**	ENUM	Selects **Frequency Rejection**. Depending on the country, you can configure the frequency rejection of main power harmonics by adapting the speed of sigma delta converter.
* 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*	**Thermocouple** **RTD Ni100** **RTD Ni1000** **RTD PT100** **RTD JPt100** **RTD PT1000** **RTD JPt1000** **RTD Cu10** **RTD Cu50** **RTD Cu100** **Voltage Sensors** **Resistance Sensors**	ENUM	Defines the range mode for the input channel. The module is 2/3-wire type sensor connection for RTD and resistance and is a 2-wire type sensor connection for thermocouple and voltage sensors. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 228.
Range Maximum *RangeMax*	**Resistance: 1..32000** **Others: -31999..32000**	INT16	Sets the high threshold value of the normal range. The values are computed according to the selected **RangeMode**.
Range Minimum *RangeMin*	**Resistance: 0..31999** **Others: -32000..31999**	INT16	Sets the low threshold value of the normal range. The values are computed according to the selected **RangeMode**.
Overflow Checked *OverflowCheck*	**FALSE** **TRUE***	BOOL	Enables or disables overflow detection. An error is detected if the measurement is greater than **Overflow Threshold**. You can only configure low threshold and high threshold setting. The Overflow setting is calculated based on high threshold and low threshold settings. For more information on **OverflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 232.
Overflow Threshold *OverMax*	**-31999..32000**	INT16	Overflow threshold value setting for configured range mode. 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**. You can only configure low threshold and high threshold setting. The Underflow setting is calculated based on high threshold and low threshold settings. For more information on **UnderflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 232.
Underflow Threshold *OverMin*	**-32000..31999**	INT16	Underflow threshold value setting for configured range mode. The values are computed according to the selected **RangeMin** value.
Broken Wire Checked *BrokenWireCheck*(1)	**FALSE** **TRUE***	BOOL	Enables or disables broken wire detection.

Displayed name *Parameter Name*	Value(s)	Data type	Description
CJC Mode *CJCMode*	**Internal CJC** **Fixed CJC Value** **Channel 0 external PT100** **Channel 0 external PT1000** **Channel 1 external PT100** **Channel 1 external PT1000** **Channel 2 external PT100** **Channel 2 external PT1000** **Channel 3 external PT100** **Channel 3 external PT1000**	ENUM	Cold junction compensation mode selection. Cold junction compensation settings are accessible if the **RangeMode** is set to a thermocouple value.
CJC Fixed Value *CJCFixedValue*	**-32768...32767**	INT16	Sets the fixed value of the Cold junction compensation. The range value is set according to the selected **Temperature Unit**: • **-400..700** when the **Temperature Unit** is set to **Celsius**. • **-400..1580** when the **Temperature Unit** is set to **Fahrenheit**. • **2332..3432** when the **Temperature Unit** is set to **Kelvin**. **NOTE:** The value set is 1/10 of the selected **Temperature Unit**.
Temperature Unit *TemperatureUnit*	**Celsius*** **Fahrenheit** **Kelvin**	ENUM	Selects the temperature unit (°C / °F / K). This parameter is used for TC or RTD sensor input.
High Resolution Enabled *HighRtd*	**FALSE*** **TRUE**	BOOL	Enables or disables RTD high resolution. When RTD high resolution mode is enabled, the code display for RTD type is set to 1/100 °C\°F\K, otherwise it is set to 1/10 °C\°F\K.
Fast Sampling Enabled *ShortSamplingTime*	**FALSE*** **TRUE**	BOOL	Enables or disables Fast Sampling. When Fast Sampling Mode is enabled, the sampling time is set to 100 ms. otherwise it is set to 200 ms.
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 227.

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 226.
* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input 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	Provides the following detected error for the channel: 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: N/A Bit 7: CJC error detected.
ChannelFault2	0...255	BYTE 1	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

NTSART0404XH Temperature Input Module, 4 Differential Inputs, RTD, Thermocouple, mV, 2-/3-/4-wire, Hardened

What's in This Chapter

NTSART0404XH Presentation

Overview

This section provides a presentation of the NTSART0404XH input module.

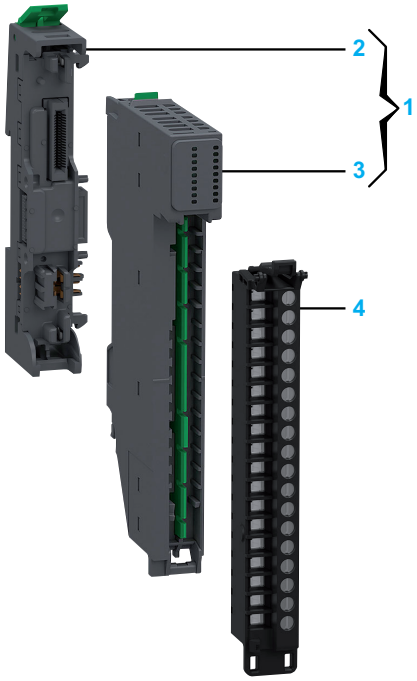
Main Characteristics

The following table describes the main characteristics of the NTSART0404XH input module:

Main Characteristics	Value
Product or component type	Analog RTD and TC input module
Number of channels	4
Channel property	Channel not isolated
Channel signal	RTD, thermocouple, voltage and resistive inputs
Operating mode	Asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTSNTSART0404XH input module:

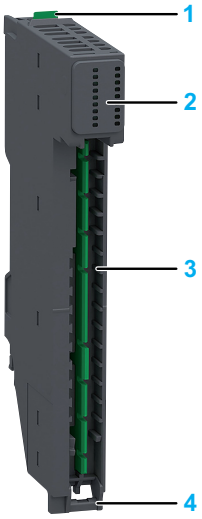


Number	Reference	Description
1	NTSART0404XHK	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSART0404XH	Temperature Input Module, 4 Differential Inputs, RTD, Thermocouple, mV, 2-/3-/4-wire, 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

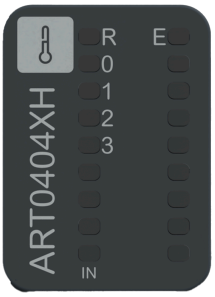
The following figure presents the elements of the module:



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

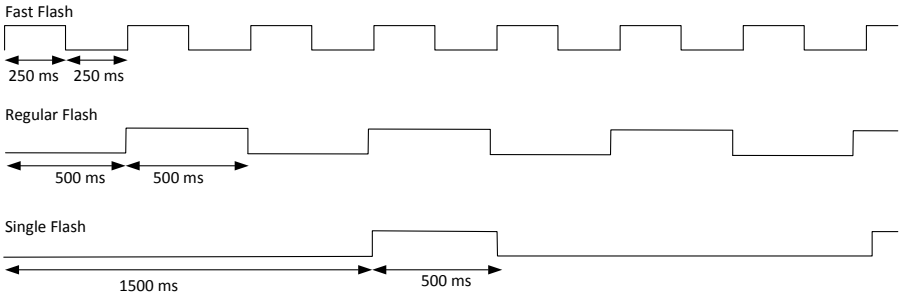
The following figure presents the NTSART0404XH status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...3 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding input channel is activated.
ON	-	OFF	Indicates that the corresponding input channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • Overflow/underflow error detection. • CJC error detection.

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



NTSART0404XH Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

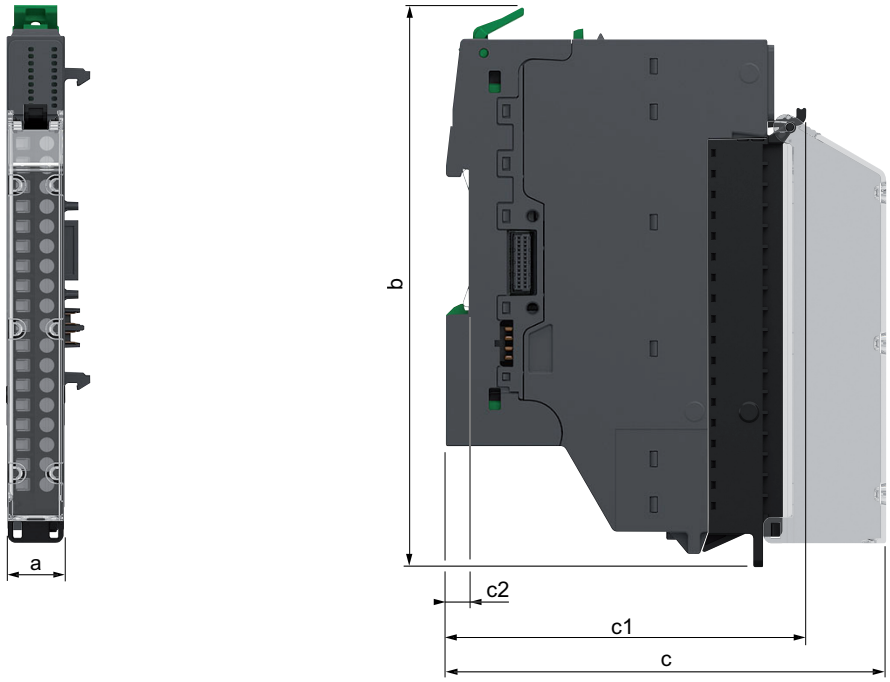
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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: 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

- NTSART0404XH: 49 g (1.73 oz)
- NTSART0404XHK: 74 g (2.61 oz)

General Characteristics

The following table describes the general characteristics of the NTSART0404XH 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	1,000 Vac
	Between field power and bus	1,500 Vac
Protection and detection		Protection: Miswiring protection by channel Detection: • Module: ◦ Field power from the power supply module Input: ◦ Broken wire on RTD/TC/Resistance/Voltage input by channel
Power dissipation		1.73 W

Input Characteristics

The following table describes the input characteristics of the NTSART0404XH input module:

Characteristics	Value
Input type	Differential
Logic type	Temperature input
Wiring type sensor connection	2/3/4-wire for RTD, Resistance 2-wire for TC, mV Voltage
Input range	Resistance: 150 / 300 / 600 / 2,000 / 4,500 Ω
	Voltage: ±40 mV; ±80 mV; ±160 mV; ±320 mV; ±640 mV; ±1.28 V
	RTD (standard mode and high resolution mode): Pt100/1000, Ni100/1000, JPt100/1000, Cu10/50/100
	Thermocouple: Type J / K / R / S / B / T / N / E / C / L / U
	Scaling range, refer to Temperature Input Modules Scaling Range, page 237.
Input impedance	10 MΩ Typical
Resolution	Resistance: • 16 bits with Overflow ◦ 0.0048 Ω on 150 Ω ◦ 0.0096 Ω on 300 Ω ◦ 0.0192 Ω on 600 Ω ◦ 0.064 Ω on 2,000 Ω ◦ 0.144 Ω on 4,500 Ω
	Voltage: • 2.4 µV on ±40 mV • 0.01 mV on ±80 mV; ±160 mV; ±320 mV • 0.1 mV on ±640 mV; ±1.28 V
	RTD : • 0.1 °C (0.18 °F) in standard mode • 0.01 °C (0.018 °F) in high resolution mode
	Thermocouple: • 0.1 °C (0.18 °F)

Characteristics		Value
Maximum accuracy at ambient operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		Resistance: • For short time sampling: 0.08 % / 0.15 % • For long time sampling: 0.05 % / 0.12 %
		Voltage: • For short time sampling: 0.065 % / 0.125 % • For long time sampling: 0.05 % / 0.11 %
		RTD: • For short time sampling: ◦ 0.8 °C (1.44 °F) / 1.75 °C (3.15 °F) in standard mode except Cu10 ◦ 0.35 °C (0.63 °F) / 0.75 °C (1.35 °F) in Pt100/Pt1000 high resolution mode ◦ 0.45 °C (0.81 °F) / 0.9 °C (1.62 °F) in Cu50/Cu100/Ni100/Ni1000 high resolution mode ◦ 2.5 °C (4.5 °F) / 3.05 °C (5.49 °F) in Cu10 mode • For long time sampling: ◦ 0.5 °C (0.9 °F) / 1.45 °C (2.61 °F) in standard mode except Cu10 ◦ 0.25 °C (0.45 °F) / 0.65 °C (1.17 °F) in Pt100/Pt1000 high resolution mode ◦ 0.35 °C (0.63 °F) / 0.8 °C (1.44 °F) in Cu50/Cu100/Ni100/Ni1000 high resolution mode ◦ 2 °C (3.6 °F) / 2.55 °C (4.59 °F) in Cu10 mode
		Thermocouple: • For short time sampling: ◦ 2.7 °C (4.86 °F) / 5.0 °C (9.0 °F) with internal CJC ◦ 2.4 °C (4.32 °F) / 3.9 °C (7.02 °F) + CJC error with fixed CJC value ◦ 2.4 °C (4.32 °F) / 3.9 °C (7.02 °F) + CJC error with external CJC • For long time sampling: ◦ 1.7 °C (3.06 °F) / 4.0 °C (7.2 °F) with internal CJC ◦ 1.4 °C (2.52 °F) / 2.9 °C (5.22 °F) + CJC error with fixed CJC value ◦ 1.4 °C (2.52 °F) / 2.9 °C (5.22 °F) + CJC error with external CJC These accuracies apply at the temperatures listed in Thermocouple Accuracy Characteristics, page 244. **NOTE:** The CJC error with external CJC refers to the measurement accuracy of Pt100/Pt1000 in standard mode for long time sampling.
Channel switching time	Fast sampling disabled (by default)	140 ms
	Fast sampling enabled	60 ms
Input response time		At 50 Hz rejection: 60 ms + Channel switch time + additional processing time At 60 Hz rejection: 50 ms + Channel switch time + additional processing time
		Additional processing time: • For external CJC use: 100 ms at 50 Hz rejection / 90 ms at 60 Hz rejection • For 3 wires: 60 ms at 50 Hz rejection / 50 ms at 60 Hz rejection
Conversion mode		Sigma-Delta
Maximum allowable input no damage		Overvoltage protection Maximum 30 Vdc no damage
Input filter		Cutoff frequency 50 Hz / 60 Hz Software run-time configurable filter. Refer to Measurement Filter, page 226.
Temperature drift		Within 0.003 %/°C of full scale
Repeatability after stabilization time		0.05 % of full scale
Nonlinearity		Voltage/Resistor input: 0.01 % of full scale TC/RTD: 0.01 % of full scale
Differential mode rejection (50/60 Hz)		60 dB
Common mode rejection (50/60 Hz)		100 dB

Characteristics		Value
CJC		Internal: temperature sensor on board **NOTE:** It takes 30 minutes after power-up for the internal temperature of the module to stabilize. External: Pt100 / Pt1000 on terminal block Fixed : reference temperature
Crosstalk		50 dB
Maximum input range		Voltage: over/under range margins: ±2.4 %
Cable	Type	Shielded
	Length	50 m (164 ft) maximum with thermocouples, 200 m (656) ft otherwise.

NTSART0404XH Wiring

Overview

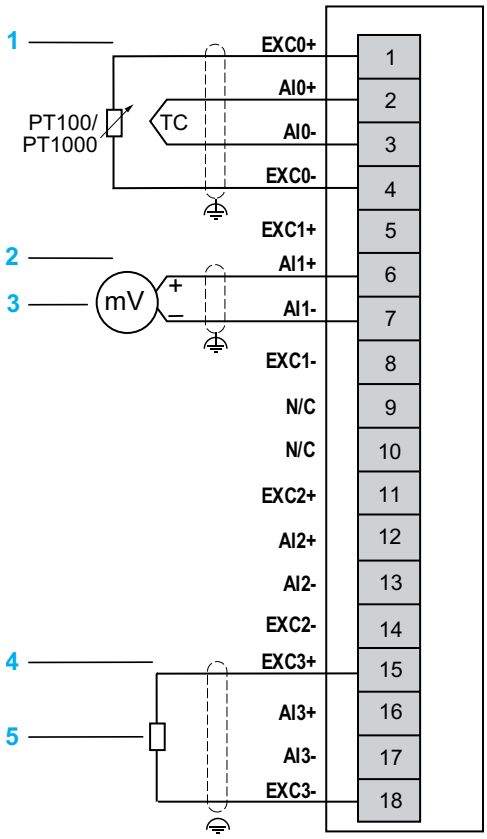
This section provides the wiring diagrams for the NTSART0404XH input module.

Wiring Rules

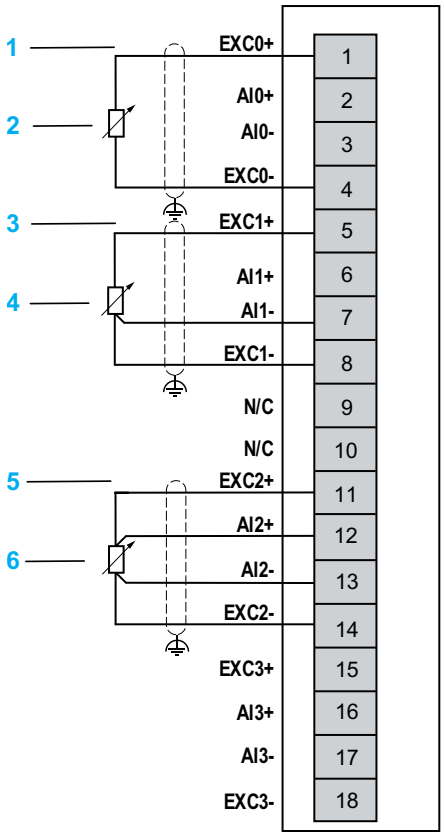
For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagrams

The following figures illustrate the connection between the inputs and the sensors:



1: 2-wire connection with external CJC
2, **4**: 2-wire connection
3: Voltage
5: Resistance
N/C: Not Connected



1: 2-wire connection
2, **4**, **6**: RTD
3: 3-wire connection
5: 4-wire connection
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.

NTSART0404XH Parameters

Overview

This section describes the parameters of the NTSART0404XH module.

Parameters Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in the cluster, a configuration error is detected.
Frequency Rejection *Frequency Rejection*	**50 Hz*** **60 Hz**	ENUM	Selects **Frequency Rejection**. Depending on the country, you can configure the frequency rejection of main power harmonics by adapting the speed of sigma delta converter.
* 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*	**Thermocouple** **RTD Ni100** **RTD Ni1000** **RTD PT100** **RTD JPt100** **RTD PT1000** **RTD JPt1000** **RTD Cu10** **RTD Cu50** **RTD Cu100** **Voltage Sensors** **Resistance Sensors**	ENUM	Defines the range mode for the input channel. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 228.
Range Maximum *RangeMax*	**Resistance: 1..32000** **Others: -31999..32000**	INT16	Sets the high threshold value of the normal range. The values are computed according to the selected **RangeMode**.
Range Minimum *RangeMin*	**Resistance: 0..31999** **Others: -32000..31999**	INT16	Sets the low threshold value of the normal range. The values are computed according to the selected **RangeMode**.
Overflow Checked *OverflowCheck*	**FALSE** **TRUE***	BOOL	Enables or disables overflow detection. An error is detected if the measurement is greater than **Overflow Threshold**. You can only configure low threshold and high threshold setting. The Overflow setting is calculated based on high threshold and low threshold settings. For more information on **OverflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 232.
Overflow Threshold *OverMax*	**-31999..32000**	INT16	Overflow threshold value setting for configured range mode. 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**. You can only configure low threshold and high threshold setting. The Underflow setting is calculated based on high threshold and low threshold settings. For more information on **UnderflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 232.
Underflow Threshold *OverMin*	**-32000..31999**	INT16	Underflow threshold value setting for configured range mode. The values are computed according to the selected **RangeMin** value.
Broken Wire Checked *BrokenWireCheck*(1)	**FALSE** **TRUE***	BOOL	Enables or disables broken wire detection.

Displayed Name *Parameter Name*	Value(s)	Data type	Description
CJC Mode *CJCMode*	**Internal CJC** **Fixed CJC Value** **Channel 0 external PT100** **Channel 0 external PT1000** **Channel 1 external PT100** **Channel 1 external PT1000** **Channel 2 external PT100** **Channel 2 external PT1000** **Channel 3 external PT100** **Channel 3 external PT1000**	ENUM	Cold junction compensation mode selection.
CJC Fixed Value *CJCFixedValue*	**-32768...32767**	INT16	Sets the fixed value of the Cold junction compensation. The range value is set according to the selected **Temperature Unit**: • **-400..700** when the **Temperature Unit** is set to **Celsius**. • **-400..1580** when the **Temperature Unit** is set to **Fahrenheit**. • **2332..3432** when the **Temperature Unit** is set to **Kelvin**. **NOTE:** The value set is 1/10 of the selected **Temperature Unit**.
Temperature Unit *TemperatureUnit*	**Celsius*** **Fahrenheit** **Kelvin**	ENUM	Selects the temperature unit (°C / °F / K). This parameter is used for TC or RTD sensor input.
High Resolution Enabled *HighRtd*	**FALSE*** **TRUE**	BOOL	Enables or disables RTD high resolution. When RTD high resolution mode is enabled, the code display for RTD type is set to 1/100 °C\°F\K, otherwise it is set to 1/10 °C\°F\K.
Fast Sampling Enabled *ShortSamplingTime*	**FALSE*** **TRUE**	BOOL	Enables or disables Fast Sampling. When Fast Sampling Mode is enabled, the sampling time is set to 100 ms. otherwise it is set to 200 ms.
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 227.

Displayed Name ***Parameter Name***	**Value(s)**	**Data type**	**Description**
Filter *Filter*(1)	**0*** **1** **2** **3** **4** **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 226.
* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input 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	Provides the following detected error for the channel: 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: N/A Bit 7: CJC error detected.
ChannelFault2	0...255	BYTE 1	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

NTSART0603 Temperature Input Module, 6 Differential Inputs, RTD, Thermistor, 2-/3-wire

What's in This Chapter

NTSART0603 Presentation

Overview

This section provides a presentation of the NTSART0603 input module.

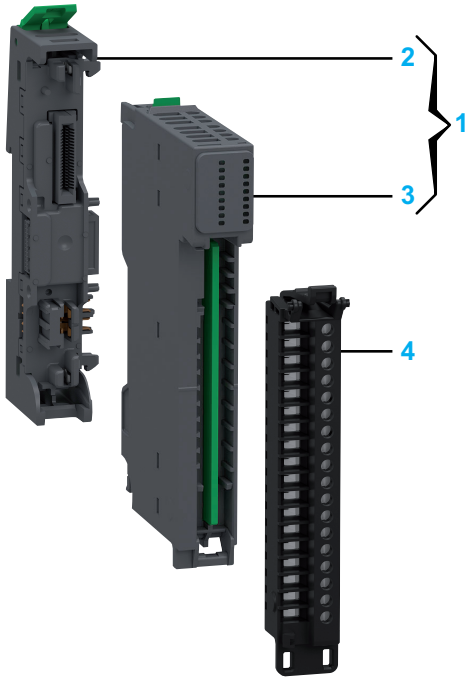
Main Characteristics

The following table describes the main characteristics of the NTSART0603 input module:

Main Characteristics	Value
Product or component type	Analog RTD and thermistor input module
Number of channels	6
Channel property	Not isolated
Channel signal	RTD, resistive and thermistor inputs
Operating mode	Asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS NTSART0603 input module:

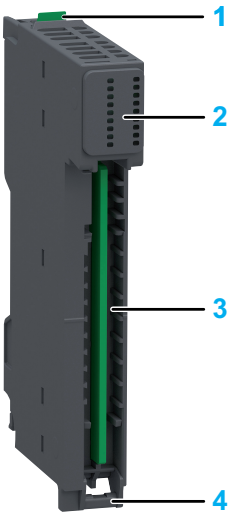


Number	Reference	Description
1	NTSART0603K	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSART0603	Temperature Input Module, 6 Differential Inputs, RTD, Thermistor, 2-/3-wire
4	NTSXTB18200H	Spring Terminal Block, 18 Points, 3.81 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB18201H	Spring Terminal Block, 18 Points, 3.81 mm Pitch, With Cover, use on Low Height Module, Hardened
	NTSXTB18000H	Screw Terminal Block, 18 Points, 3.81 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB18001H	Screw Terminal Block, 18 Points, 3.81 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

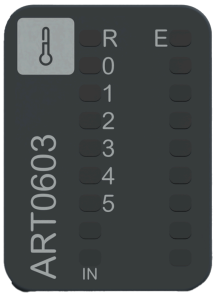
The following figure presents the elements of the module:



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

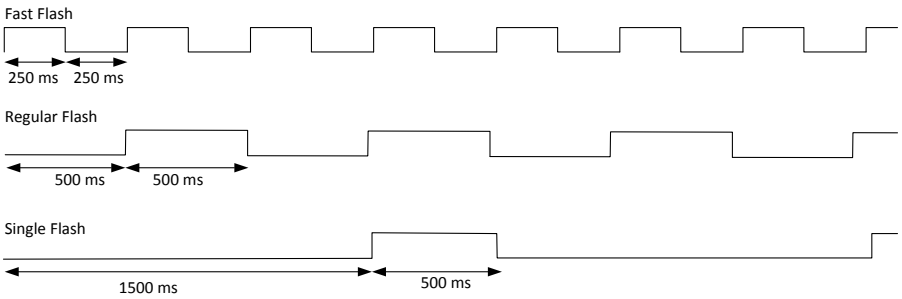
The following figure presents the NTSART0603 status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...5 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding input channel is activated.
ON	-	OFF	Indicates that the corresponding input channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • Overflow/underflow error detection.

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



NTSART0603 Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

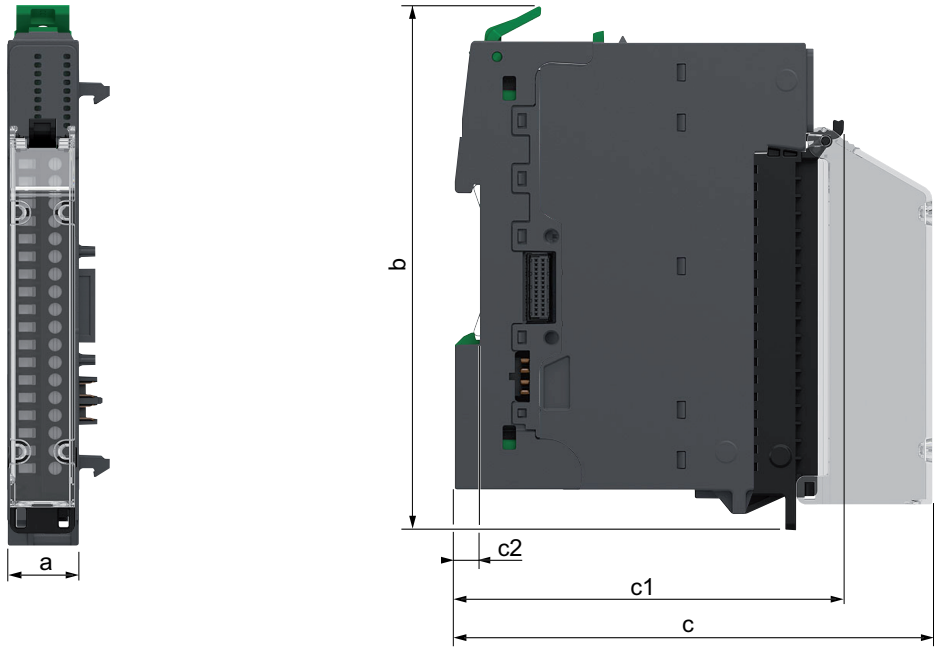
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

- NTSART0603: 48 g (1.69 oz)
- NTSART0603K: 73 g (2.58 oz)

General Characteristics

The following table describes the general characteristics of the NTSART0603 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	1,000 Vac
	Between field power and bus	1,500 Vac
Protection and detection		Protection: Miswiring protection by channel Detection: • Module: ◦ Field power from the power supply module Input: ◦ Broken wire on RTD/Resistance/Thermistor input by channel
Power dissipation		1.59 W

Input Characteristics

The following table describes the input characteristics of the NTSART0603 input module:

Characteristics		Value
Input type		Differential
Logic type		Temperature input
Wiring type sensor connection		2/3 wires for RTD and Resistance. 2-wire for thermistor NTC / PTC
Input range		Resistance: 150 Ω / 300 Ω / 600 Ω / 2,000 Ω / 32 kΩ
		RTD (standard mode and high resolution mode): Pt100/1000, Ni100/1000, JPt100/1000, Cu10/50/100
		Thermistor: PTC: 100 Ω to 10 kΩ NTC: 100 Ω to 200 kΩ, or calculated temperature -90 to 150 °C (-130 to 302 °F)
		Scaling range, refer to Temperature Input Modules Scaling Range, page 237.
Input impedance		10 MΩ Typical
Resolution		Resistance: • 0.0048 Ω on 150 Ω • 0.0096 Ω on 300 Ω • 0.019 Ω on 600 Ω • 0.064 Ω on 2,000 Ω • 1 Ω on 32,000 Ω
		RTD: • 0.1 °C (0.18 °F) in standard mode • 0.01 °C (0.018 °F) in high resolution mode
		Thermistor: • PTC: 1 Ω • NTC: 1 Ω
Maximum accuracy at ambient operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		Resistance: • For short time sampling: 0.08 % / 0.16 % • For long time sampling: 0.05 % / 0.13 %
		RTD: • For short time sampling: ◦ 0.8 °C (1.44 °F) / 1.65 °C (2.97 °F) in standard mode except Cu10 ◦ 0.5 °C (0.9 °F) / 0.9 °C (1.62 °F) in high resolution RTD mode ◦ 2 °C (3.6 °F) / 2.9 °C (5.22 °F) in Cu10 mode • For long time sampling: ◦ 0.5 °C (0.9 °F) / 1.35 °C (2.43 °F) in standard mode except Cu10 ◦ 0.3 °C (0.54 °F) / 0.7 °C (1.26 °F) in high resolution RTD mode ◦ 1 °C (1.8 °F) / 1.9 °C (3.42 °F) in Cu10 mode
		Thermistor: • For short time sampling: 0.2 % / 0.45 % • For long time sampling: 0.15 % / 0.4 %
Channel switching time	Fast sampling disabled (by default)	140 ms
	Fast sampling enabled	40 ms

Characteristics		Value
Input response time		At 50 Hz rejection: 60 ms + Channel switch time + additional processing time At 60 Hz rejection: 50 ms + Channel switch time+ additional processing time
		Additional processing time: • For wire-break check: 10 ms; In ranges Resistor, RTD, Thermistor when Fast sampling enabled • For 3 wires: 60 ms at 50 Hz rejection / 50 ms at 60 Hz rejection
Conversion mode		Sigma-Delta
Maximum allowable input no damage		Overvoltage protection Maximum 30 Vdc no damage
Input filter		Cutoff frequency 50 Hz / 60 Hz Software run-time configurable filter. Refer to Measurement Filter, page 226.
Temperature drift		Within 0.003 %/°C of full scale
Repeatability after stabilization time		0.05 % of full scale
Nonlinearity		Voltage/Resistor input: 0.01 % of full scale Thermistor / RTD: 0.01 % of full scale
Differential mode rejection (50/60 Hz)		60 dB
Common mode rejection (50/60 Hz)		100 dB
Crosstalk		50 dB
Maximum input range		Voltage: over/under range margins: ±2.4 %
Cable	Type	Shielded
	Length	200 m (656 ft) maximum

NTSART0603 Wiring

Overview

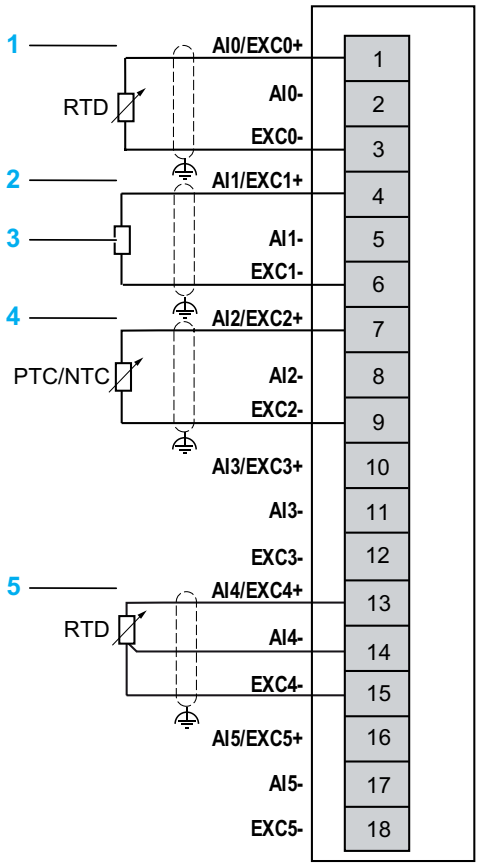
This section provides the wiring diagram for the NTSART0603 input module.

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:



1, **2**, **4**: 2-wire connection
3: Resistance
5: 3-wire connection

NTSART0603 Parameters

Overview

This section describes the parameters of the NTSART0603 module.

Parameters Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in the cluster, a configuration error is detected.
Frequency Rejection *Frequency Rejection*	**50 Hz*** **60 Hz**	ENUM	Selects **Frequency Rejection**. Depending on the country, you can configure the frequency rejection of main power harmonics by adapting the speed of sigma delta converter.
* 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*	**RTD Ni100** **RTD Ni1000** **RTD PT100** **RTD JPt100** **RTD PT1000** **RTD JPt1000** **RTD Cu10** **RTD Cu50** **RTD Cu100** **Resistance Sensors** **Thermistor Sensors**	ENUM	Defines the range mode for the input channel. The module is 2/3-wire type sensor connection for RTD and resistance and is a 2-wire type sensor connection for thermistor NTC / PTC. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 228.
Range Maximum *RangeMax*	**Resistance: 1..32000** **Others: -31999..32000**	INT16	Sets the high threshold value of the normal range. The values are computed according to the selected **RangeMode**.
Range Minimum *RangeMin*	**Resistance: 0..31999** **Others: -32000..31999**	INT16	Sets the low threshold value of the normal range. The values are computed according to the selected **RangeMode**.

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**. You can only configure low threshold and high threshold setting. The Overflow setting is calculated based on high threshold and low threshold settings. For more information on **OverflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 232.
Overflow Threshold *OverMax*	**-31999..32000**	INT16	Overflow threshold value setting for configured range mode. 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**. You can only configure low threshold and high threshold setting. The Underflow setting is calculated based on high threshold and low threshold settings. For more information on **UnderflowChecked** parameter, refer to Overflowcheck/Underflowcheck, page 232.
Underflow Threshold *OverMin*	**-32000..31999**	INT16	Underflow threshold value setting for configured range mode. The values are computed according to the selected **RangeMin** value.
Broken Wire Checked *BrokenWireCheck*(1)	**FALSE** **TRUE***	BOOL	Enables or disables broken wire detection.
Temperature Unit *TemperatureUnit*	**Celsius*** **Fahrenheit** **Kelvin**	ENUM	Selects the temperature unit (°C / °F / K). This parameter is used for TC or RTD sensor input.
High resolution enabled *HighRtd*	**FALSE*** **TRUE**	BOOL	Enables or disables RTD high resolution. When RTD high resolution mode is enabled, the code display for RTD type is set to 1/100 °C\°F\K, otherwise it is set to 1/10 °C\°F\K.
Fast Sampling Enabled *ShortSamplingTime*	**FALSE*** **TRUE**	BOOL	Enables or disables Fast Sampling. When Fast Sampling Mode is enabled, the sampling time is set to 100 ms. otherwise it is set to 200 ms.
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 227.
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 226.

* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input 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	Provides the following detected error for the channel: 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: N/A Bit 7: N/A
ChannelFault2	0...255	BYTE 1	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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

NTSAHO0212H Analog Output Module, 2 Isolated Outputs, Current, HART, Hardened

What's in This Chapter

NTSAHO0212H Presentation

Overview

This section provides a presentation of the NTSAHO0212H output module.

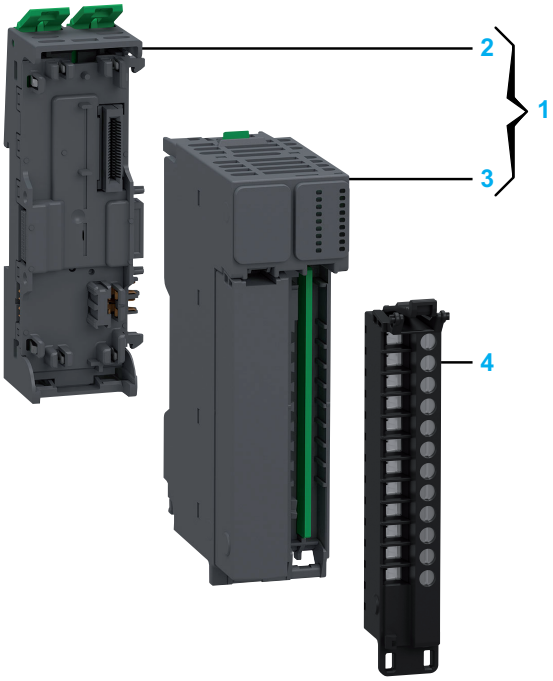
Main Characteristics

The following table describes the main characteristics of the NTSAHO0212H output module:

Main Characteristics	Value
Product or component type	Analog current output module with HART
HART protocols supported	HART versions 5, 6 and 7
Number of channels	2
Channel property	Single-ended/differential
Channel signal	Current
Operating mode	Asynchronous

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS NTSAHO0212H output module:

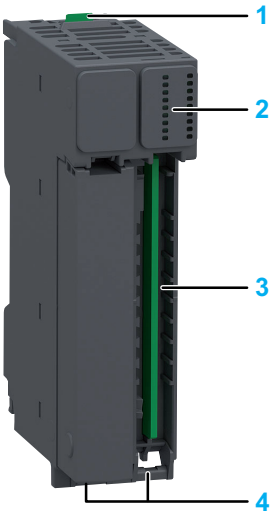


Number	Reference	Description
1	NTSAHO0212HK	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0200H	Spare Base, 2 Slots, for Input/Output Common/Expert/Safety Module, Hardened
3	NTSAHO0212H	Analog Output Module, 2 Isolated Outputs, Current, HART, Hardened
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

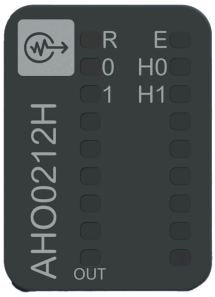
The following figure presents the elements of the module:



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

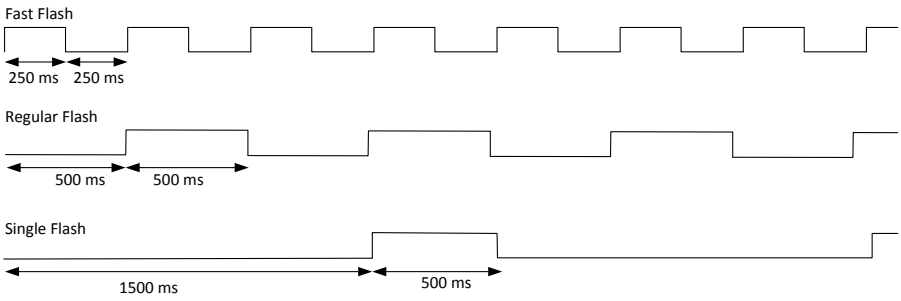
The following figure presents the NTSAHO0212H status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	OUT0...1 (Green)	H0...1 (Green)	Description
Initialization and non-operational states				
OFF	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.
Regular Flash	ON	-	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	-	Indicates that the module is in commissioning mode.
Operational state				
ON	OFF	-	-	Indicates that the module is energized, configured and operational.
ON	-	ON	-	Indicates that the corresponding output channel is activated.
ON	-	OFF	OFF	Indicates that the corresponding output channel is deactivated.
ON	Single Flash	-	-	Indicates an 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	OFF	OFF	Indicates an internal error detection.
ON	Regular Flash	Regular Flash	-	Indicates one of the following: • Broken wire detection. • Short circuit detection. • Overflow/underflow error detection. • DAC power error detection.
ON	-	-	OFF	Indicates that the input channel is activated but the HART Communication Diagnostics Channel is disabled.
ON	Single Flash	-	Single Flash	Indicates one of the following: • HART Communication Diagnostics Channel is disconnected. • HART Communication Diagnostics Channel is connected and a difference change is detected. For more information on major and minor differences, refer to Major and minor differences, page 179.
ON	-	-	ON	Indicates that the HART Communication Diagnostics Channel is connected without changing status.

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



NTSAHO0212H Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

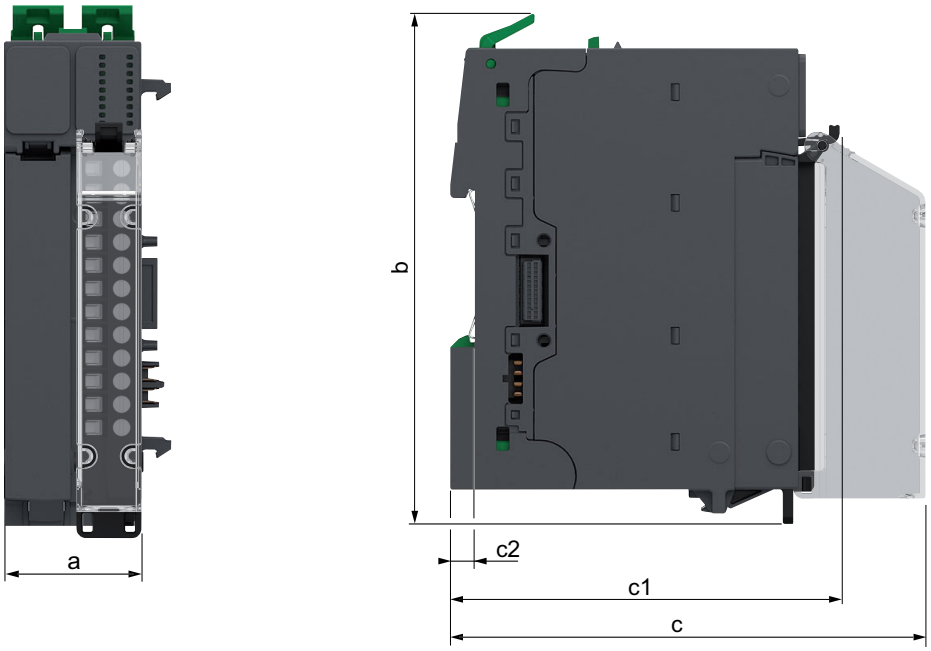
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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: 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

- NTSAHO0212H: 48 g (1.69 oz)
- NTSAHO0212HK: 73 g (2.58 oz)

General Characteristics

The following table describes the general characteristics of the NTSAHO0212H output module:

Characteristics		**Value**
Rated power supply voltage		24 Vdc
Power supply 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
	Between field power and bus	1,500 Vac
Protection and detection		Module: • Field power from the power supply module detection Analog Output: • Current output: Miswiring protection and broken wire detection by channel
Power dissipation		1.64 W

Output Characteristics

The following table describes the output characteristics of the NTSAHO0212H output module:

Characteristics		Value
Output type		Single-ended/Differential
Logic type		Current output with HART
Wiring type Actuator connection		2-wire
Output range		4...20 mA
		Scaling range, refer to NTSAHO0212H Scaling Range, page 243.
Load impedance		Current output: 750 Ω maximum
Resolution		16 bits: 4...20 mA 12 bits on readback monitoring
Maximum accuracy at ambient operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		0.1 % / 0.2 % of full scale
Response time		500 µs at 750 Ω (without HART)
Maximum allowable output no damage		30 V
Temperature drift		0.002 %/°C of full scale
Repeatability after stabilization time		0.03 % of full scale
Nonlinearity		0.02 % of full scale
Cable	Type	Shielded
	Length	Current output: 1,000 m (3,280 ft)

NTSAHO0212H Wiring

Overview

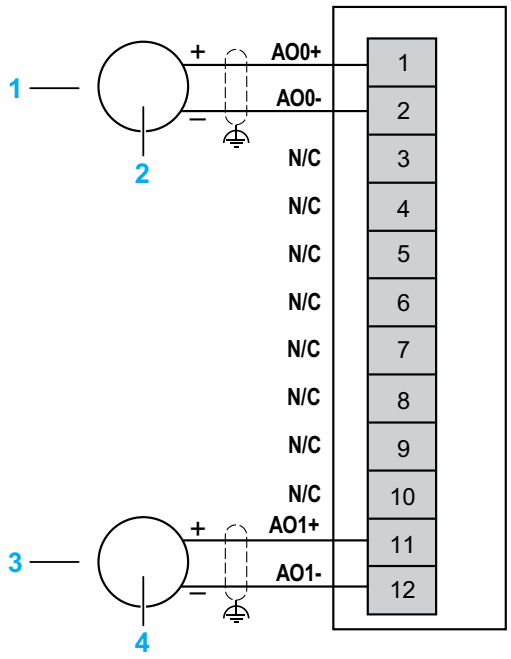
This section provides the wiring diagram for the NTSAHO0212H output module.

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 outputs and the actuators:



1, **3**: 2-wire connection for current output
2, **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.

NTSAHO0212H Parameters

Overview

This section describes the parameters of the NTSAHO0212H module.

Parameters Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in the cluster, a configuration error is detected.
Gender *Gender*	0: **Primary Master*** 1: **Secondary Master**	ENUM	Allows you to select the master mode in the HART loop: • **Primary Master**: The module is the primary master in the HART loop. • **Secondary Master**: The module is the secondary master in the HART loop. A primary master, such as an asset management system or device configuration tool, already exists in the HART loop.
* 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*	**4..20 mA**	ENUM	Defines the range mode for the output channel. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 228.
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	Allows you to select the behavior for the output in case of a communication interruption: • **Predefined Fallback Value**: Sets the output to the configured **Predefined Fallback Value** value. • **Maintain**: The output remains in its present state.
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 232.
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 232.
Underflow Threshold *OverMin*	**-32768...32766**	INT16	Sets the underflow threshold value. The values are computed according to the selected **RangeMin** value.
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 227.
Broken Wire Checked *BrokenWireCheck*(1)	**FALSE** **TRUE***	BOOL	Enables or disables broken wire detection
Predefined Fallback Value *OutputFallbackValue*(1)	**-32768...32767**	INT16	Sets the value of the predefined Fallback value.
Hart Enabled *HartEnable*	**FALSE*** **TRUE**	BOOL	Enables or disables the HART function. For more information on **Hart Enabled** parameter, refer to HartEnable, page 225.
Hart Fallback Mode *HartFallBackMode*	**Return to zero*** **Maintain**	ENUM	Specify the HART values when the HART function is in fallback mode.
Preambles Number *PreamblesNumber*	**5*...20**	BYTE	Sets the length of the start of the HART frame.

Displayed Name ***Parameter Name***	**Value(s)**	**Data type**	**Description**
Lower Scan Address *LowerScanAddress*	**0*...62**	BYTE	Sets the lower limitation of address for scanning setting. The values are computed according to the selected **Upper Scan Address** value.
Upper Scan Address *UpperScanAddress*	**1...63** **15***	BYTE	Sets the upper limitation of address for scanning setting. The values are computed according to the selected **Lower Scan Address** value.
Communication Retries Number *CommunicationRetries-Number*	**0..5***	BYTE	Sets the number of times the HART module sends a command after a communication interruption with a HART instrument.
Busy Retries Counts *BusyRetriesNumber*	**0..5**	BYTE	Sets the number of times the HART module sends a command after receiving a busy reply from a HART instrument.
Instrument Status Enabled *InstrumentStatusEnable*	**FALSE*** **TRUE**	BOOL	Enables or disables HART Scan command for instrument status.
Primary Variable Enabled *PrimaryVariableEnable*	**FALSE** **TRUE***	BOOL	Enables or disables HART Scan command for primary variable.
Secondary Variable Enabled *SecondaryVariableEnable*	**FALSE** **TRUE***	BOOL	Enables or disables HART Scan command for secondary variable.
Tertiary Variable Enabled *TertiaryVariableEnable*	**FALSE** **TRUE***	BOOL	Enables or disables HART Scan command for tertiary variable.
Quaternary Variable Enabled *QuaternaryVariableEnable*	**FALSE** **TRUE***	BOOL	Enables or disables HART Scan command for quaternary variable.
Current Value Enabled *CurrentValueEnable*	**FALSE*** **TRUE**	BOOL	Enables or disables HART Scan command for current value.
Percent Value Enabled *PercentValueEnable*	**FALSE*** **TRUE**	BOOL	Enables or disables HART Scan command for percent value.
Reset Difference Change *CHResetChanged*(1)	**0*** **1**	BYTE	To accept a connected HART instrument that has either major differences or minor differences from the previously connected instrument, set the value to 1 for the corresponding channel. **NOTE:** For more information on major and minor differences, refer to Major and minor differences, page 179.

* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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

Parameter Name	**Value(s)**	**Data type** **Size in bytes**	**Description**
QBackValue	-32,768... 32,767	INT16 2	Output readback value of the channel.
InstrumentStatus	0...65,535	UINT16 2	Instrument status of channel. First byte (byte 0), response code: • Bit 0..5: Summary of the communication detected error. • Bit 6: N/A. • Bit 7: Communication detected error (1: detected error). **NOTE:** Depending on this bit 7 value, the remaining bits provide information: ◦ on the communication detected error (bit 7 value is 1). ◦ indicating whether the command executed successfully or not (bit 7 value is 0). Second byte (byte 1), device status: • Bit 8: Primary variable out of limits: the value of the instrument Primary Variable (PV) has exceeded its operating limits. • Bit 9: Non-primary variable out of limits: the value of an instrument variable, other than the Primary Variable (PV), has exceeded its operating limits. • Bit 10: Loop current saturated: current on the HART channel has reached its upper or lower limit, and cannot increase or decrease further. • Bit 11: Loop Current Fixed: the Loop Current is being held at a fixed value and is not responding to process variations. • Bit 12: More status available: additional instrument information is available through HART command 48 (Read Additional Status Information). • Bit 13: Cold start: the instrument was reset, or power was cycled off then on. • Bit 14: Configuration changed: an operation occurred that changed the instrument configuration. • Bit 15: Device Malfunction: a detected error rendered the instrument non-operational.
ChannelStatus	0...255	BYTE 1	Connection status of channel: • Value 0: The channel is disabled. • Value 1: The module is searching for, and attempting to connect to, a HART instrument on the channel. • Value 2: The channel is connected to a HART instrument. • Value 3: One or more minor differences exist between the connected HART instrument and the instrument description in the multiplexer configuration. • Value 4: One or more major differences exist between the connected HART instrument and the instrument description in the multiplexer configuration. **NOTE:** For more information on major and minor differences, refer to Major and minor differences, page 179 • Value 5: This state indicates one of the following: ◦ The module did not discover a HART instrument on the channel, after performing two scans on the specified address range. ◦ The module discovered a HART instrument on the channel, but the connection was interrupted. The module continues to search for a HART instrument on this channel. • Values 6...255 are reserved.
PrimaryVariable	3.4×10^{-38}...3.4×10^{38}	FLOAT 4	Primary variable value of HART instrument.
SecondaryVariable	3.4×10^{-38}...3.4×10^{38}	FLOAT 4	Secondary variable value of HART instrument.

Parameter Name	Value(s)	Data type Size in bytes	Description
TertiaryVariable	3.4 x 10^{-38}...3.4 x 10^{38}	FLOAT 4	Tertiary variable value of HART instrument.
QuaternaryVariable	3.4 x 10^{-38}...3.4 x 10^{38}	FLOAT 4	Quaternary variable value of HART instrument.
CurrentValue	3.4 x 10^{-38}...3.4 x 10^{38}	FLOAT 4	Reading of loop current, from 4...20 mA.
PercentValue	3.4 x 10^{-38}...3.4 x 10^{38}	FLOAT 4	Reading of loop current, expressed as a percent of the 16 mA range.

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

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

Major and minor differences

Differences in the following definitions of a HART field instrument are described as minor:

- HART supported protocol major version
- Hardware revision level
- Device ID

Differences in the following definitions of a HART field instrument are described as major:

- Expanded device type
- Device revision level
- Software revision level
- Flags
- Manufacturer ID (only for HART versions 5 and 6)
- Label (only for HART versions 5 and 6)
- Device profile (only for HART versions 5 and 6)

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	Provides the following detected error for the channel: 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: N/A Bit 7: N/A
ChannelFault2	0...255	BYTE 1	Provides the following detected error for the channel: Bit 0: DAC power error detected Bit 7: Power supply error detected **NOTE:** Bits 1 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

NTSAMO0210/NTSAMO0210H Analog Output Module, 2 Isolated Outputs, Current, Voltage, Standard/Hardened

What's in This Chapter

NTSAMO0210/NTSAMO0210H Presentation

Overview

This section provides a presentation of the NTSAMO0210/NTSAMO0210H output modules.

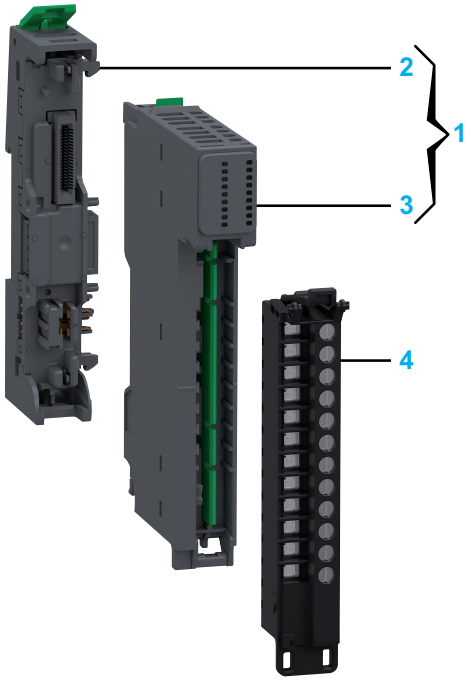
Main Characteristics

The following table describes the main characteristics of the NTSAMO0210/ NTSAMO0210H output modules:

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

Purchasing Information

The following figure shows the elements of the Modicon Edge I/O NTS NTSAMO0210/NTSAMO0210H output modules:

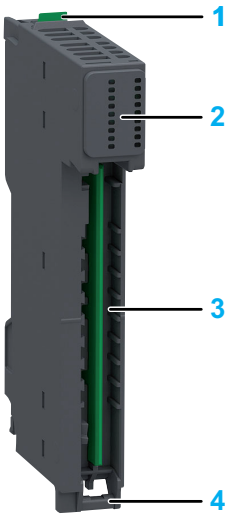


Number	Reference	Description
1	NTSAMO0210K NTSAMO0210HK	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSAMO0210	Analog Output Module, 2 Isolated Outputs, Current, Voltage
	NTSAMO0210H	Analog Output Module, 2 Isolated 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

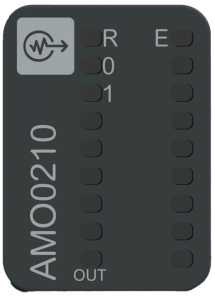
The following figure presents the elements of the module:



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

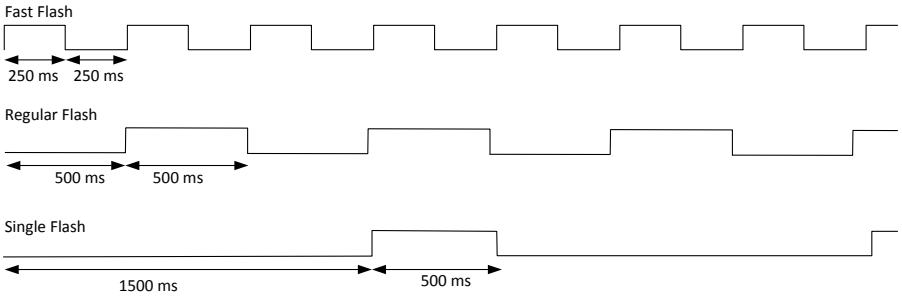
The following figure presents the NTSAMO0210/NTSAMO0210H status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	OUT0...1 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding output channel is activated.
ON	-	OFF	Indicates that the corresponding output channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	-	Module in fallback state.
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • Short circuit detection. • Overflow/underflow error detection. • DAC power error detection.

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



NTSAMO0210/NTSAMO0210H Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

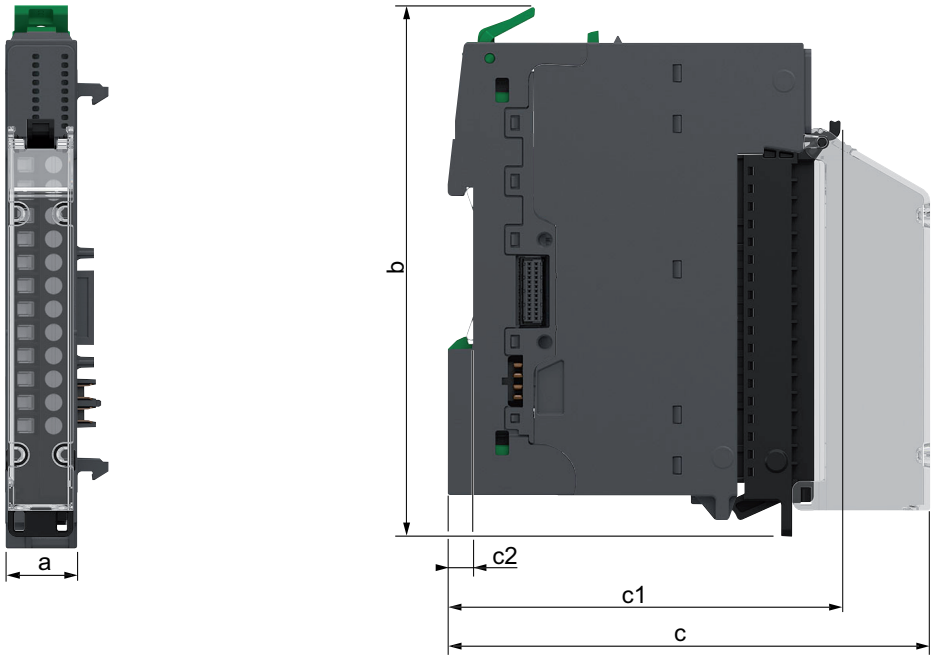
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

- NTSAMO0210/NTSAMO0210H: 48 g (1.69 oz)
- NTSAMO0210K/NTSAMO0210HK: 73 g (2.58 oz)

General Characteristics

The following table describes the general characteristics of the NTSAMO0210/ NTSAMO0210H output modules:

Characteristics		**Value**
Rated power supply voltage		24 Vdc
Power supply 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
	Between field power and bus	1,500 Vac
Protection and detection		Overcurrent on voltage output Broken wire on current output
Power dissipation		1.16 W

Output Characteristics

The following table describes the output characteristics of the NTSAMO0210/ NTSAMO0210H output modules:

Characteristics		Value
Output type		Single-ended/Differential
Logic type		High level output
Wiring type connection		2/3/4 wires to actuator (3-wire with +Vsense or, 4-wire with ±Vsense)
Output range		±10 Vdc 0...10 Vdc ±5 Vdc 0...5 Vdc 1...5 Vdc ±20 mA 0...20 mA 4...20 mA
		Scaling range, refer to NTSAMO0210/NTSAMO0210H/NTSAMM0600 Scaling Range, page 242.
Load impedance		Voltage output: 1 K Ω minimum Current output: 750 Ω maximum
Resolution		16 bits, or 15 bits plus sign bit: ±10 Vdc, ±5 Vdc, ±20 mA 15 bits: 0...10 Vdc, 0...5 Vdc, 1...5 Vdc, 0...20 mA, 4...20 mA
Maximum accuracy at ambient operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		0.1 % / 0.2 % of full scale
Response time		500 µs at 600 Ω
Maximum allowable output no damage		30 Vdc
Temperature drift		0.002 %/°C of full scale
Repeatability after stabilization time		0.03 % 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)

NTSAMO0210/NTSAMO0210H Wiring

Overview

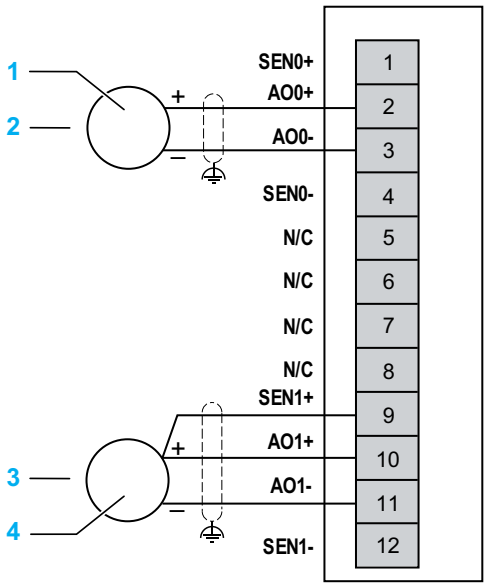
This section provides the wiring diagrams for the NTSAMO0210/NTSAMO0210H output modules.

Wiring Rules

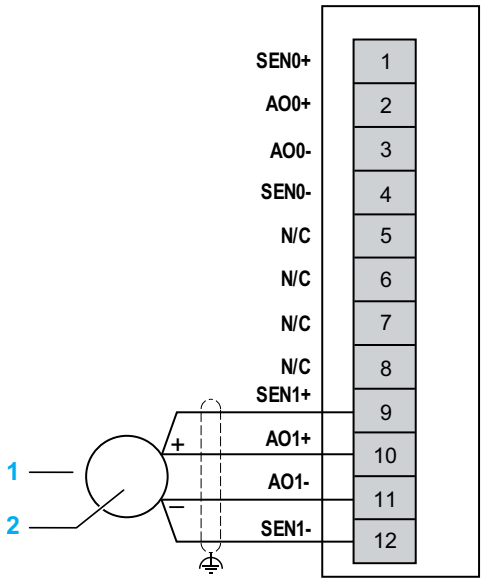
For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagrams

The following figures illustrate the connection between the outputs and the actuators:



1, **4**: Actuator
2: 2-wire connection for voltage/current output
3: 3-wire connection for voltage output
SEN•+ : Sensor sense line positive
SEN•- : Sensor sense line negative
N/C: Not Connected



1: 4-wire connection for voltage output
2: Actuator
SEN•+ : Sensor sense line positive
SEN•- : Sensor sense line negative
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.

NOTE: The sensor sense line connections are used to compensate the voltage drop over long distances.

NTSAMO0210/NTSAMO0210H Parameters

Overview

This section describes the parameters of the NTSAMO0210/NTSAMO0210H modules.

Parameters Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in 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 output channel. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 228.
Range Minimum *RangeMin*	**-32767...32767**	INT16	Sets the low threshold value of the normal range. The values are computed according to the selected **RangeMode**.
Range Maximum *RangeMax*	**-32768...32766**	INT16	Sets the high threshold value of the normal range. The values are computed according to the selected **RangeMode**.

Displayed Name ***Parameter Name***	**Value(s)**	**Data type**	**Description**
Fallback Mode *OutputFallBackMode*	**Predefined Fallback Value*** **Maintain**	ENUM	Allows you to select the behavior for the output in case of a communication interruption: • **Predefined Fallback Value**: Sets the output to the configured **Predefined Fallback Value** value. • **Maintain**: The output remains in its present state.
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 on the analog current output. For analog output modules, this function is achieved by setting DAC output slew rate. 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 **HartToleranceEnabled** parameter, refer to HartToleranceEnable, page 224.
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 232.
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 232.
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 227.

* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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

Parameter Name	**Value(s)**	**Data type** **Size in bytes**	**Description**
QValue	-32,768... 32,767	INT16 2	Value of the output channel requested by the controller.

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	Provides the following detected error for the channel: 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	Provides the following detected error for the channel: Bit 0: DAC power error detected Bit 7: Power supply error detected **NOTE:** Bits 1 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

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.

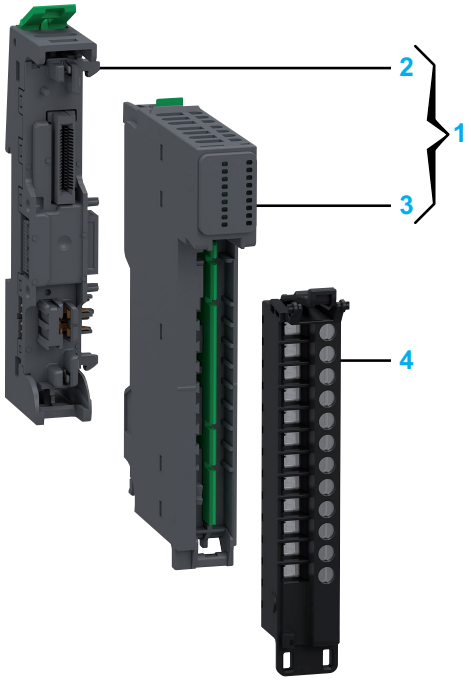
Main Characteristics

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:

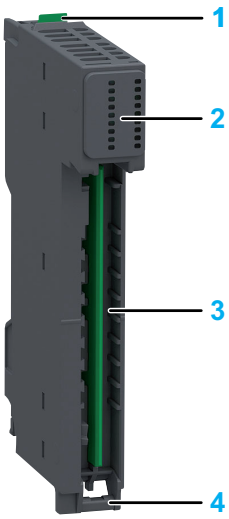


Number	Reference	Description
1	NTSAMO0400K NTSAMO0400HK	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSAMO0400	Analog Output Module, 4 Outputs, Current, Voltage
	NTSAMO0400H	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

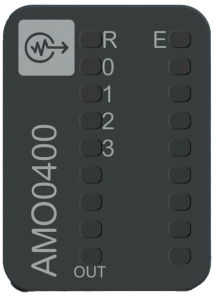
The following figure presents the elements of the module:



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

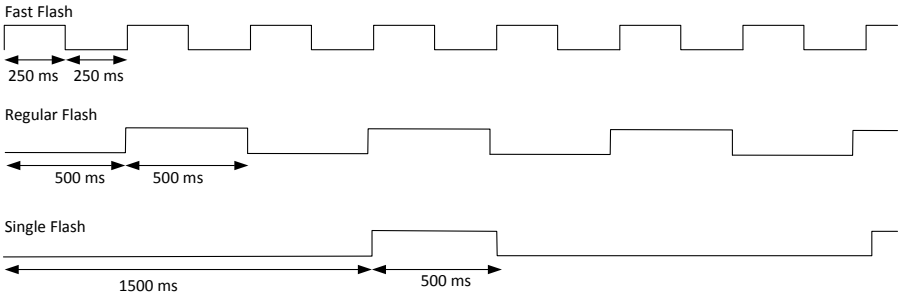
The following figure presents the NTSAMO0400/NTSAMO0400H status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	OUT0...3 (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.
Regular Flash	ON	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	Indicates that the module is in commissioning mode.
Operational state			
ON	OFF	-	Indicates that the module is energized, configured and operational.
ON	-	ON	Indicates that the corresponding output channel is activated.
ON	-	OFF	Indicates that the corresponding output channel is deactivated.
ON	Single Flash	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	-	Module in fallback state.
ON	Regular Flash	Regular Flash	Indicates one of the following: • Broken wire detection. • Short circuit detection. • Overflow/underflow error detection. • DAC power error detection.

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



NTSAMO0400/NTSAMO0400H Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

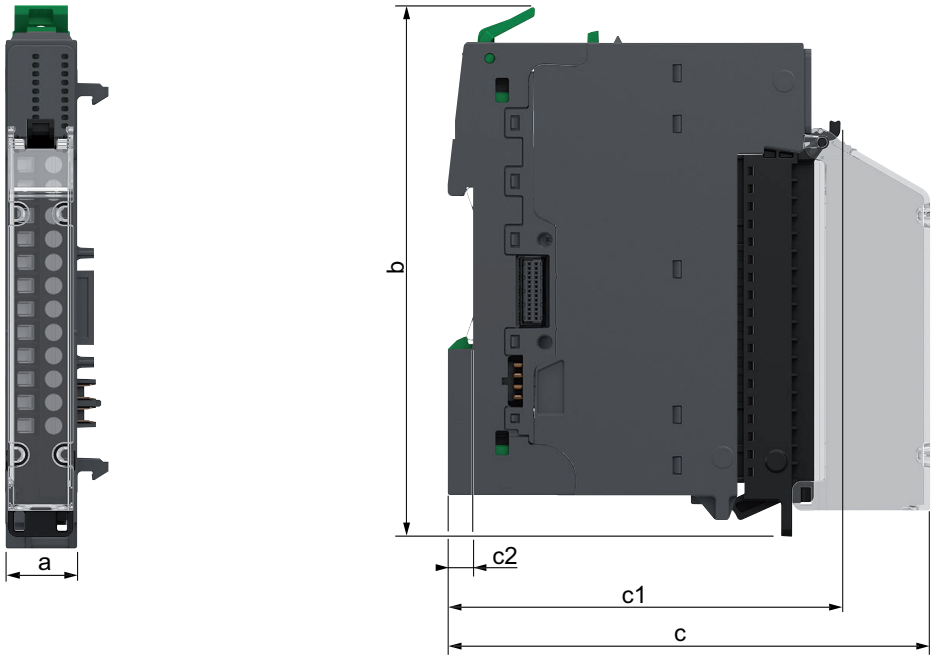
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

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

General Characteristics

The following table describes 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	1,500 Vac
	Between channels and field power	No
	Between field power and bus	1,500 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-ended	
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	
		Scaling range, refer to NTSAMO0400/NTSAMO0400H Scaling Range, page 243.	
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 operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		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

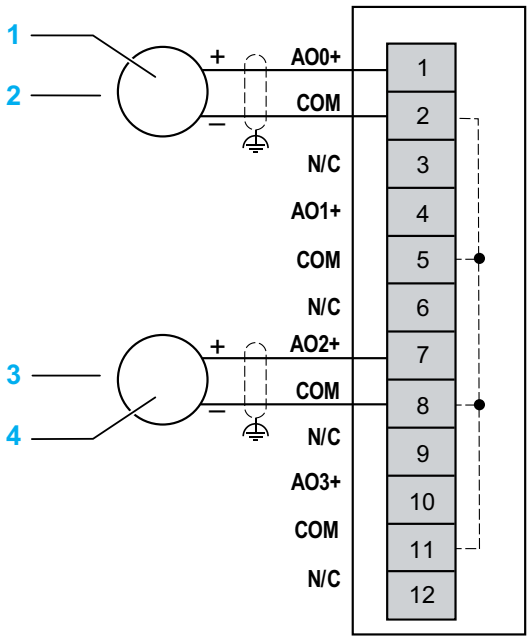
This section provides the wiring diagram for the NTSAMO0400/NTSAMO0400H output modules.

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 Description

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.**

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** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in 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 228.
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**.

Displayed Name ***Parameter Name***	**Value(s)**	**Data type**	**Description**
Fallback Mode *OutputFallBackMode*	**Predefined Fallback Value*** **Maintain**	ENUM	Allows you to select the behavior for the output in case of a communication interruption: • **Predefined Fallback Value**: Sets the output to the configured **Predefined Fallback Value** value. • **Maintain**: The output remains in its present state.
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 224.
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 232.
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 232.
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 227.
* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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

Parameter Name	**Value(s)**	**Data type** **Size in bytes**	**Description**
QValue	-32,768... 32,767	INT16 2	Value of the output channel requested by the controller.

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	Provides the following detected error for the channel: 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	Provides the following detected error for the channel: Bit 0: DAC power error detected Bit 7: Power supply error detected **NOTE:** Bits 1 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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.

Analog Input/Output Modules

What’s in This Part

NTSAMM0600 Analog Input/Output Module, 4 Inputs, 2 Outputs, Group Isolated, Current, Voltage, 2-wire

What's in This Chapter

NTSAMM0600 Presentation

Overview

This section provides a presentation of the NTSAMM0600 input and output module.

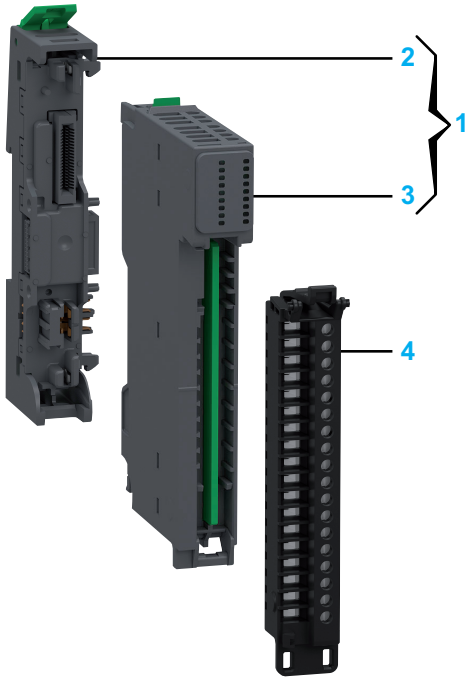
Main Characteristics

The following table describes the main characteristics of the NTSAMM0600 input and output module:

Main Characteristics	Value
Product or component type	Analog current and voltage input/output module
Number of channels	4 input, 2 output
Channel property	Isolation between input and output
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 NTSAMM0600 input and output module:

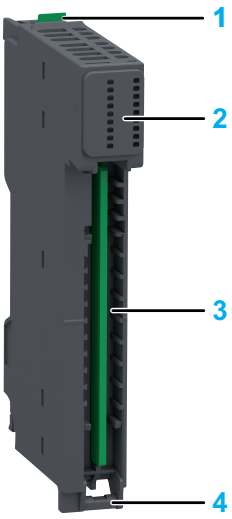


Number	Reference	Description
1	NTSAMM0600K	Base + Module (kit) **NOTE:** The module and its corresponding base can be purchased as a kit.
2	NTSXBA0100H	Spare Base, 1 Slot, for Input/Output Common or Expert Module, Hardened
3	NTSAMM0600	Analog Input/Output Module, 4 Inputs, 2 Outputs, Group Isolated, Current, Voltage, 2-wire
4	NTSXTB18200H	Spring Terminal Block, 18 Points, 3.81 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB18201H	Spring Terminal Block, 18 Points, 3.81 mm Pitch, With Cover, use on Low Height Module, Hardened
	NTSXTB18000H	Screw Terminal Block, 18 Points, 3.81 mm Pitch, Without Cover, use on Low Height Module, Hardened
	NTSXTB18001H	Screw Terminal Block, 18 Points, 3.81 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

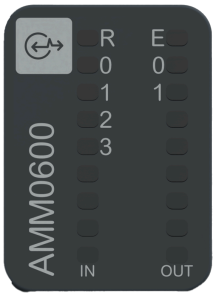
The following figure presents the elements of the module:



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

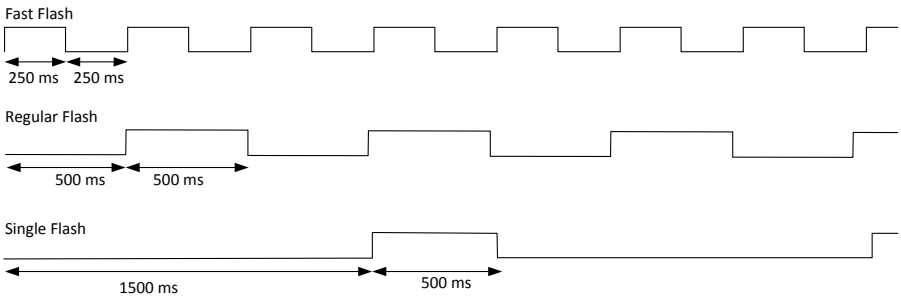
The following figure presents the NTSAMM0600 status LEDs:



The following table describes the status of LEDs:

R (Green)	E (Red)	IN0...3 (Green)	OUT0...1 (Green)	Description
Initialization and non-operational states				
OFF	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.
Regular Flash	ON	-	-	Indicates that a module mismatch is detected.
Single Flash	OFF	-	-	Indicates that the module is energized and not configured.
Fast Flash	-	-	-	Indicates that the module is in commissioning mode.
Operational state				
ON	OFF	-	-	Indicates that the module is energized, configured and operational.
ON	-	ON	-	Indicates that the corresponding input channel is activated.
ON	-	OFF	-	Indicates that the corresponding input channel is deactivated.
ON	-	-	ON	Indicates that the corresponding output channel is activated.
ON	-	-	OFF	Indicates that the corresponding output channel is deactivated.
ON	Single Flash	-	-	Indicates an advisory detection.
ON	Single Flash	Single Flash	Single Flash	Indicates one of the following: • Lower tolerance advisory detection. • Upper tolerance advisory detection.
ON	Regular Flash	OFF	OFF	Indicates one of the following: • 24 Vdc field power error detection. • An internal error detection
ON	Regular Flash	-	-	Module in fallback state.
ON	Regular Flash	Regular Flash	-	Indicates one of the following: • Broken wire detection. • Overflow/underflow error detection.
ON	Regular Flash	-	Regular Flash	Indicates one of the following: • Broken wire detection. • Short circuit detection. • Overflow/underflow error detection. • DAC power error detection.

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



NTSAMM0600 Characteristics

Overview

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

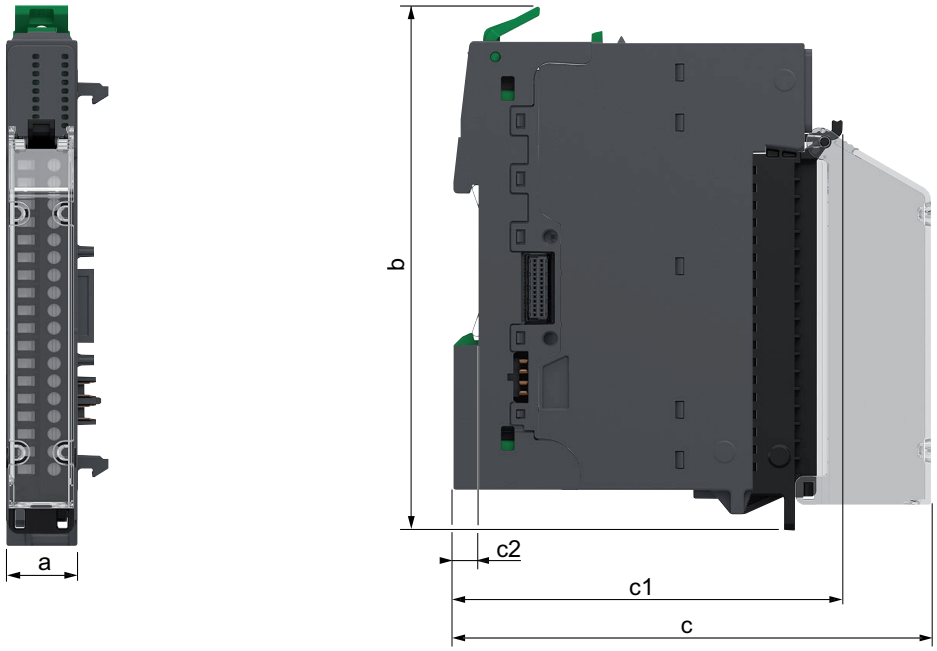
Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

- NTSAMM0600: 48 g (1.69 oz)
- NTSAMM0600K: 73 g (2.58 oz)

General Characteristics

The following table describes the general characteristics of the NTSAMM0600 input and output module:

Characteristics		Value
Rated power supply voltage		24 Vdc
Power supply range		20.4...28.8 Vdc
Isolation	Between channels	Input: No Output: No Input-Output: 530 Vac
	Between channels and bus	1,000 Vac
	Between channels and field power	Input: 1,000 Vac Output: 1000 Vac
	Between field power and bus	1,500 Vac
Protection and detection		Module: • Field power from the power supply module detection Analog Input: • Voltage input: Miswiring protection by channel • Current input: Overcurrent and miswiring protection by channel Analog Output: • Voltage output: Overcurrent detection and protection by channel • Current output: Broken wire detection by channel • External actuator power supply input detection
Power dissipation		1.66 W

Input Characteristics

The following table describes the input characteristics of the NTSAMM0600 module:

Characteristics		Value
Input type		Single-ended
Logic type		High level input
Wiring type Sensor connection		1/2-wire
Input range		±10 Vdc 0...10 Vdc ±5 Vdc 0...5 Vdc 1...5 Vdc ±20 mA 0...20 mA 4...20 mA
		Scaling range, refer to NTSAMI0400/NTSAMI0420/NTSAMI0800/NTSAMM0600 Scaling Range, page 235.
Input impedance		Vdc: > 10 MΩ I: 100 Ω + internal current protector 10 Ω typical
Resolution		16 bits, or 15 bits plus sign bit: ±10 Vdc, ±5 Vdc, ±20 mA 15 bits: 0...10 Vdc, 0...5 Vdc, 1...5 Vdc, 0...20 mA, 4...20 mA
Maximum accuracy at ambient operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		0.3 % / 0.5 % of full scale
Input response time	Per enabled channel	250 µs
	Per module	Internal I/O bus exchange cycle time(1) 1 ms minimum
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)
Conversion mode		Sigma-Delta
Maximum allowable input no damage		Voltage input: 30 Vdc Current input: 30 Vdc / 50 mA
Input filter		Software run-time configurable filter. Refer to Measurement Filter, page 226.
Temperature drift		0.0057 %/°C of full scale
Repeatability after stabilization time		0.01 % of full scale
Nonlinearity		0.01 % of full scale
Monotonicity		Yes
Common mode rejection (50/60 Hz)		90 dB

Characteristics		Value
Cable	Type	Shielded
	Length	Voltage input: 200 m (656 ft) Current input: 1,000 m (3,280 ft)
(1) For more information, refer to Configurable Parameters in Modicon Edge I/O NTS - Network Interface Modules - User Guide.		

Output Characteristics

The following table describes the output characteristics of the NTSAMM0600 module:

Characteristics		Value
Output type		Single-ended/Differential
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 ±20 mA 0...20 mA 4...20 mA
		Scaling range, refer to Output Modules Scaling Range, page 242.
Load impedance		Voltage output: 1 kΩ minimum Current output: 600 Ω maximum
Resolution		16 bits, or 15 bits plus sign bit: ±10 Vdc, ±5 Vdc, ±20 mA 15 bits: 0...10 Vdc, 0...5 Vdc, 1...5 Vdc, 0...20 mA, 4...20 mA
Maximum accuracy at ambient operating temperature 25 °C (77 °F) / In the allowed ambient operating temperature range		0.3 % / 0.5 % of full scale
Response time		1 ms at 600 Ω
Maximum allowable output no damage		30 Vdc
Temperature drift		0.006 %/°C of full scale
Repeatability after stabilization time		0.05 % of full scale
Ripple		2 mV rms on 50 Ω
Nonlinearity		0.02 % of full scale
Cable	Type	Shielded
	Length	Voltage output: 200 m (656 ft) Current output: 1,000 m (3,280 ft)

NTSAMM0600 Wiring

Overview

This section provides the wiring diagram for the NTSAMM0600 input and output module.

Wiring Rules

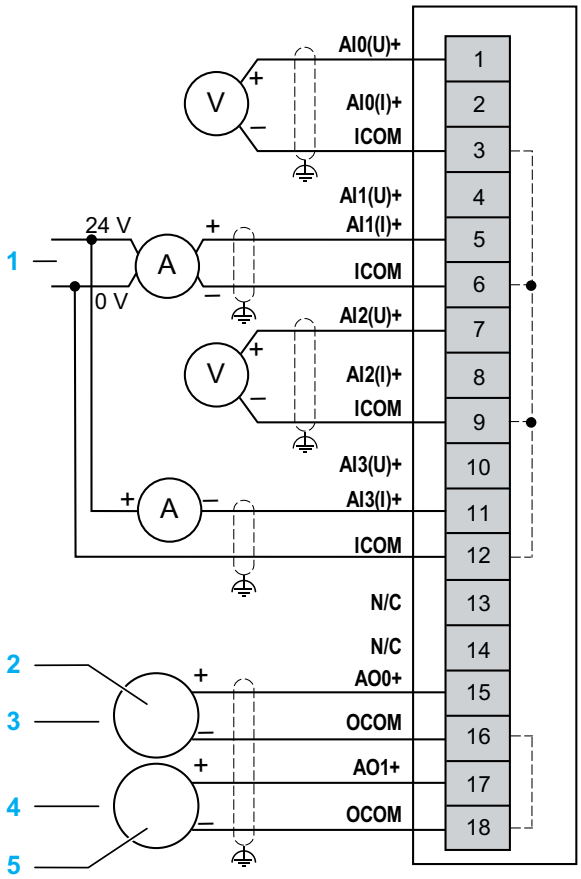
For more information on the wiring, refer to Modicon Edge I/O - System Planning and Installation Guide.

Wiring Diagram

Use the Power supply Field Distribution module for internal electronics, even if the power supplies for the sensors are provided by external sources.

The following figure illustrates the connection between:

- The inputs and the current and voltage measurement sensors
- The outputs and the actuators



1: External SELV supply
2, **5**: Actuator
3: 2-wire connection for Voltage output
4: 2-wire connection for Current output
(U): Voltage
(I): 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.

NTSAMM0600 Parameters

Overview

This section describes the parameters of the NTSAMM0600 module.

Parameters Description

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.**

Configurable Parameters

The following table presents the configurable parameters for the module:

Name ***Parameter Name***	**Value(s)**	**Data type**	**Description**
Device Mode *DeviceMode*	0: **Normal*** 1: **Optional** 2: **Virtual reserved** 3: **Virtual absent**	ENUM	Allows you to select the device mode: • **Normal**: The module is part of the software configuration and is physically installed in the cluster. • **Optional**: The module is part of the software configuration. A dummy module or the configured module must be physically installed in the cluster. Whether either module is present does not cause a configuration error to be detected. • **Virtual reserved**: The module is part of the software configuration. A dummy module must be physically installed in the cluster. If the virtual reserved module is physically installed in the cluster, a configuration error is detected. • **Virtual absent**: The module is part of the software configuration. A base must not be physically installed in the cluster. If a module is physically installed in the cluster, a configuration error is detected.
* Parameter default value			

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

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 228.
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 232.
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 232.
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 227.

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 226.
* Parameter default value (1) Online modification is allowed.			

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

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 output channel. For more information on **RangeMode** parameter, refer to RangeMode Parameters, page 228.
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	Allows you to select the behavior for the output in case of a communication interruption: • **Predefined Fallback Value**: Sets the output to the configured **Predefined Fallback Value** value. • **Maintain**: The output remains in its present state.
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 224.
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 232.
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 232.
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.

Name ***Parameter Name***	**Value(s)**	**Data type**	**Description**
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 227.
* 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 **NOTE:** For more information, refer to Modicon Edge I/O - Diagnostic Data - User Guide.
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 if the optimized I/O profile is selected. For more information on the **IO Profile** parameter, refer to the Modicon Edge I/O NTS - Network Interface Modules - User Guide.			

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	Value of the input channel.

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

Parameter Name	**Value(s)**	**Data type** **Size in bytes**	**Description**
QValue	-32,768... 32,767	INT16 2	Value of the output channel requested by the controller.

Explicit Data

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

Parameter Name	**Value(s)**	**Data type** **Size in bytes**	**Description**
ChannelFault1	0...255	BYTE 1	Provides the following detected error for the channel: 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	Provides the following detected error for the channel: Bit 7: Power supply error detected **NOTE:** Bits 0 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: Bit 0: Lower tolerance alert Bit 1: Upper tolerance alert Bit 2: Non-zero alignment offset configured Bit 3: Channel enabled configured **NOTE:** Bits 5 to 7 are reserved.
MeasureStatus2	0...255	BYTE 1	Bits 0 to 7 are reserved.

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

Parameter Name	**Value(s)**	**Data type** **Size in bytes**	**Description**
ChannelFault1	0...255	BYTE 1	Provides the following detected error for the channel: 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 **NOTE:** Bits 5 to 7 are reserved.
ChannelFault2	0...255	BYTE 1	Provides the following detected error for the channel: Bit 0: DAC power error detected Bit 7: Power supply error detected **NOTE:** Bits 1 to 6 are reserved.
MeasureStatus1	0...255	BYTE 1	Provides the following status for the channel: 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

General Parameters

What's in This Chapter

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 NTSAMI0210H, 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**.

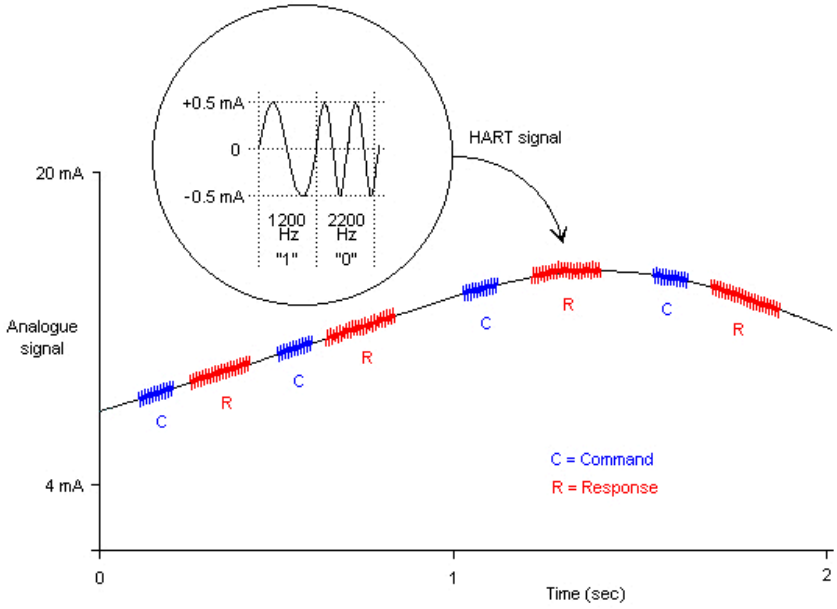
HartEnable

The Highway Addressable Remote Transducer (HART) protocol provides digital communication to microprocessor-based analog process control instruments. HART uses the Bell 202 frequency-shift-keying (FSK) standard to superimpose a digital signal on top of the **4..20 mA** current loop analog signal.

The analog signal communicates the primary measured process variable value and the digital signal communicates additional instrument information including instrument status, additional process variables, configuration data, and diagnostics.

The digital signal shifts between a frequency of 1,200 Hz (representing a binary 1) and a frequency of 2,200 Hz (representing a binary 0).

The following graphic illustrates the HART waveform:



In the waveform, digital signal frequencies are higher than the analog signaling frequency range of 0...10 Hz. The digital signal is typically isolated using a passive high-pass filter with a cutoff frequency in the range of 400 Hz to 800 Hz. The analog signal is likewise isolated using a passive low-pass filter.

The separation in frequency between the HART and the analog signaling allows both signals to coexist on the same current loop.
Because the HART digital signal is phase continuous:

- It does not interfere with the **4..20 mA** signal.
- It allows the analog process to continue operating during HART digital communication.

  NOTE: HART communication is half-duplex in design, which means that a HART-compliant instrument does not simultaneously transmit and receive.

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:

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

Where:

- α = efficiency of the filter
- $\mathbf{Meas}_{f(n)}$ = filtered measurement at moment n
- $\mathbf{Meas}_{f(n-1)}$ = filtered measurement at moment n-1
- $\mathbf{Val}_{b(n)}$ = 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 x T_{cycle}	0.040 / T_{cycle}
	2	0.875	8 x T_{cycle}	0.020 / T_{cycle}
Medium filtering	3	0.937	16 x T_{cycle}	0.010 / T_{cycle}
	4	0.969	32 x T_{cycle}	0.005 / T_{cycle}
High filtering	5	0.984	64 x T_{cycle}	0.0025 / T_{cycle}
	6	0.992	128 x T_{cycle}	0.0012 / T_{cycle}
T_{cycle} = input response time of the module. T_{cycle} for NTSART••••• modules = input response time x number of activated channels (**Channel Enabled** = TRUE). For more information on input response time, refer to the Input Characteristics page for each module.				

You may also configure the NTSAMI0420 filtering value using peak filtering as follow:

Desired Efficiency	Required Value	Description
Peak filtering	7	This type of filtering is used to filter peaks above 1.1% of the fullscale input range. If the absolute value of the difference between the present value ($\mathbf{Val}_{b(n)}$) and the previous one ($\mathbf{Val}_{b(n-1)}$) is greater than 1.1% of the fullscale, the $\mathbf{Meas}_{f(n)}$ is equal to the previous value ($\mathbf{Val}_{b(n-1)}$). If the value of the difference between the next value ($\mathbf{Val}_{b(n+1)}$) and the previous one ($\mathbf{Val}_{b(n-1)}$) is greater than 1.1% of the fullscale, the $\mathbf{Meas}_{f(n)}$ is equal to the next value ($\mathbf{Val}_{b(n+1)}$).

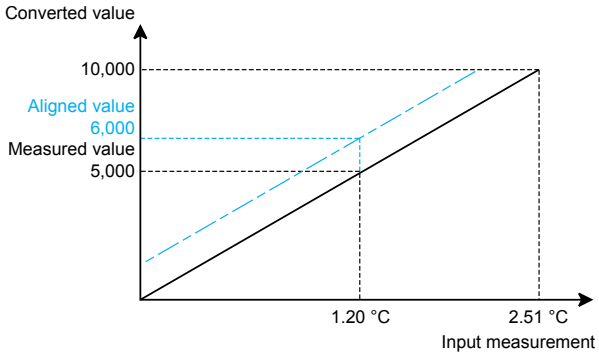
Alignment Offset

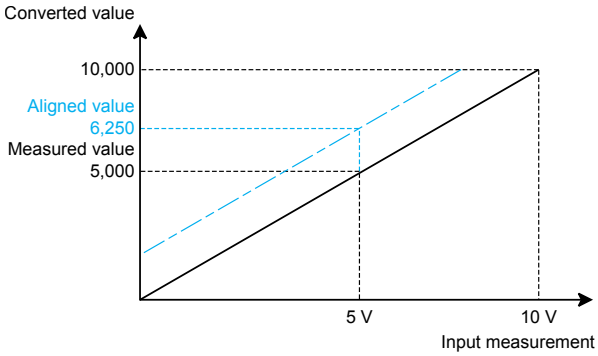
The process of alignment offset compensates for a permanent offset observed with a given sensor, around a specific operating point.

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

What's in This Chapter

Range Modes for Input and Output Modules

The following table enumerates the range mode parameter values for the input and output modules:

Enumeration Value	Value Meaning
0	**+/-10 V**
1	**0..10 V**
2	**+/-5 V**
3	**0..5 V**
4	**1..5 V**
5	**+/-20 mA**
6	**0..20 mA**
7	**4..20 mA**

Range Modes for Temperature Input Modules

Thermocouple Range Mode Parameters

The following table enumerates the thermocouple range mode parameter values for the modules:

- NTSART0214/NTSART0214H
- NTSART0404
- NTSART0404XH

Enumeration Value	Value Meaning
0	**Thermocouple J**
1	**Thermocouple K**
2	**Thermocouple E**
3	**Thermocouple T**
4	**Thermocouple S**
5	**Thermocouple R**
6	**Thermocouple B**
7	**Thermocouple N**
8	**Thermocouple U**
9	**Thermocouple L**
10	**Thermocouple C**

Resistance Temperature Detector RTD Range Mode Parameters

The following table enumerates the resistance temperature detector RTD range mode parameter values for the modules:

- NTSART0214/NTSART0214H
- NTSART0404
- NTSART0404XH
- NTSART0603

Enumeration Value	Value Meaning
11	**Ni100 (2 wires)**
12	**Ni100 (3 wires)**
13(1)	**Ni100 (4 wires)**
14	**Ni1000 (2 wires)**
15	**Ni1000 (3 wires)**
16(1)	**Ni1000 (4 wires)**
17	**PT100 (2 wires)**
18	**PT100 (3 wires)**
19(1)	**PT100 (4 wires)**
20	**JPt100 (2 wires)**
21	**JPt100 (3 wires)**
22(1)	**JPt100 (4 wires)**
23	**PT1000 (2 wires)**
24	**PT1000 (3 wires)**
25(1)	**PT1000 (4 wires)**
26	**JPt1000 (2 wires)**
27	**JPt1000 (3 wires)**
28(1)	**JPt1000 (4 wires)**
29	**Cu10 (2 wires)**
30	**Cu10 (3 wires)**
31(1)	**Cu10 (4 wires)**
32	**Cu50 (2 wires)**
33	**Cu50 (3 wires)**
34(1)	**Cu50 (4 wires)**
35	**Cu100 (2 wires)**
36	**Cu100 (3 wires)**
37(1)	**Cu100 (4 wires)**
(1) The enumeration value is only valid for NTSART0214/NTSART0214H/NTSART0404XH/NTSART0603 modules.	

Voltage Sensor Range Mode

The following table enumerates the voltage sensor range mode parameter values for the modules:

- NTSART0214/NTSART0214H
- NTSART0404XH

Enumeration Value	Value Meaning
38	**+/-40 mV**
39	**+/-80 mV**
40	**+/-160 mV**
41	**+/-320 mV**
42	**+/-640 mV**
43	**+/-1.28 V**

Resistance Sensor Range Mode

The following table enumerates the resistance sensor range mode parameter values for the modules:

- NTSART0214/NTSART0214H
- NTSART0404
- NTSART0404XH
- NTSART0603

Enumeration Value	Value Meaning
44	**0..150 Ohm (2 wires)**
45	**0..150 Ohm (3 wires)**
46(1)	**0..150 Ohm (4 wires)**
47	**0..300 Ohm (2 wires)**
48	**0..300 Ohm (3 wires)**
49(1)	**0..300 Ohm (4 wires)**
50	**0..600 Ohm (2 wires)**
51	**0..600 Ohm (3 wires)**
52(1)	**0..600 Ohm (4 wires)**
53	**0..2000 Ohm (2 wires)**
54	**0..2000 Ohm (3 wires)**
55(1)	**0..2000 Ohm (4 wires)**
56	**0..4500 Ohm (2 wires)**
57	**0..4500 Ohm (3 wires)**
58(1)	**0..4500 Ohm (4 wires)**
(1) The enumeration value is only valid for NTSART0214/NTSART0214H/NTSART0404XH/NTSART0603 modules.	

Resistance Sensor Range Mode

The following table enumerates the resistance sensor range mode parameter values for the module NTSART0603:

Enumeration Value	Value Meaning
59	**0..32000 Ohm (2 wires)**
60	**0..32000 Ohm (3 wires)**

Thermistor Sensor Range Mode

The following table enumerates the thermistor sensor range mode parameter values for the module NTSART0603:

Enumeration Value	Value Meaning
61	**PTC 100..10000 Ohm (2 wires)**
62	**NTC 100..200000 Ohm (2 wires)**

Scaling Range Parameters

What's in This Chapter

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.

For the temperature input modules, you can set:

Temperature unit display: The values are displayed in tenth of degree.

- Tenth of degree Celsius if the configured unit is °C

- Tenth of degree Fahrenheit if the configured unit is °F:
T[°F] = 1.8 x T[°C] + 32.

- Tenth of Kelvin if the configured unit is K:
T[K] = T[°C] + 273.15.

User display: You can choose a user display 0...10 000 (0 to 10 000 $^{0}/_{000}$) by setting the minimal and maximal temperatures corresponding to 0 and to 10 000.

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**.

NOTE: If RTD high Resolution Mode is enabled, the code display for RTD type is 1/100; otherwise it is 1/10.

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 Configurable range	Nominal Area [Range Minimum, Range Maximum]		Default Overflow Threshold Configurable range
		Default Range Minimum Value	Default Range Maximum Value	
± 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/NTSAMI0420/NTSAMI0800/NTSAMM0600 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

NTSAHI0412XH 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	
4...20 mA	-800 -4,000...0	0	10,000	10,500 10,000...11,250
	2.72 mA -2.4...4 mA	4 mA	20 mA	20.8 mA 20...22 mA

Temperature Input Modules Scaling Range

NTSART••• TC Ranges

The following table presents the thermocouple scaling ranges for the modules:

- NTSART0214/NTSART0214H
- NTSART0404
- NTSART0404XH

Range	Standard	Unit	Default Underflow Threshold	Nominal Area [Range Minimum, Range Maximum]		Default Overflow Threshold
				Default Range Minimum Value	Default Range Maximum Value	
Type J	IEC584.1	°C	-2,070	-1,750	11,650	11,970
		°F	-3,410	-2,840	21,300	21,870
		K	660	990	14,380	14,700
Type K	IEC584.1	°C	-2,680	-2,310	13,310	13,680
		°F	-4,500	-3,830	24,270	24,940
		K	50	430	16,040	16,410
Type E	IEC584.1	°C	-2,690	-2,400	9,700	9,990
		°F	-4,510	-3,990	17,770	18,290
		K	40	340	12,430	12,720
Type T	IEC584.1	°C	-2,690	-2,540	3,840	3,990
		°F	-4,520	-4,250	7,230	7,500
		K	40	200	6,570	6,720
Type S	IEC584.1	°C	-500	-90	17,270	17,680
		°F	-540	160	29,550	30,250
		K	2,230	2,650	20,000	20,410
Type R	IEC584.1	°C	-500	-90	17,270	17,680
		°F	-540	160	29,550	30,250
		K	2,230	2,650	20,000	20,410
Type B	IEC584.1	°C	1,320	1,710	17,790	18,170
		°F	2,700	3,390	32,000	32,000
		K	4,060	4,450	20,520	20,900
Type N	IEC584.1	°C	-2,670	-2,320	12,620	12,970
		°F	-4,500	-3,860	23,040	23,680
		K	60	420	15,350	15,700
Type U	DIN43710:1985	°C	-1,990	-1,810	5,810	5,990
		°F	-3,250	-2,930	10,770	11,090
		K	740	930	8,540	8,720
Type L	DIN43710:1985	°C	-1,990	-1,740	8,740	8,990
		°F	-3,250	-2,800	16,040	16,490
		K	740	1,000	11,470	11,720
Type C	IEC584.1	°C	30	260	22,480	22,700
		°F	470	790	32,000	32,000
		K	2,770	3,000	25,210	25,430

NTSART••• Standard RTD Ranges

The RTD high resolution mode is disabled, the code display for RTD type is set to 1/10 of the selected temperature unit.

The following table presents the standard resistance temperature detector ranges for the modules:

- NTSART0214/NTSART0214H
- NTSART0404
- NTSART0404XH
- NTSART0603

Range	Standard	Unit	Default Underflow Threshold	Nominal Area [Range Minimum, Range Maximum]		Default Overflow Threshold
				Default Range Minimum Value	Default Range Maximum Value	
Pt100 (2/3/4 wires)	IEC 751	°C	-1,990	-1,750	8,250	8,490
		°F	-3,260	-2,830	15,170	15,600
		K	750	990	10,980	11,210
Pt1000(2/3/4 wires)	IEC 751	°C	-1,990	-1,750	8,250	8,490
		°F	-3,260	-2,830	15,170	15,600
		K	750	990	10,980	11,210
Ni100 (2/3/4 wires)	DIN43760:1987	°C	-590	-540	2,420	2,490
		°F	-750	-660	4,680	4,800
		K	2,120	2,200	5,150	5,220
Ni1000 (2/3/4 wires)	DIN43760:1987	°C	-590	-540	2,420	2,490
		°F	-750	-660	-4,680	-4,810
		K	2,120	2,200	5,150	5,220
JPt100 (2/3/4 wires)	JIS C1604:1997	°C	-1,990	-1,750	8,250	8,490
		°F	-3,260	-2,830	15,170	15,600
		K	750	990	10,980	11,210
JPt1000 (2/3/4 wires)	JIS C1604:1997	°C	-1,990	-1,750	8,250	8,490
		°F	-3,260	-2,830	15,170	15,600
		K	750	990	10,980	11,210
Cu10 (2/3/4 wires)	Copper	°C	-990	-910	2,510	2,590
		°F	-1,460	-1,320	4,840	4,980
		K	1,740	1,830	5,240	5,320
Cu50 (2/3/4 wires)	GOST6651:94	°C	-2,000	-1,910	1,910	2,000
		°F	-3,280	-3,120	3,760	3,920
		K	730	830	4,640	4,730
Cu100(2/3/4 wires)	GOST6651:94	°C	-2,000	-1,910	1,910	2,000
		°F	-3,280	-3,120	3,760	3,920
		K	730	830	4,640	4,730

NTSART••• High Resolution Mode RTD Ranges

The RTD high resolution mode is enabled, the code display for RTD type is set to 1/100 of the selected temperature unit.

The following table presents the high resolution mode resistance temperature detector ranges for the modules:

- NTSART0214/NTSART0214H
- NTSART0404
- NTSART0404XH
- NTSART0603

Range	Unit	Default Underflow Threshold	Nominal Area [Range Minimum, Range Maximum]		Default Overflow Threshold
			Default Range Minimum Value	Default Range Maximum Value	
Ni100/Ni1000 (2/3/4 wires)	°C	-5,900	-3,340	22,340	24,900
	°F	-6,300	-2,820	32,000	32,000
	K	23,170	23,980	32,000	32,000
Pt100/Pt1000/JPt100/ JPt1000 (2/3/4 wires)	°C	-14,500	-12,000	13,000	15,500
	°F	-22,900	-18,400	26,600	31,100
	K	13,650	15,320	32,000	32,000
Cu10 (2/3/4 wires)	°C	-9,900	-6,920	22,920	25,900
	°F	-13,380	-9,260	32,000	32,000
	K	19,240	20,400	32,000	32,000
Cu50/Cu100 (2/3/4 wires)	°C	-20,000	-16,670	16,670	20,000
	°F	-32,000	-26,800	32,000	32,000
	K	8,510	10,650	32,000	32,000

NTSART••• Voltage Ranges

The following table presents the voltage ranges for the modules:

- NTSART0214/NTSART0214H
- NTSART0404
- NTSART0404XH

Range		Default Underflow Threshold	Nominal Area [Range Minimum, Range Maximum]		Default Overflow Threshold
			Default Range Minimum Value	Default Range Maximum Value	
+/- 40 mV	default	-4,192	-4,000	4,000	4,192
	maximum	-32,000	-32,000	32,000	32,000
+/- 80 mV	default	-8,384	-8,000	8,000	8,384
	maximum	-32,000	-32,000	32,000	32,000
+/- 160 mV	default	-16,768	-16,000	16,000	16,768
	maximum	-32,000	-32,000	32,000	32,000
+/- 320 mV	default	-32,000	-32,000	32,000	32,000
	maximum	-32,000	-32,000	32,000	32,000
+/- 640 mV	default	-6,707	-6,400	6,400	6,707
	maximum	-32,000	-32,000	32,000	32,000
+/- 1280 mV	default	-13,414	-12,800	12,800	13,414
	maximum	-32,000	-32,000	32,000	32,000

NTSART••• Resistance Ranges

The following table presents the resistance ranges for the modules:

- NTSART0214/NTSART0214H
- NTSART0404
- NTSART0404XH
- NTSART0603

Range		Default Underflow Threshold	Nominal Area [Range Minimum, Range Maximum]		Default Overflow Threshold
			Default Range Minimum Value	Default Range Maximum Value	
0...150 Ohms (2/3/4 wires)	default	0	0	15,000	15,360
	maximum	0	0	32,000	32,000
0...300 Ohms (2/3/4 wires)	default	0	0	30,000	30,720
	maximum	0	0	32,000	32,000
0...600 Ohms (2/3/4 wires)	default	0	0	6,000	6,144
	maximum	0	0	32,000	32,000
0...2,000 Ohms (2/3/4 wires)	default	0	0	20,000	20,480
	maximum	0	0	32,000	32,000
0...4,500 Ohms (2/3/4 wires)	default	0	0	4,500	4,590
	maximum	0	0	32,000	32,000
0...32,000 Ohms (2/3 wires)	default	0	0	32,000	32,000
	maximum	0	0	32,000	32,000
PTC 100...10k Ohms (2 wires)	default	0	100	10,000	10,237
	maximum	0	0	32,000	32,000
NTC(1) 100...200k Ohms (2 wires)	default	0	100	20,000	20,477
	maximum	0	0	32,000	32,000

(1) NTC is only valid for NTSART0603 module.

Output Modules Scaling Range

NTSAMO0210/NTSAMO0210H/NTSAMM0600 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 -11,250, -10,000	-10,000	10,000	11,000 10,000, 11,250
	-11 V -11.25 V, -10 V	-10 V	+10 V	+11 V +10 V, +11.25 V
0...10 Vdc	-1,000 -2,000, 0	0	10,000	11,000 10,000, 11,250
	-1 V -2 V, 0 V	0 V	+10 V	+11 V +10 V, +11.25 V
± 5 Vdc	-11,000 -11,250, -10,000	-10,000	10,000	11,000 10,000, 11,250
	-5.5 V -5.625 V, -5 V	-5 V	+5 V	+5.5 V +5 V, +5.625 V
0...5 Vdc	-1,000 -2,000, 0	0	10,000	11,000 10,000, 11,250
	-0.5 V -1 V, 0 V	0 V	+5 V	+5.5 V +5 V, +5.625 V
1...5 Vdc	-800 -1,600, 0	0	10,000	11,000 10,000, 11,250
	0.68 V 0.36 V, 1 V	1 V	+5 V	+5.4 V +5 V, +5.5 V
± 20 mA	-10,800 -11,600, -10,000	-10,000	10,000	10,800 10,000, 11,600
	-21.6mA -23.2 mA, -20 mA	-20 mA	20 mA	21.6 mA 20 mA, 23.2 mA
0...20 mA	-1,000 -2,000, 0	0	10,000	10,800 10,000, 11,600
	-2 m A -4 mA, 0 mA	0 mA	20 mA	21.6 mA 20 mA, 23.2 mA
4...20 mA	-800 -1,600, 0	0	10,000	10,800 10,000, 11,600
	2.72 mA 1.44 mA, 4 mA	4 mA	20 mA	21.28 mA 20 mA, 22.56 mA

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

NTSAHO0212H 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	
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

Thermocouple Accuracy Characteristics

The following table presents the temperature for which thermocouple accuracy is specified:

Thermocouple range	Temperature
Type T	-150 °C (-238 °F)
Type K	
Type N	
Type E	
Type J	
Type L	
Type U	
Type R	200 °C (392 °F)
Type S	100 °C (212 °F)
Type B	700 °C (1292 °F)
Type C	500 °C (932 °F)

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.

CJC: (*Cold Junction Compensation*) A process whereby a voltage is added (or subtracted) from the output voltage of the thermocouple so that the reference junction appears to be at 0 °C even if it is not. This process provides the proper temperature for the TC sensors.

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).

D

derating:

A reduction in an operating specification. For devices in general, it is usually a specified reduction in nominal power to allow operation at increased ambient conditions like higher temperatures or higher altitudes.

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

Readback: Readback is the re-reading of the physical output. The readback error is therefore a different reading of the command.

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

TC: (*ThermoCouple*) A device for measuring temperature in which a pair of wires of dissimilar metals (such as copper and iron) are joined and the free ends of the wires are connected to an instrument (such as a voltmeter) that measures the difference in potential created at the junction of the two metals.

terminal block:

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

Index

A

M

T

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