NX-series Temperature Input Unit

NX-TS

CSM_NX-TS_DS_E_3_1

Temperature Input Units for Standard and High-speed, High-precision Temperature measurement and control

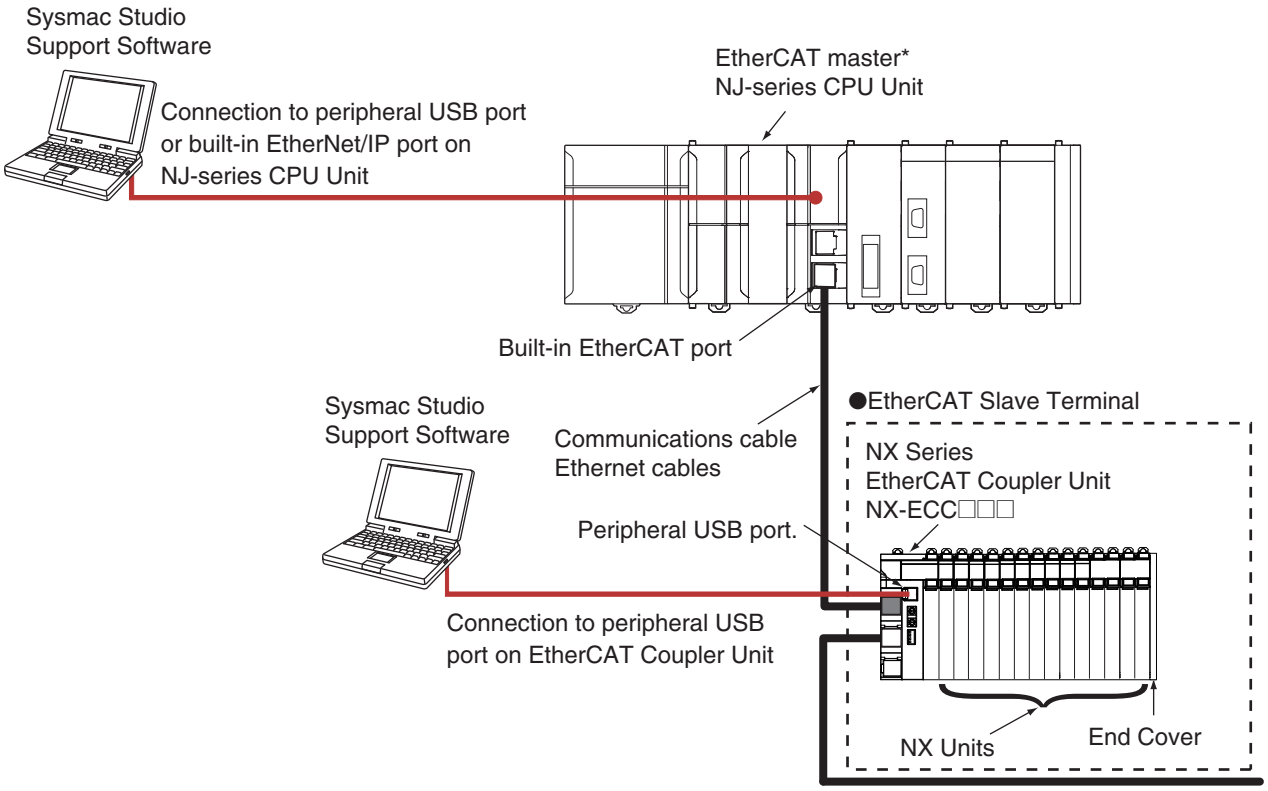
- Temperature Input Units for the NX-series modular I/O system.
- Connect to other NX-series I/O Units and EtherCAT Coupler units using the high-speed NX-bus.
- Thermocouple and platinum resistance thermometer input models are available.

NX-TS2101 **NX-TS3101** **NX-TS2201** **NX-TS3201**

Features

- Input up to four temperature sensor signals with one Unit.
- Three sampling speeds, 250 ms, 60 ms, and 10 ms, are available to cover a wide range from general-purpose application to high-speed, high-precision control.
- Moving average, input sensor disconnection detection function, cold junction compensation enable/disable selection function, and input compensation.
- The screwless terminal block is detachable for easy commissioning and maintenance.
- Screwless push-in terminal block significantly reduces wiring work.

System Configuration



* OMRON CJ1W-NC□81/□82 Position Control Units cannot be connected to the EtherCAT Slave Terminal even though they support EtherCAT.

Ordering Information

International Standards

- The standards are abbreviated as follows: U: UL, U1: UL (Class I Division 2 Products for Hazardous Locations), C: CSA, UC: cULus, UC1: cULus (Class I Division 2 Products for Hazardous Locations), CU: cUL, N: NK, L: Lloyd, CE: EC Directives,and KC: KC Registration.
- Contact your OMRON representative for further details and applicable conditions for these standards.

Temperature Input Unit

Unit type	Product Name	Specification							NX Unit power consumption	Model	Standards
		Capacity	Input type	Resolution (25°C)	Over all accuracy (25°C)	Conversion time	I/O refreshing method	Terminals			
NX Series Temperature Input Unit	Thermocouple Input type 	2 points	Thermocouple	0.1°C max. *1	Refer to Reference accuracy and temperature coefficient according to the input type and measurement temperature	250 ms/ Unit	Free-Run refreshing	16 Terminals	0.90W max.	**NX-TS2101**	UC1, N, L, CE, KC
		4 points						16 Terminals x 2	1.30W max.	**NX-TS3101**	
		2 points		0.01°C max.		10 ms/Unit		16 Terminals	0.80W max.	**NX-TS2102**	
		4 points						16 Terminals x 2	1.10W max.	**NX-TS3102**	
		2 points		0.001°C max.		60 ms/Unit		16 Terminals	0.80W max.	**NX-TS2104**	
		4 points						16 Terminals x 2	1.10W max.	**NX-TS3104**	
	Resistance Thermometer Input type 	2 points	Resistance Thermometer (Pt100/ Pt1000, three-wire) *2	0.1°C max.		250 ms/ Unit		16 Terminals	0.90W max.	**NX-TS2201**	
		4 points						16 Terminals x 2	1.30W max.	**NX-TS3201**	
		2 points		0.01°C max.		10 ms/Unit		16 Terminals	0.75W max.	**NX-TS2202**	
		4 points						16 Terminals x 2	1.05W max.	**NX-TS3202**	
		2 points		0.001°C max.		60 ms/Unit		16 Terminals	0.75W max.	**NX-TS2204**	
		4 points						16 Terminals x 2	1.05W max.	**NX-TS3204**	

*1. The resolution is 0.2°C max. when the input type is R, S, or W.
*2. The NX-TS2202 and NX-TS3202 only supports Pt100 three-wire sensor.

Option

Product Name	Specification	Model	Standards
Unit/Terminal Block Coding Pins	For 10 Units (Terminal Block: 30 pins, Unit: 30 pins)	**NX-AUX02**	---

Product Name	Specification				Model	Standards
	No. of terminals	Terminal number indications	Ground terminal mark	Terminal current capacity		
Terminal Block	16	A/B	None	10 A	**NX-TBA162**	---
		C/D			**NX-TBB162**	

Accessories

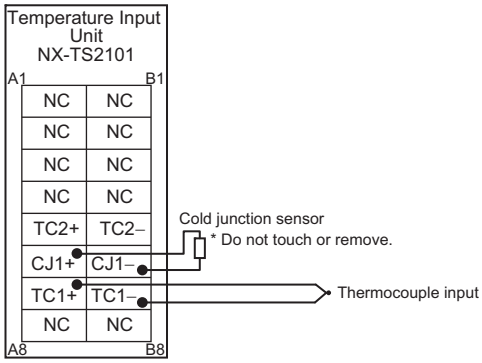
Not included.

General Specification

Item		Specification
Enclosure		Mounted in a panel
Grounding method		Ground to 100 Ω or less
Operating environment	Ambient operating temperature	0 to 55°C
	Ambient operating humidity	10% to 95% (with no condensation or icing)
	Atmosphere	Must be free from corrosive gases.
	Ambient storage temperature	−25 to 70°C (with no condensation or icing)
	Altitude	2,000 m max.
	Pollution degree	2 or less: Conforms to JIS B3502 and IEC 61131-2.
	Noise immunity	2 kV on power supply line (Conforms to IEC61000-4-4.)
	Overvoltage category	Category II: Conforms to JIS B3502 and IEC 61131-2.
	EMC immunity level	Zone B
	Vibration resistance	Conforms to IEC 60068-2-6. 5 to 8.4 Hz with 3.5-mm amplitude, 8.4 to 150 Hz, acceleration of 9.8 m/s^2, 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)
	Shock resistance	Conforms to IEC 60068-2-27. 147 m/s^2, 3 times each in X, Y, and Z directions
Applicable standards		cULus: Listed UL508 and ANSI/ISA 12.12.01 EC: EN 61131-2 and C-Tick, KC Registration, NK, LR

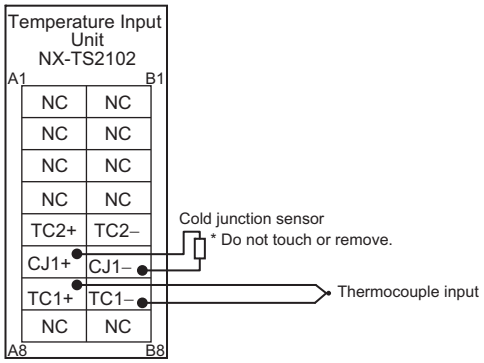
Temperature Input Unit Specifications

Temperature Input Unit (Thermocouple Input type) 2 points NX-TS2101

Unit name	Temperature Input Unit (thermocouple input type)	**Model**	NX-TS2101
Number of points	2 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Free-Run refreshing		
Indicators	TS indicator 	**Temperature sensor**	K, J, T, E, L, U, N, R, S, B, WRe5-26, PLII
		Input conversion range	±20°C of the input range
		Absolute maximum rating	±130 mV
		Input impedance	20 kΩ min.
		Resolution	0.1°C max. *1
		Reference accuracy	*2
		Temperature coefficient	*2
		Cold junction compensation error	±1.2°C *3 *4
		Input disconnection detection current	Approx. 0.1 μA
Warm-up period	30 minutes	**Conversion time**	250 ms/Unit
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Photocoupler Between inputs: Power = Transformer, Signal = Photocoupler
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.90 W max.	**Current consumption from I/O power supply**	No consumption
Weight	70 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: The cold junction compensation error is restricted according to the installation orientation and the power consumption of adjacent Units. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type*.		
Terminal connection diagram			

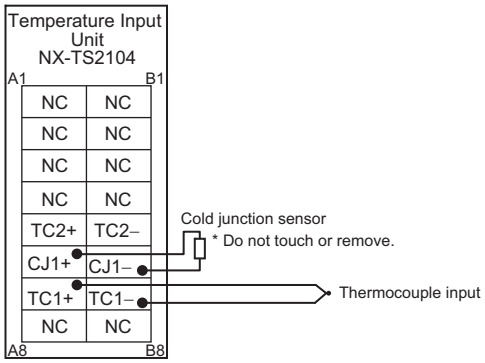
*1. The resolution is 0.2°C max. when the input type is R, S, or W.
*2. Refer to *Reference Accuracy and Temperature Coefficient According to the Input Type and Measurement Temperature*.
*3. The overall accuracy is guaranteed for a set consisting of a cold junction sensor that is mounted on the terminal block and a Temperature Input Unit. Be sure to use the terminal block and the Temperature Input Unit together. A calibration control number is both displayed on the terminal block and the Unit. Make sure to return the terminal block (including a cold junction sensor mounted) and the Unit together for repair.
*4. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type* for the specifications for each set of operating conditions.

Temperature Input Unit (Thermocouple Input type) 2 points NX-TS2102

Unit name	Temperature Input Unit (thermocouple input type)	**Model**	NX-TS2102
Number of points	2 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Free-Run refreshing		
Indicators	TS indicator 	**Temperature sensor**	K, J, T, E, L, U, N, R, S, WRe5-26, PLII
		Input conversion range	±20°C of the input range
		Absolute maximum rating	±130 mV
		Input impedance	20 kΩ min.
		Resolution	0.01°C max.
		Reference accuracy	*1
		Temperature coefficient	*1
		Cold junction compensation error	±1.2°C *2 *3
		Input disconnection detection current	Approx. 0.1 μA
Warm-up period	45 minutes	**Conversion time**	10 ms/Unit
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Digital isolator Between inputs: Power = Transformer, Signal = Digital isolator
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.80 W max.	**Current consumption from I/O power supply**	No consumption
Weight	70 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: The cold junction compensation error is restricted according to the installation orientation and the power consumption of adjacent Units. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type*.		
Terminal connection diagram			

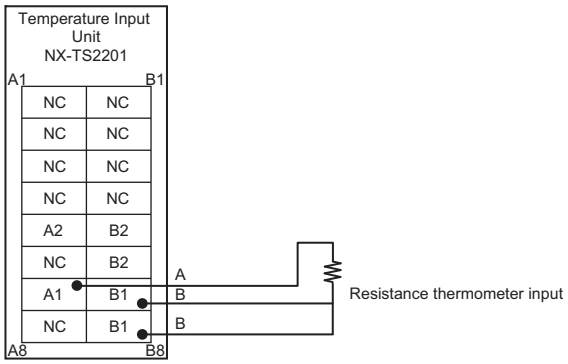
*1. Refer to *Reference Accuracy and Temperature Coefficient According to the Input Type and Measurement Temperature*.
*2. The overall accuracy is guaranteed for a set consisting of a cold junction sensor that is mounted on the terminal block and a Temperature Input Unit. Be sure to use the terminal block and the Temperature Input Unit together. A calibration control number is both displayed on the terminal block and the Unit. Make sure to return the terminal block (including a cold junction sensor mounted) and the Unit together for repair.
*3. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type* for the specifications for each set of operating conditions.

Temperature Input Unit (Thermocouple Input type) 2 points NX-TS2104

Unit name	Temperature Input Unit (thermocouple input type)	**Model**	NX-TS2104
Number of points	2 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Free-Run refreshing		
Indicators	TS indicator 	**Temperature sensor**	K, J, T, E, L, U, N, R, S, WRe5-26, PLII
		Input conversion range	±20°C of the input range
		Absolute maximum rating	±130 mV
		Input impedance	20 kΩ min.
		Resolution	0.001°C max.
		Reference accuracy	*1
		Temperature coefficient	*1
		Cold junction compensation error	±1.2°C *2 *3
		Input disconnection detection current	Approx. 0.1 μA
Warm-up period	45 minutes	**Conversion time**	60 ms/Unit
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Digital isolator Between inputs: Power = Transformer, Signal = Digital isolator
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.80 W max.	**Current consumption from I/O power supply**	No consumption
Weight	70 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: The cold junction compensation error is restricted according to the installation orientation and the power consumption of adjacent Units. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type*.		
Terminal connection diagram			

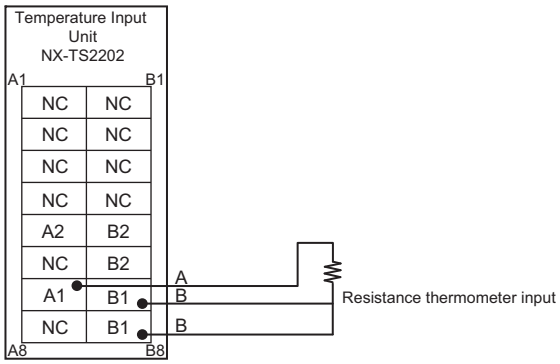
*1. Refer to *Reference Accuracy and Temperature Coefficient According to the Input Type and Measurement Temperature*.
*2. The overall accuracy is guaranteed for a set consisting of a cold junction sensor that is mounted on the terminal block and a Temperature Input Unit. Be sure to use the terminal block and the Temperature Input Unit together. A calibration control number is both displayed on the terminal block and the Unit. Make sure to return the terminal block (including a cold junction sensor mounted) and the Unit together for repair.
*3. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type* for the specifications for each set of operating conditions.

Temperature Input Unit (Resistance Thermometer Input type) 2 points NX-TS2201

Unit name	Temperature Input Unit (resistance thermometer input type)	**Model**	NX-TS2201
Capacity	2 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Free-Run refreshing		
Indicator	TS indicator 	**Temperature sensor**	Pt100 (three-wire)/Pt1000 (three-wire)
		Input conversion range	±20°C of the input range
		Input detection current	Approx. 0.25 mA
		Resolution	0.1°C max.
		Reference accuracy	*
		Temperature coefficient	*
		Effect of conductor resistance	0.06°C/Ω max. (also 20 Ω max.)
Warm-up period	10 minutes	**Conversion time**	250 ms/Unit
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Photocoupler Between inputs: Power = Transformer, Signal = Photocoupler
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.90 W max.	**Current consumption from I/O power supply**	No consumption
Weight	70 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			

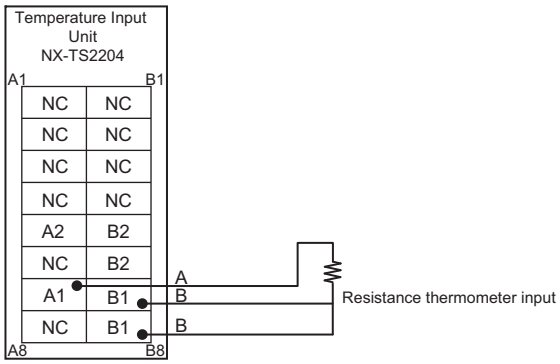
* Refer to Reference accuracy and temperature coefficient according to the input type and measurement temperature.

Temperature Input Unit (Resistance Thermometer Input type) 2 points NX-TS2202

Unit name	Temperature Input Unit (resistance thermometer input type)	**Model**	NX-TS2202
Capacity	2 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Free-Run refreshing		
Indicator	TS indicator 	**Temperature sensor**	Pt100 (three-wire)
		Input conversion range	±20°C of the input range
		Input detection current	Approx. 0.25 mA
		Resolution	0.01°C max.
		Reference accuracy	*
		Temperature coefficient	*
		Effect of conductor resistance	0.06°C/Ω max. (also 20 Ω max.)
Warm-up period	30 minutes	**Conversion time**	10 ms/Unit
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Digital isolator Between inputs: Power = Transformer, Signal = Digital isolator
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.75 W max.	**Current consumption from I/O power supply**	No consumption
Weight	70 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			

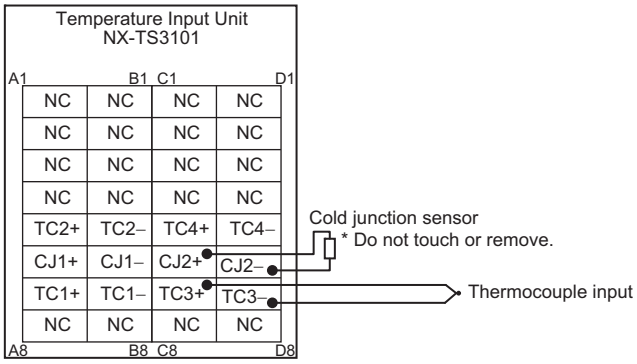
* Refer to Reference accuracy and temperature coefficient according to the input type and measurement temperature.

Temperature Input Unit (Resistance Thermometer Input type) 2 points NX-TS2204

Unit name	Temperature Input Unit (resistance thermometer input type)	**Model**	NX-TS2204
Capacity	2 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Free-Run refreshing		
Indicator	TS indicator 	**Temperature sensor**	Pt100 (three-wire)/Pt1000 (three-wire)
		Input conversion range	±20°C of the input range
		Input detection current	Approx. 0.25 mA
		Resolution	0.001°C max.
		Reference accuracy	*
		Temperature coefficient	*
		Effect of conductor resistance	0.06°C/Ω max. (also 20 Ω max.)
Warm-up period	30 minutes	**Conversion time**	60 ms/Unit
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Digital isolator Between inputs: Power = Transformer, Signal = Digital isolator
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.75 W max.	**Current consumption from I/O power supply**	No consumption
Weight	70 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			

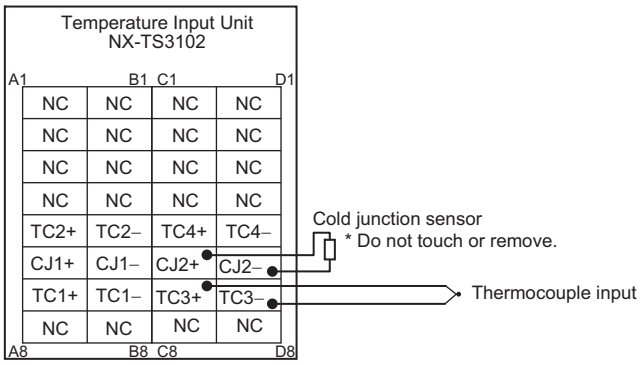
* Refer to Reference accuracy and temperature coefficient according to the input type and measurement temperature.

Temperature Input Unit (Thermocouple Input type) 4 points NX-TS3101

Unit name	Temperature Input Unit (thermocouple input type)	**Model**	NX-TS3101
Number of points	4 points	**External connection terminals**	Screwless clamping terminal block (16 terminals x 2)
I/O refreshing method	Free-Run refreshing		
Indicators	TS indicator 	**Temperature sensor**	K, J, T, E, L, U, N, R, S, B, WRe5-26, PLII
		Input conversion range	±20°C of the input range
		Absolute maximum rating	±130 mV
		Input impedance	20 kΩ min.
		Resolution	0.1°C max. *1
		Reference accuracy	*2
		Temperature coefficient	*2
		Cold junction compensation error	±1.2°C *3 *4
		Input disconnection detection current	Approx. 0.1μA
Warm-up period	30 minutes	**Conversion time**	250 ms/Unit
Dimensions	24 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Photocoupler Between inputs: Power = Transformer, Signal = Photocoupler
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	1.30 W max.	**Current consumption from I/O power supply**	No consumption
Weight	140 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: The cold junction compensation error is restricted according to the installation orientation and the power consumption of adjacent Units. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type*.		
Terminal connection diagram			

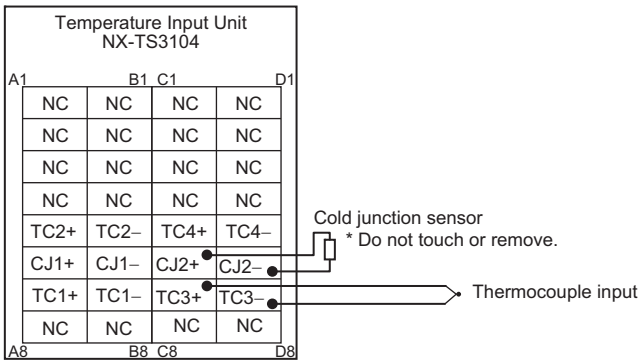
*1. The resolution is 0.2°C max. when the input type is R, S, or W.
*2. Refer to *Reference Accuracy and Temperature Coefficient According to the Input Type and Measurement Temperature*.
*3. The overall accuracy is guaranteed for a set consisting of a cold junction sensor that is mounted on the terminal block and a Temperature Input Unit. Be sure to use the terminal block and the Temperature Input Unit together. A calibration control number is both displayed on the terminal block and the Unit. Make sure to return the terminal block (including a cold junction sensor mounted) and the Unit together for repair.
*4. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type* for the specifications for each set of operating conditions.

Temperature Input Unit (Thermocouple Input type) 4 points NX-TS3102

Unit name	Temperature Input Unit (thermocouple input type)	**Model**	NX-TS3102
Number of points	4 points	**External connection terminals**	Screwless clamping terminal block (16 terminals x 2)
I/O refreshing method	Free-Run refreshing		
Indicators	TS indicator 	**Temperature sensor**	K, J, T, E, L, U, N, R, S, WRe5-26, PLII
		Input conversion range	±20°C of the input range
		Absolute maximum rating	±130 mV
		Input impedance	20 kΩ min.
		Resolution	0.01°C max.
		Reference accuracy	*1
		Temperature coefficient	*1
		Cold junction compensation error	±1.2°C *2 *3
		Input disconnection detection current	Approx. 0.1 μA
Warm-up period	45 minutes	**Conversion time**	10 ms/Unit
Dimensions	24 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Digital isolator Between inputs: Power = Transformer, Signal = Digital isolator
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	1.10 W max.	**Current consumption from I/O power supply**	No consumption
Weight	140 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: The cold junction compensation error is restricted according to the installation orientation and the power consumption of adjacent Units. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type*.		
Terminal connection diagram			

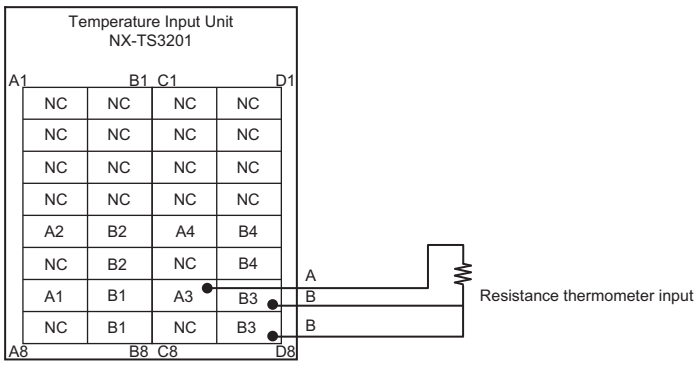
*1. Refer to *Reference Accuracy and Temperature Coefficient According to the Input Type and Measurement Temperature*.
*2. The overall accuracy is guaranteed for a set consisting of a cold junction sensor that is mounted on the terminal block and a Temperature Input Unit. Be sure to use the terminal block and the Temperature Input Unit together. A calibration control number is both displayed on the terminal block and the Unit. Make sure to return the terminal block (including a cold junction sensor mounted) and the Unit together for repair.
*3. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type* for the specifications for each set of operating conditions.

Temperature Input Unit (Thermocouple Input type) 4 points NX-TS3104

Unit name	Temperature Input Unit (thermocouple input type)	**Model**	NX-TS3104
Number of points	4 points	**External connection terminals**	Screwless clamping terminal block (16 terminals x 2)
I/O refreshing method	Free-Run refreshing		
Indicators	TS indicator 	**Temperature sensor**	K, J, T, E, L, U, N, R, S, WRe5-26, PLII
		Input conversion range	±20°C of the input range
		Absolute maximum rating	±130 mV
		Input impedance	20 kΩ min.
		Resolution	0.001°C max.
		Reference accuracy	*1
		Temperature coefficient	*1
		Cold junction compensation error	±1.2°C *2 *3
		Input disconnection detection current	Approx. 0.1 μA
Warm-up period	45 minutes	**Conversion time**	60 ms/Unit
Dimensions	24 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Digital isolator Between inputs: Power = Transformer, Signal = Digital isolator
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	1.10 W max.	**Current consumption from I/O power supply**	No consumption
Weight	140 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: The cold junction compensation error is restricted according to the installation orientation and the power consumption of adjacent Units. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type*.		
Terminal connection diagram			

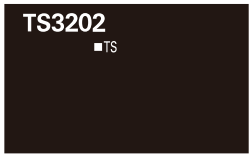
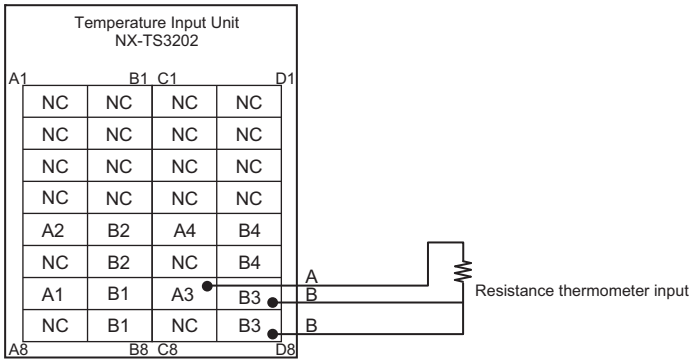
*1. Refer to *Reference Accuracy and Temperature Coefficient According to the Input Type and Measurement Temperature*.
*2. The overall accuracy is guaranteed for a set consisting of a cold junction sensor that is mounted on the terminal block and a Temperature Input Unit. Be sure to use the terminal block and the Temperature Input Unit together. A calibration control number is both displayed on the terminal block and the Unit. Make sure to return the terminal block (including a cold junction sensor mounted) and the Unit together for repair.
*3. Refer to *Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type* for the specifications for each set of operating conditions.

Temperature Input Unit (Resistance Thermometer Input type) 4 points NX-TS3201

Unit name	Temperature Input Unit (resistance thermometer input type)	**Model**	NX-TS3201
Capacity	4 points	**External connection terminals**	Screwless clamping terminal block (16 Terminals x 2)
I/O refreshing method	Free-Run refreshing		
Indicator	TS indicator 	**Temperature sensor**	Pt100 (three-wire)/Pt1000 (three-wire)
		Input conversion range	±20°C of the input range
		Input detection current	Approx. 0.25 mA
		Resolution	0.1°C max.
		Reference accuracy	*
		Temperature coefficient	*
		Effect of conductor resistance	0.06°C/Ω max. (also 20 Ω max.)
Warm-up period	10 minutes	**Conversion time**	250 ms/Unit
Dimensions	24 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Photocoupler Between inputs: Power = Transformer, Signal = Photocoupler
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	1.30 W max.	**Current consumption from I/O power supply**	No consumption
Weight	140 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			

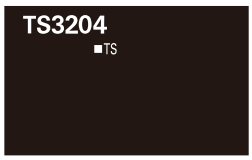
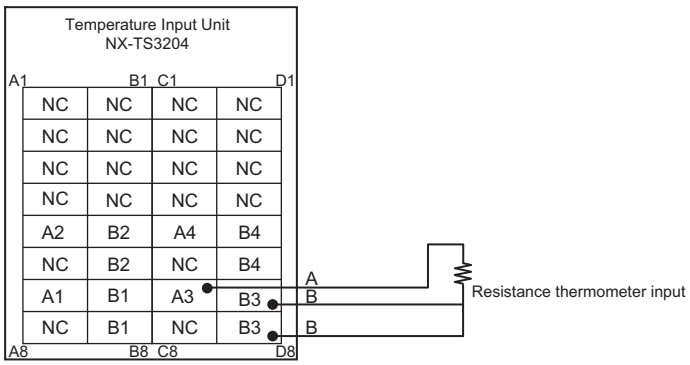
* Refer to Reference accuracy and temperature coefficient according to the input type and measurement temperature.

Temperature Input Unit (Resistance Thermometer Input type) 4 points NX-TS3202

Unit name	Temperature Input Unit (resistance thermometer input type)	**Model**	NX-TS3202
Capacity	4 points	**External connection terminals**	Screwless clamping terminal block (16 terminals x 2)
I/O refreshing method	Free-Run refreshing		
Indicator	TS indicator 	**Temperature sensor**	Pt100 (three-wire)
		Input conversion range	±20°C of the input range
		Input detection current	Approx. 0.25 mA
		Resolution	0.01°C max.
		Reference accuracy	*
		Temperature coefficient	*
		Effect of conductor resistance	0.06°C/Ω max. (also 20 Ω max.)
Warm-up period	30 minutes	**Conversion time**	10 ms/Unit
Dimensions	24 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Digital isolator Between inputs: Power = Transformer, Signal = Digital isolator
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	1.05 W max.	**Current consumption from I/O power supply**	No consumption
Weight	130 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			

* Refer to Reference accuracy and temperature coefficient according to the input type and measurement temperature.

Temperature Input Unit (Resistance Thermometer Input type) 4 points NX-TS3204

Unit name	Temperature Input Unit (resistance thermometer input type)	**Model**	NX-TS3204
Capacity	4 points	**External connection terminals**	Screwless clamping terminal block (16 terminals x 2)
I/O refreshing method	Free-Run refreshing		
Indicator	TS indicator 	**Temperature sensor**	Pt100 (three-wire)/Pt1000 (three-wire)
		Input conversion range	±20°C of the input range
		Input detection current	Approx. 0.25 mA
		Resolution	0.001°C max.
		Reference accuracy	*
		Temperature coefficient	*
		Effect of conductor resistance	0.06°C/Ω max. (also 20 Ω max.)
Warm-up period	30 minutes	**Conversion time**	60 ms/Unit
Dimensions	24 (W) x 100 (H) x 71 (D)	**Isolation method**	Between the input and the NX bus: Power = Transformer, Signal = Digital isolator Between inputs: Power = Transformer, Signal = Digital isolator
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	No supply	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	1.05 W max.	**Current consumption from I/O power supply**	No consumption
Weight	130 g max.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			

* Refer to Reference accuracy and temperature coefficient according to the input type and measurement temperature.

• Reference accuracy and temperature coefficient according to the input type and measurement temperature *1

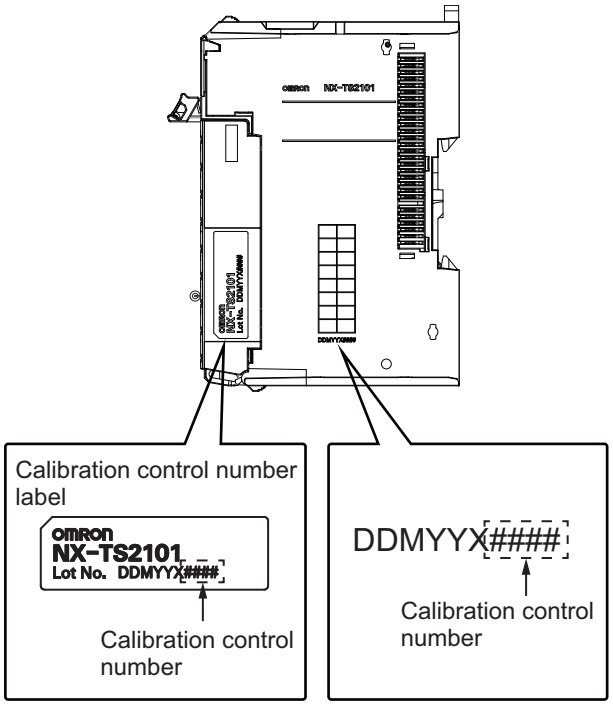
For NX-TS□□02/TS□□04

Conversion time	Input type		Measurement temperature (°C)	Reference accuracy °C (%) *3	Temperature coefficient °C/°C *4 (ppm/°C *5)
	Input type *2	Temperature range (°C)			
10/60ms	K	-200 to 1300	Same as the left	±0.75 (±0.05%)	±0.08 (±50 ppm/°C)
	K	-20 to 600 (High Resolution)	Same as the left	±0.30 (±0.05%)	±0.03 (±48 ppm/°C)
	J	-200 to 1200	-200 to 0	±0.70 (±0.05%)	±0.13 (±96 ppm/°C)
			0 to 1200		±0.06 (±42 ppm/°C)
	J	-20 to 600 (High Resolution)	Same as the left	±0.30 (±0.05%)	±0.04 (±72 ppm/°C)
	T	-200 to 400	-200 to -180	±1.30 (±0.22%)	±0.05 (±75 ppm/°C)
			-180 to 0	±0.70 (±0.12%)	
			0 to 400	±0.33 (±0.055%)	
	E	-200 to 1000	-200 to 0	±0.60 (±0.05%)	±0.12 (±100 ppm/°C)
			0 to 1000		±0.06 (±50 ppm/°C)
	L	-200 to 900	Same as the left	±0.50 (±0.05%)	±0.04 (±40 ppm/°C)
	U	-200 to 600	-200 to -100	±0.70 (±0.09%)	±0.06 (±75 ppm/°C)
			-100 to 0	±0.50 (±0.07%)	
			0 to 600	±0.40 (±0.05%)	
	N	-200 to 1300	-200 to -150	±1.60 (±0.11%)	±0.11 (±70 ppm/°C)
			-150 to -100	±0.75 (±0.05%)	
			-100 to 1300		±0.08 (±50 ppm/°C)
	R	-50 to 1700	-50 to 0	±3.20 (±0.19%)	±0.13 (±77 ppm/°C)
			0 to 100	±2.50 (±0.15%)	±0.11 (±60 ppm/°C)
			100 to 1700	±1.75 (±0.10%)	
	S	-50 to 1700	-50 to 0	±3.20 (±0.19%)	±0.13 (±77 ppm/°C)
			0 to 100	±2.50 (±0.15%)	±0.11 (±60 ppm/°C)
			100 to 1700	±1.75 (±0.10%)	
	WRe5-26	0 to 2300	0 to 1500	±1.15 (±0.05%)	±0.13 (±58 ppm/°C)
			1500 to 2200		±0.21 (±91 ppm/°C)
			2200 to 2300	±1.40 (±0.07%)	
	PL II	0 to 1300	Same as the left	±0.65 (±0.05%)	±0.07 (±57 ppm/°C)
	Pt100	-200 to 850	-200 to -50	±0.50 (±0.05%)	±0.08 (±78 ppm/°C)
			-50 to 150	±0.21 (±0.02%)	±0.03 (±29 ppm/°C)
			150 to 850	±0.50 (±0.05%)	±0.08 (±78 ppm/°C)
	Pt1000	-200 to 850	Same as the left	±0.50 (±0.05%)	±0.09 (±85 ppm/°C)

For NX-TS□□01

Conversion time	Input type		Measurement temperature (°C)	Reference accuracy °C (%) *3	Temperature coefficient °C/°C *4 (ppm/°C *5)
	Input type	Temperature range (°C)			
250 ms	K	-200 to 1300	-200 to -100	±1.5 (±0.1%)	±0.15 (±100 ppm/°C)
			-100 to 400		±0.30 (±200 ppm/°C)
			400 to 1300		±0.38 (±250 ppm/°C)
	J	-200 to 1200	-200 to 400	±1.4 (±0.1%)	±0.14 (±100 ppm/°C)
			400 to 900	±1.2 (±0.09%)	±0.28 (±200 ppm/°C)
			900 to 1200		±0.35 (±250 ppm/°C)
	T	-200 to 400	-200 to -100	±1.2 (±0.2%)	±0.30 (±500 ppm/°C)
			-100 to 400		±0.12 (±200 ppm/°C)
	E	-200 to 1000	-200 to 400	±1.2 (±0.1%)	±0.12 (±100 ppm/°C)
			400 to 700	±2.0 (±0.17%)	±0.24 (±200 ppm/°C)
			700 to 1000		±0.30 (±250 ppm/°C)
	L	-200 to 900	-200 to 300	±1.1 (±0.1%)	±0.11 (±100 ppm/°C)
			300 to 700	±2.2 (±0.2%)	±0.22 (±200 ppm/°C)
			700 to 900		±0.28 (±250 ppm/°C)
	U	-200 to 600	-200 to 400	±1.2 (±0.15%)	±0.12 (±150 ppm/°C)
			400 to 600	±1.0 (±0.13%)	
	N	-200 to 1300	-200 to 400	±1.5 (±0.1%)	±0.30 (±200 ppm/°C)
			400 to 1000		
			1000 to 1300		±0.38 (±250 ppm/°C)
	R	-50 to 1700	-50 to 500	±1.75 (±0.1%)	±0.44 (±250 ppm/°C)
			500 to 1200	±2.5 (±0.15%)	
			1200 to 1700		
	S	-50 to 1700	-50 to 600	±1.75 (±0.1%)	±0.44 (±250 ppm/°C)
			600 to 1100	±2.5 (±0.15%)	
			1100 to 1700		
	B	0 to 1800	0.0 to 400.0	Reference accuracy does not apply	Reference accuracy does not apply
			400 to 1200	±3.6 (±0.2%)	±0.45 (±250 ppm/°C)
			1200 to 1800	±5.0 (±0.28%)	±0.54 (±300 ppm/°C)
	WRe5-26	0 to 2300	0 to 300	±1.15 (±0.05%)	±0.46 (±200 ppm/°C)
			300 to 800	±2.3 (±0.1%)	
			800 to 1500	±3.0 (±0.13%)	
			1500 to 2300		±0.691 (±300 ppm/°C)
	PLII	0 to 1300	0 to 400	±1.3 (±0.1%)	±0.23 (±200 ppm/°C)
			400 to 800	±2.0 (±0.15%)	±0.39 (±300 ppm/°C)
			800 to 1300		±0.65 (±500 ppm/°C)
	Pt100	-200 to 850	-200 to 300	±1.0 (±0.1%)	±0.1 (±100 ppm/°C)
			300 to 700	±2.0 (±0.2%)	±0.2 (±200 ppm/°C)
			700 to 850	±2.5 (±0.25%)	±0.25 (±250 ppm/°C)
	Pt1000	-200 to 850	-200 to 300	±1.0 (±0.1%)	±0.1 (±100 ppm/°C)
			300 to 700	±2.0 (±0.2%)	±0.2 (±200 ppm/°C)
			700 to 850	±2.5 (±0.25%)	±0.25 (±250 ppm/°C)

*1. To convert the temperature unit from Celsius to Fahrenheit, use the following equation.
Fahrenheit temperature (°F) = Celsius temperature (°C) x 1.8 + 32
*2. If there is more than one input range for the same input type, the one with narrower input range has higher resolution.
*3. For a thermocouple input type Temperature Input Unit, the overall accuracy is guaranteed for a set consisting of a cold junction sensor that is mounted on the terminal block and a Temperature Input Unit. Be sure to use the terminal block and Temperature Input Unit with the same calibration control number together. For the 24 mm wide model, also be sure the left and right terminal blocks are correctly attached.



*4. An error for a measured value when the ambient temperature changes by 1°C.
The following formula is used to calculate the error of the measured value.
Overall accuracy = Reference accuracy + Temperature characteristic x Change in the ambient temperature + Cold junction compensation error
(Calculation example)
Conditions

Item	Description
Ambient temperature	30°C
Measured value	100°C
NX Unit	NX-TS2101
Thermocouple	K thermocouple

The characteristic values are formulated from the data sheet or reference accuracy and temperature coefficient table under the above conditions

Item	Description
Reference accuracy	-100 to 400°C: ±1.5°C
Temperature coefficient	-100 to 400°C: ±0.30°C/°C
Change in the ambient temperature	25°C -> 30°C 5 deg
Cold junction compensation error	±1.2°C

Therefore,
Overall accuracy = Reference accuracy + Temperature characteristic x Change in the ambient temperature + Cold junction compensation error
= ±1.5°C + (±0.30°C/°C) x 5 deg + ±1.2°C
= ±4.2°C

*5. The ppm value is for the full scale of temperature range.

• Cold Junction Compensation Error Specifications for Units That Take a Thermocouple Input Type

The cold junction compensation error for Units that take a thermocouple input type is restricted as follows according to the installation orientation and the power consumption of adjacent Units *.

(a) For upright installation, when the power consumption is 1.5 W or less for both the left and right adjacent Units

The cold junction compensation error is ±1.2°C.
However, there are exceptions depending on the input type and temperature. Those conditions and the cold junction compensation error are as in the table below.

Input type and temperature range	Cold junction compensation error
T below -90°C	±3.0°C
J, E, K and N below -100°C	
U, L and PLII	
R and S below 200°C	
B below 400°C	Not guaranteed
W	±3.0°C

(b) When the power consumption of either the left or the right adjacent Unit is more than 1.5 W but less than 3.9 W. Or for any installation other than upright, when the power consumption of both the left and right adjacent Units is less than 3.9 W

The cold junction compensation error is ±4.0°C.
However, there are exceptions depending on the input type and temperature. Those conditions and the cold junction compensation error are as in the table below.

Input type and temperature range	Cold junction compensation error
T below -90°C	±7.0°C
J, E, K and N below -100°C	
U, L and PLII	
R and S below 200°C	
B below 400°C	Not guaranteed
W	±9.0°C

(c) When the power consumption exceeds 3.9 W for either the left or right adjacent Unit

Do not use the above condition (c) because the cold junction compensation error is not guaranteed in this condition.

* The power consumption of adjacent Units is the total of the following values.
The power consumption of the NX Unit power supply and I/O power supply for the NX Units adjacent to the Temperature Input Unit. If the adjacent Unit is an Input Unit, it is the total power consumption according to the input current.

Version Information

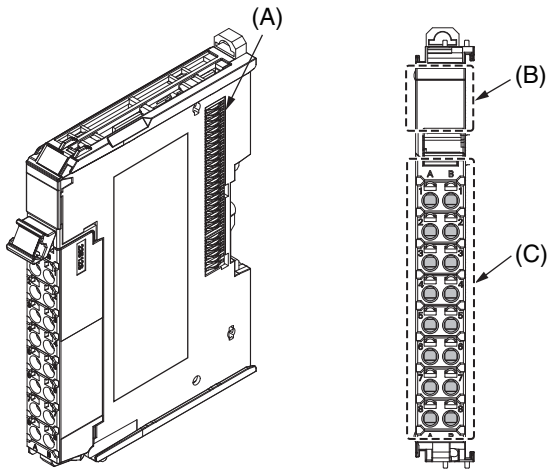
NX Units		Corresponding unit versions/versions		
Model	Unit Version	EtherCAT Coupler Units NX-ECC201/ECC202 *	NJ-series CPU Units NJ501-□□□□/NJ301-□□□□	Sysmac Studio
NX-TS2101	Ver.1.0	Ver.1.0 or later	Ver.1.05 or later	Ver.1.06 or higher
	Ver.1.1			Ver.1.08 or higher
NX-TS2102	Ver.1.1			Ver.1.08 or higher
NX-TS2104	Ver.1.1			Ver.1.08 or higher
NX-TS2201	Ver.1.0			Ver.1.06 or higher
	Ver.1.1			Ver.1.08 or higher
NX-TS2202	Ver.1.1			Ver.1.08 or higher
NX-TS2204	Ver.1.1			Ver.1.08 or higher
NX-TS3101	Ver.1.0			Ver.1.06 or higher
	Ver.1.1			Ver.1.08 or higher
NX-TS3102	Ver.1.1			Ver.1.08 or higher
NX-TS3104	Ver.1.1			Ver.1.08 or higher
NX-TS3201	Ver.1.0			Ver.1.06 or higher
	Ver.1.1			Ver.1.08 or higher
NX-TS3202	Ver.1.1			Ver.1.08 or higher
NX-TS3204	Ver.1.1			Ver.1.08 or higher

* For the NX-ECC202, there is no unit version of 1.1 or earlier.

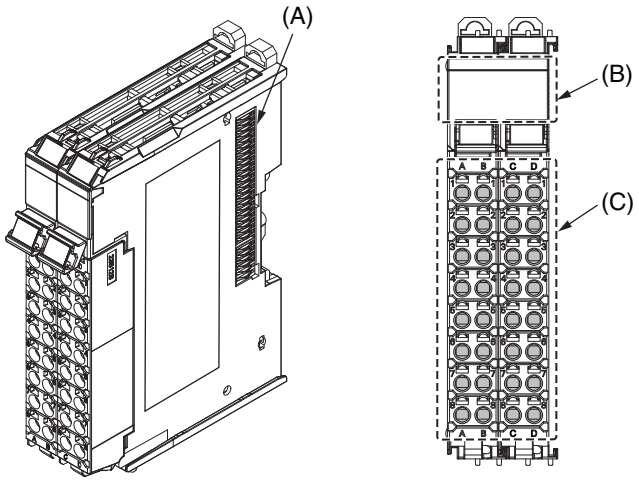
External Interface

Temperature Input Unit (Resistance Thermometer Input type)

NX-TS2201/2202/2204
12mm Width



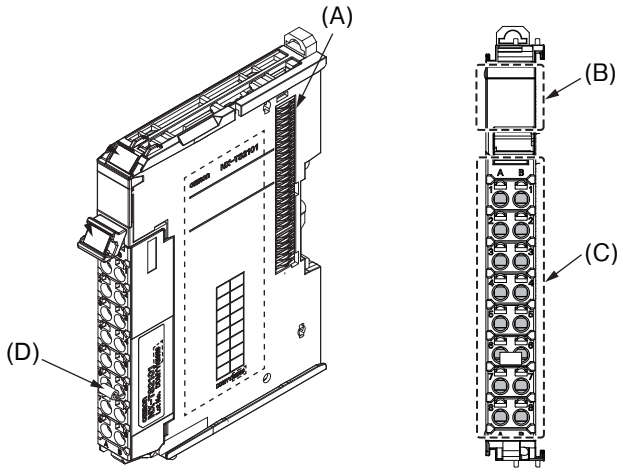
NX-TS3201/3202/3204
24mm Width



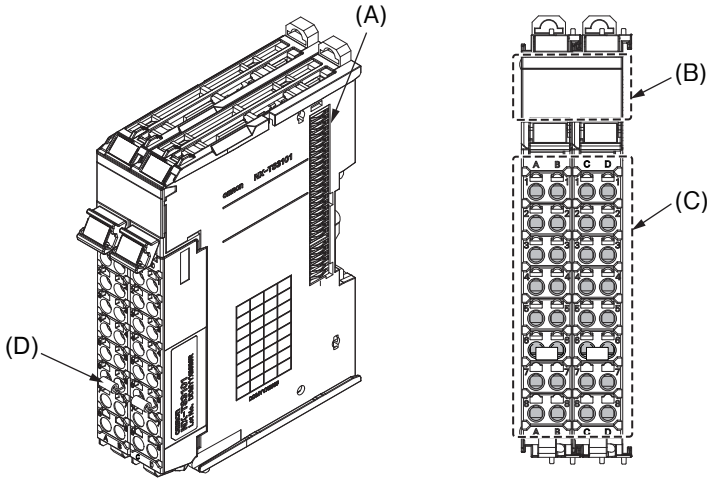
Symbol	Name	Function
(A)	NX bus connector	This connector is used to connect each Unit.
(B)	Indicators	The indicators show the current operating status of the Unit.
(C)	Terminal block	The terminal block is used to connect external devices. The number of terminals depends on the type of Unit.

Temperature Input Unit (Thermocouple Input type)

NX-TS2101/2102/2104
12mm Width

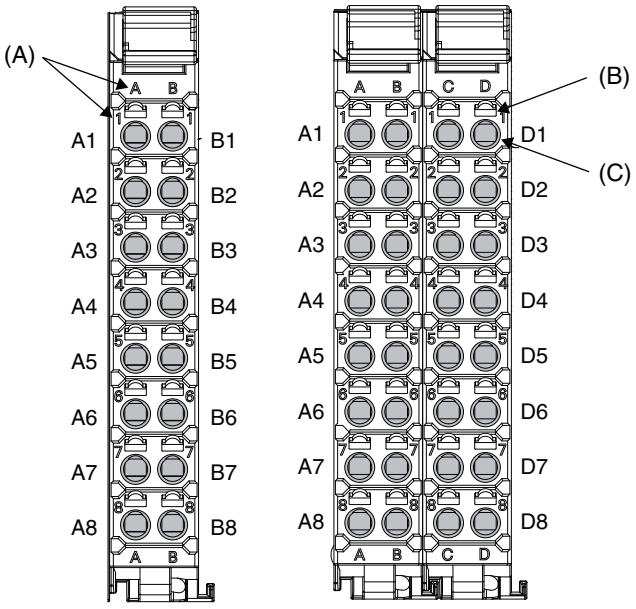


NX-TS3101/3102/3104
24mm Width



Symbol	Name	Function
(A)	NX bus connector	This connector is used to connect each Unit.
(B)	Indicators	The indicators show the current operating status of the Unit.
(C)	Terminal block	The terminal block is used to connect external devices. The number of terminals depends on the type of Unit.
(D)	Cold junction sensor	This sensor is used to compensate the cold junction. The sensors are mounted on both left and right terminal blocks for models with 24 mm width.

Terminal Blocks



Symbol	Name	Function
(A)	Terminal number indications	Terminal numbers for which A to D indicate the column, and 1 to 8 indicate the line are displayed. The terminal number is a combination of column and line, so A1 to A8 and B1 to B8 are displayed. For models of 16-terminal type x 2, A1 to A8 and B1 to B8 are terminal number of the left terminal block, C1 to C8 and D1 to D8 are terminal numbers of the right terminal block. The terminal number indications are the same regardless of the number of terminals on the terminal block.
(B)	Release holes	Insert a flat-blade screwdriver into these holes to connect and remove the wires.
(C)	Terminal holes	The wires are inserted into these holes.

Applicable Terminal Blocks for Each Unit Model

Unit model	Terminal Blocks				
	Model	No. of terminals	Terminal number indications	Ground terminal mark	Terminal current capacity
NX-TS2□□□	NX-TBA162	16	A/B	None	10 A
NX-TS3□□□	NX-TBA162	16	A/B	None	10 A
	NX-TBB162		C/D		

Applicable Wires

Using Ferrules

If you use ferrules, attach the twisted wires to them.
Observe the application instructions for your ferrules for the wire stripping length when attaching ferrules.
Always use one-pin ferrules. Do not use two-pin ferrules.

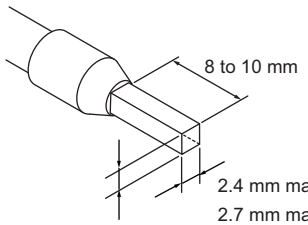
The applicable ferrules, wires, and crimping tool are given in the following table.

Terminal types	Manufacturer	Ferrule model number	Applicable wire (mm^2 (AWG))	Crimping tool
Terminals other than ground terminals	Phoenix Contact	AI0,34-8	0.34 (#22)	Phoenix Contact (The figure in parentheses is the applicable wire size.) CRIMPFOX 6 (0.25 to 6 mm^2, AWG24 to 10)
		AI0,5-8	0.5 (#20)	
		AI0,5-10		
		AI0,75-8	0.75 (#18)	
		AI0,75-10		
		AI1,0-8	1.0 (#18)	
		AI1,0-10		
		AI1,5-8	1.5 (#16)	
		AI1,5-10		
Ground terminals		AI2,5-10	2.0 *	
Terminals other than ground terminals	Weidmuller	H0.14/12	0.14 (#26)	Weidmuller (The figure in parentheses is the applicable wire size.) PZ6 Roto (0.14 to 6 mm^2, AWG 26 to 10)
		H0.25/12	0.25 (#24)	
		H0.34/12	0.34 (#22)	
		H0.5/14	0.5 (#20)	
		H0.5/16		
		H0.75/14	0.75 (#18)	
		H0.75/16		
		H1.0/14	1.0 (#18)	
		H1.0/16		
		H1.5/14	1.5 (#16)	
		H1.5/16		

* Some AWG 14 wires exceed 2.0 mm^2 and cannot be used in the screwless clamping terminal block.

When you use any ferrules other than those in the above table, crimp them to the twisted wires so that the following processed dimensions are achieved.

Finished Dimensions of Ferrules



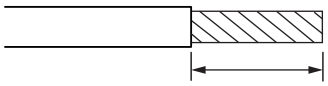
1.6 mm max. (except ground terminals)
2.0 mm max. (ground terminals)

2.4 mm max. (except ground terminals)
2.7 mm max. (ground terminals)

Using Twisted Wires/Solid Wires

If you use the twisted wires or the solid wires, the applicable wire range and conductor length (stripping length) are as follows.

Terminal types	Applicable wires	Conductor length (stripping length)
Ground terminals	2.0 mm^2	9 to 10 mm
Terminals other than ground terminals	0.08 to 1.5 mm^2 AWG28 to 16	8 to 10 mm



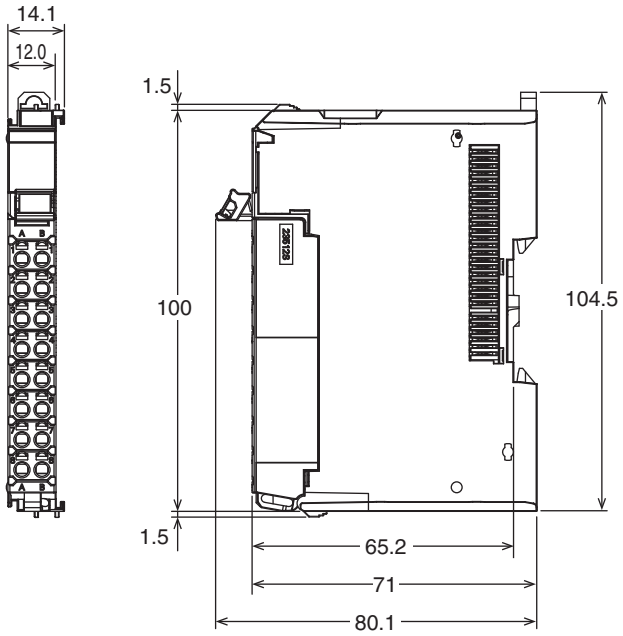
Conductor length (stripping length)

Dimensions

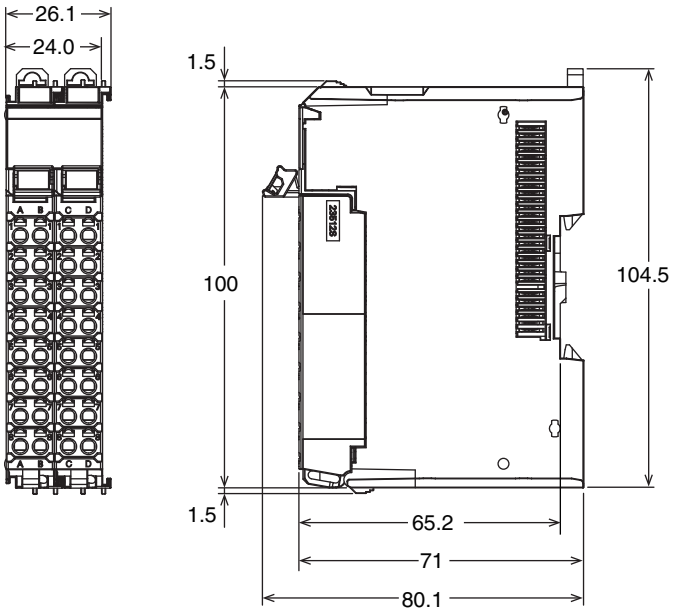
(Unit/mm)

Temperature Iutput Unit

NX-TS□□□□
12 mm Width



24 mm Width



Related Manuals

Cat. No.	Model number	Manual name	Application	Description
W522	NX-AD□□□□ NX-DA□□□□ NX-TS□□□□	NX-series Analog I/O Units User's Manual	Learning how to use NX-series Analog I/O Units and Temperature Input Units	The hardware, setup methods, and functions of the NX-series Analog I/O Units and Temperature Input Units are described.

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