

Product Description

Nexto Series is a powerful and complete Programmable Logic Controller (PLC) with unique and innovative features. Due to its flexibility, smart design, enhanced diagnostics capabilities and modular architecture, Nexto is suitable for control systems ranging from medium to high-end large applications. Finally, its compact size, high density of points per module and superior performance, allow Nexto Series to be applied in small automation systems with high performance requirements, such as manufacturing applications and industrial machines.

The Series has a wide variety of CPUs, I/O and communication modules with features to fit requirements in different kinds of applications. The options available cover from standard automation systems, high-availability applications where redundancy is a major requirement, distributed applications to functional safety systems.

NX6010 has eight thermocouple analog inputs which can be individually configured to different kinds of thermocouple. Also, this module provides different temperature scales either in Celsius or Fahrenheit. Besides, due to its configurable filters, it also can be used in automation processes, where both low pass filter and notch filter are commonly required. Finally, Nexto Series has some exclusive features such as Electronic Tag on Display, Easy Plug System and One Touch Diag.



Its main features are:

- 8 inputs in a single width module
- Supports 8 different types of thermocouple: J, K, B, E, T, R, S and N
- Galvanic isolation between inputs and internal logic
- Protection against surge voltage
- Open loop diagnostic
- Under and over range diagnostics
- Display for module diagnostics and input state indication
- Easy Plug System
- One Touch Diag
- Electronic Tag on Display

Ordering Information

Included Items

The product package contains the following items:

- NX6010 Module
- 20-terminal connector with wire holder
- Installation guide

Product Code

The following code should be used to purchase the product:

Code	Description
NX6010	8 AI Thermocouple Module

Related Products

The following products must be purchased separately when necessary:

Code	Description
NX9403	20-terminal connector with wire holder

Innovative Features

Nexto Series brings to the user several innovations in utilization, supervision and system maintenance. These features were developed focusing on a new experience in industrial automation. The list below shows some new features that the user will find:



Easy Plug System: Nexto Series has an exclusive method to plug and unplug I/O connectors. The connectors can be easily removed with a single movement and with no special tools. In order to plug the connector back to the module, the frontal cover assists the installation procedure, fitting the connector to the module.



One Touch Diag: One Touch Diag is an exclusive feature that Nexto Series brings to PLCs. With this new concept, the user can check diagnostic information of any module present in the system directly on CPU's graphic display with one single press in the diagnostic switch of the respective module. OTD is a powerful diagnostic tool that can be used offline (without supervisor or programmer), reducing maintenance and commissioning times.





ETD – Electronic Tag on Display: Another exclusive feature that Nexto Series brings to PLCs is the Electronic Tag on Display. This new functionality makes the process of checking the tag of any I/O terminal or module used in the system directly on the CPU's graphic display. Along with this information, the user can check the description as well. This feature is extremely useful during maintenance and troubleshooting procedures.



iF Product Design Award 2012: Nexto Series was the winner of iF Product Design Award 2012 in industry + skilled trades group. This award is recognized internationally as a seal of quality and excellence, considered the Oscars of the design in Europe.

Product Features

General Features

	NX6010
Backplane rack occupation	1 slot
Number of inputs	8 analog inputs
Input type	Thermocouple, type: J, K, B, E, T, R, S and N
Input state indication	Yes
One Touch Diag (OTD)	Yes
Electronic Tag on Display (ETD)	Yes
Status and diagnostic indication	Display, web pages and CPU's internal memory
Hot swap capability	Yes
Module protection	Yes, protection against surge voltages
Isolation	
Inputs to logic	1500 Vac / 1 minute
Inputs to protective earth 	1500 Vac / 1 minute
Logic to protective earth 	1250 Vac / 1 minute
Current consumption from backplane rack	270 mA
Maximum power dissipation	3 W
IP level	IP 20
Operating temperature	0 to 60 °C
Storage temperature	-25 to 75 °C
Operating and storage relative humidity	5 to 96%, non-condensing
Conformal coating	Yes
Standards	IEC 61131-2 CE, Electromagnetic Compatibility directives (EMC) and Low-voltage devices (Low-Voltage Directive – LVD)  
Module dimensions (W x H x D)	18.00 x 114.62 x 117.46 mm
Package dimensions (W x H x D)	25.00 x 122.00 x 147.00 mm
Net weight	200 g
Gross weight	250 g

Notes:

Conformal coating: Conformal coating protects the electronic components inside the product from moisture, dust and other harsh elements to electronic circuits.

Thermocouple Mode Features

NX6010 – Thermocouple Mode			
Temperature drift	$\pm 0.001\%$ / °C of full scale rating		
Data format	16 bits in two's complement, justified to the left		
Converter resolution	16 bits monotonicity guaranteed, no missing codes		
Measurement unit	Configurable: °C or °F		
Input impedance	> 1 M Ω		
Continuous maximum voltage without damage	30 Vdc		
Noise suppression filter	60 Hz or 50 Hz		
Low pass filter	1 st order digital filter		
Low pass filter time constant	200 ms, 1 s, 10 s or disabled		
Maximum common mode voltage	± 1500 mVdc		
Common mode rejection	120 dB @ 60 Hz		
Crosstalk between channels @ 100 Hz	-30 dB min		
Open thermocouple detection	Indicated in the diagnostics		
Cold junction compensation	Compensation range 0 to 80 °C Accuracy ± 1 °C @ 0 to 80 °C range		
Conversion time			
50 Hz	81 ms		
60 Hz	68 ms		
Maximum conversion time			
50 Hz	650 ms		
60 Hz	542 ms		
Thermocouple mode: °C ITS-90 curve	Model	Temperature	Accuracy @ 25 °C
	J	-210 a 1200 °C	0.10%
	K	-250 a -200 °C	0.22%
		-200 a 1372 °C	0.10%
	B	250 a 500 °C	0.45%
		500 a 1050 °C	0.22%
		1050 a 1800 °C	0.12%
	E	-230 a 1000 °C	0.15%
	T	-220 a -180 °C	0.45%
		-180 a 400 °C	0.25%
	R	-50 a 0 °C	0.30%
		0 a 200 °C	0.14%
		200 a 1768 °C	0.08%
	S	-50 a 0 °C	0.30%
		0 a 200 °C	0.14%
		200 a 1768 °C	0.08%
	N	-250 a -200 °C	0.30%
		-200 a -150 °C	0.15%
		-150 a 1300 °C	0.08%
Thermocouple mode: °F ITS-90 curve	Model	Temperature	Accuracy
	J	-346 a 2192 °F	0.10%
	K	-418 a -328 °F	0.22%
		-328 a 2501 °F	0.10%
	B	482 a 932 °F	0.45%
		932 a 1922 °F	0.22%
		1922 a 3272 °F	0.12%

	E	-382 a 1832 °F	0.15%
	T	-364 a -292 °F	0.45%
		-292 a 752 °F	0.25%
	R	-58 a 32 °F	0.30%
		32 a 392 °F	0.14%
		392 a 3214 °F	0.08%
	S	-58 a 32 °F	0.30%
		32 a 392 °F	0.14%
		392 a 3214 °F	0.08%
	N	-418 a -328 °F	0.30%
		-328 a -238 °F	0.15%
		-238 a 2372 °F	0.08%

Note:

Noise suppression filter: This parameter enables or disables a filter that rejects a particular frequency in the measurements, but this rejection includes a delay per enabled input for data acquisition, which depends on the selected frequency. It is important to consider the delays presented while developing an application. The value of the selected filter in this parameter will be applied to all module reading inputs.

Conversion time: Each module channel corresponds to an enabled input.

Maximum conversion time: The conversion time shown in the table above refers to the total conversion time for the 8 channels according to the selected noise suppression filter.

Accuracy: The informed accuracy is in percentage of the maximum temperature value of each thermocouple type.

Example: For thermocouple type R in the range 0 to 200 °C the percentage error is 0.14% of the 1768 °C maximum temperature, in this case the accuracy is 2.48 °C.

Installation

Electrical Installation

The figure below shows an example where the four inputs are used: input 00, input 02, input 03 and input 06. Each input presents a different connection, as explain below.

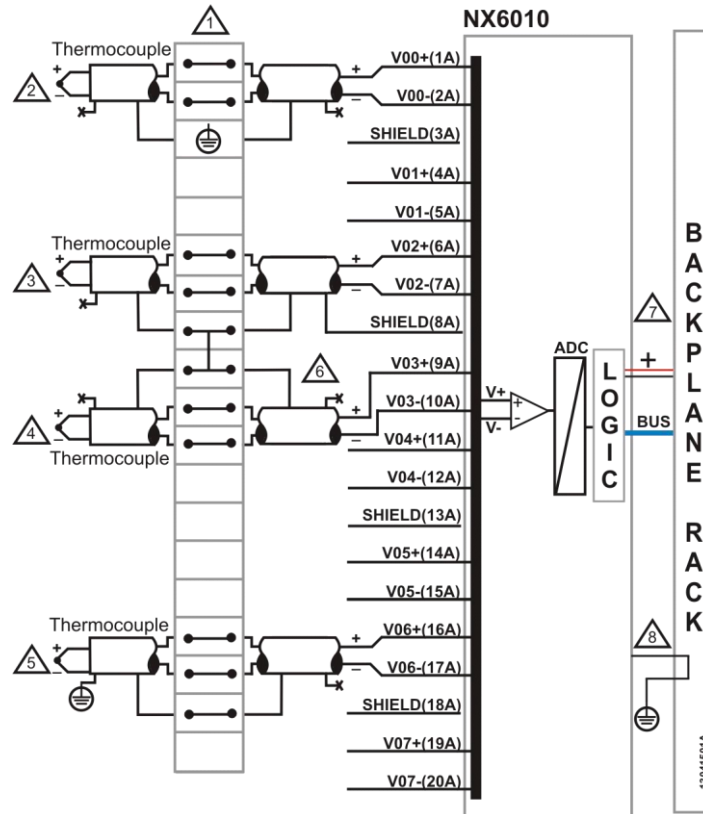


Diagram Notes:

- 1 – The diagram above has the representation a set of terminal blocks where each symbol represents a different kind of terminal block: represents a standard feed-through terminal block, represents a grounding terminal block, and represents a feed-through terminal block with connection to other terminal block.
- 2 – Input 00 is connected to a thermocouple sensor, placed on the field. The cable shielding of this input is connected to the grounding terminal block.
- 3 – Input 02 is connected to a thermocouple sensor, placed on the field. The cable shielding of this input and input 03 is connected to the shield pin which is shared between these two inputs.
- 4 – Input 03 is connected to a thermocouple sensor, placed on the field. The cable shielding of this input and input 02 is connected to the shield pin which is shared between these two inputs.
- 5 – Input 06 is connected to a thermocouple sensor, placed on the field. The cable shielding of the input 06 is connected to the earth close to the device on the field.
- 6 – There is one shield pin for each pair of inputs.
- 7 – The module power supply is derived from the connection to the backplane rack and does not require external connections.
- 8 – NX6010 is connected to the protective earth through the backplane rack.

Connector Terminals

The following table shows the description of each connector terminal:

Terminal Number	Description
1	Input 00
2	Reference input 00
3	Shield
4	Input 01
5	Reference input 01
6	Input 02
7	Reference input 02
8	Shield
9	Input 03
10	Reference input 03
11	Input 04
12	Reference input 04
13	Shield
14	Input 05
15	Reference input 05
16	Input 06
17	Reference input 06
18	Shield
19	Input 07
20	Reference input 07

Mechanical Assembly

The mechanical and electrical mounting and the connector pin insertion and removing for single hardware width I/O modules are described at Nexto Series User Manual – MU214600.

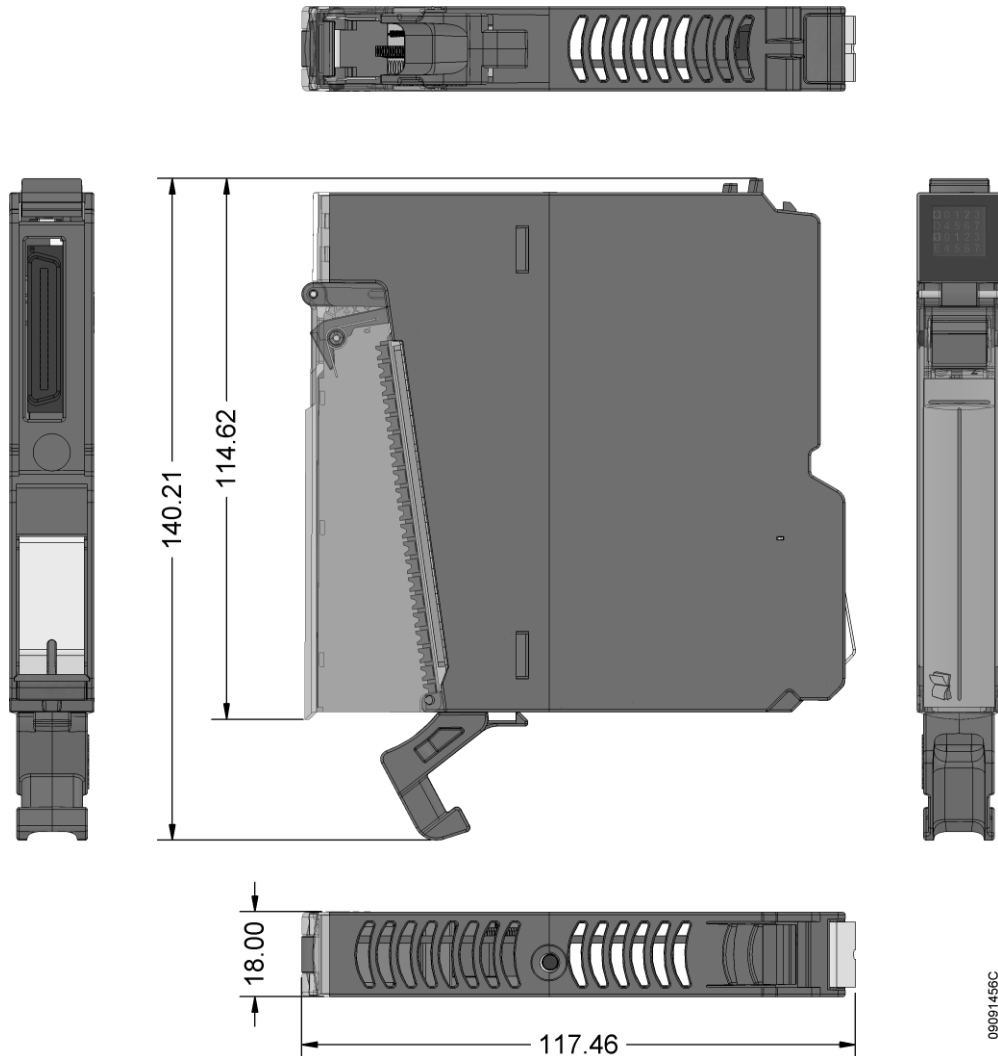
Compatibility with Other Products

The following table brings information regarding the compatibility between NX6010 module, Nexto CPUs and the Nexto Series MasterTool IEC XE programming tool.

NX6010		Compatible Software Version	
Version	Revision	MasterTool IEC XE	Nexto CPUs
1.0.0.0 or higher	AA or higher	1.40 or higher	1.3.0.18 or higher

Physical Dimensions

Dimensions in mm.



Nexto Series User Manual - MU214600 should be consulted for general measurement of installation panel.

Configuration

NX6010 was developed to be used with Nexto Series products. All Nexto Series products are configured in MasterTool IEC XE. All configuration data of a given module can be accessed through a double click in it on the Graphical Editor

Process Data

Process Data are the variables that are used to access and control NX6010 module. The list below describes all variables delivered by NX6010.

The process data of the module, when inserted in a PROFIBUS network, can be accessed through variables. The table below presents the variables organizational structure in the UCP memory.

Besides these data, this module also provides a set of variables containing information related to diagnostics which are also described in this document.

Variable	Size	Process Data	Description	Type	Update
%IW(n)	WORD	AI 00	Analogic input 00	INT (Read)	Always
%IW(n+2)	WORD	AI 01	Analogic input 01	INT (Read)	Always
%IW(n+4)	WORD	AI 02	Analogic input 02	INT (Read)	Always
%IW(n+6)	WORD	AI 03	Analogic input 03	INT (Read)	Always
%IW(n+8)	WORD	AI 04	Analogic input 04	INT (Read)	Always
%IW(n+10)	WORD	AI 05	Analogic input 05	INT (Read)	Always
%IW(n+12)	WORD	AI 06	Analogic input 06	INT (Read)	Always
%IW(n+14)	WORD	AI 07	Analogic input 07	INT (Read)	Always

Notes:

Update: The field "Update" indicates if the respective process data is updated by CPU and NX6010 by default. When defined as "Always", it means that the process data is always updated. When defined as "Selectable", it means that the user can select if the respective process data will be updated or not. All these process data are exchanged between CPU and NX6010 through the bus, to improve CPU performance. It is recommended to update only the process data that will be used in the application.

Module Parameters

Name	Description	Standard Value	Options	Configuration
Noise Suppression Filter	Defines the frequency of the noise suppression filter	60 Hz	50 Hz 60 Hz	Per module
Measurement Unit	Defines the temperature unit (°C or °F)	Degrees Celsius	Degrees Celsius Degrees Fahrenheit	Per module
Type	Defines the thermocouple type: J, K, B, E, T, R, S, N	Not Configured	Not Configurado J K B E T R S N	Per input
Digital Filter	1st order digital filter time constant (ms)	Disabled	Disabled 200 ms 1 s 10 s	Per input
Cold junction compensation	Enables or disables the cold junction compensation	Enabled	Disabled Enabled	Per input
%Q Start Address of Module Diagnostics	Defines the start address of the module diagnostics	-		Per module

Module Usage

General Purpose Input Read

NX6010 has one variable for each input, which will be presented in the temperature scale defined in the Measurement Unit, where the value is multiplied for 10. Thus, a 25 °C temperature, for example, is read as 250.

Maintenance

Altus recommends that all modules' connections should be checked and any dust or any kind of dirt in the module's enclosure should be removed at least every 6 months.

Nexto Series CPUs offers five important features to assist users during maintenance: Electronic Tag on Display, One Touch Diag, status and diagnostics indicators, Web page with complete status and diagnostics list and status and diagnostics mapped to internal memory.

Electronic Tag on Display and One Touch Diag

Electronic Tag on Display and One Touch Diag are important features that provide to the user the option to check the tag, description and diagnostics related to a given module directly on the CPU display.

Electronic Tag on Display and One Touch Diag are easy-to-use features. To check the tag and diagnostics of a given module, it's required only one short press (shorter than 1 s) on its diagnostic switch. After pressing once, CPU will start to scroll tag information and diagnostic information of the module. To access the respective module description just long press (longer than 1 s) the diagnostics switch of the respective module.



More information about Electronic Tag on Display can be found at Nexto Series CPUs User Manual – MU214605.

Web Pages with Complete Status and Diagnostics List

Another way to access diagnostics information on Nexto Series is via Web pages. Nexto Series CPU's has an embedded Web page server that provides all Nexto status and diagnostics information, which can be accessed using a simple browser.

More information about Web page with complete status and diagnostics list can be found at Nexto Series CPUs User Manual – MU214605.

Status and Diagnostics Indicators

All Nexto slave modules have a display with the following symbols: D, E,  and numerical characters. The states of the symbols D, E,  are common for all Nexto Series slave modules. These states can be consulted in the table below.

The meaning of the numerical characters can be different for specific modules.

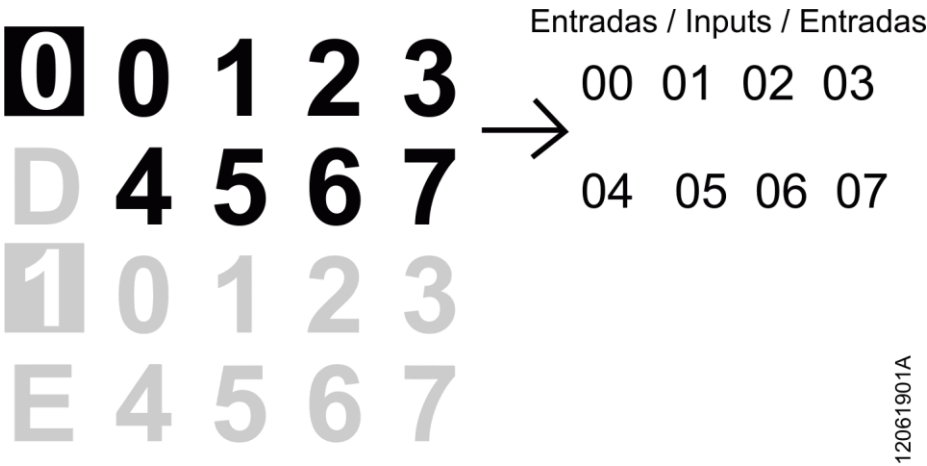
D and E States

D	E	Description	Cause	Solution	Priority
Off	Off	Display fail or module off	Module off, external power supply fail or hardware fail	Check if the module is completely connected to the backplane rack and if the backplane rack is supplied by an external power supply	-
On	Off	Normal use	-	-	9 (Lower)
Blinking 1x	Off	Active Diagnostic	There is at least one active diagnostic related to the module	Check what the active diagnostic is	8
Blinking 2x	Off	CPU in STOP mode. If the module is in a Remote PROFIBUS, Master is in Clear state;	CPU in STOP mode	Check if CPU is in RUN mode or if PROFIBUS Master is in OPERATE mode. More information can be found on CPU's or PROFIBUS Master's documentation	7
Blinking 3x	Off	Reserved	-	-	6
Blinking 4x	Off	Non-fatal hardware fault	Hardware fault	The module remains with its main	5

				functionality. For fail correction please contact Altus Technical Support	
Off	Blinking 2x	Loss of master	Loss of communication between module and CPU or module and PROFIBUS head	Check if the module is completely connected to the backplane rack Check if CPU is in RUN mode or if PROFIBUS head is Active.	4
Off	Blinking 3x	Module without calibration	The module isn't calibrated or has an error with calibration value	The module must return to manufacturer	3
Off	Blinking 1x	Parameterization error	The module isn't parameterized or didn't receive the parameterization	Check if the module parametrization is ok	2
Off	Blinking 4x	Fatal hardware fault	Hardware fault	contact Altus Technical Support in case of fatal hardware fault	1 (Higher)

0, 1 and Numerical Characters

The segments 0 and 1 are used to group the numerical characters used for the first 8 I/O and the numerical characters used for the last 8 I/O. In case of NX6010 only the character 0 is on. The figure below shows the relation between numerical characters and the respective input.



Diagnostics Mapped to Variables

All NX6010's diagnostics can be accessed through variables that can be handled by the user application or even forwarded to a supervisory system using a communication channel. There are two different ways to access diagnostics in the user application: using symbolic variables with AT directive or addressing memory. Altus recommends the use of symbolic variables for diagnostic accessing. The table below shows all available diagnostics for NX6010 and their respective memory address, description, symbolic variable and string that will be shown on the CPU graphical display and Web.

Direct Representation Variable		Diagnostic Message	Symbolic Variable DG_modulename.tGeneral.	Description	PROFIBUS Message Code
Variable	Bit				
%QB(n)	0	INPUT 00 W/ DIAG	bActiveDiagnosticsInput00	TRUE – Input 00 has active diagnostics	-
		-		FALSE – Input 00 has no active diagnostics	
	1	INPUT 01 W/ DIAG	bActiveDiagnosticsInput01	TRUE – Input 01 has active diagnostics	-
		-		FALSE – Input 01 has no active diagnostics	
	2	INPUT 02 W/ DIAG	bActiveDiagnosticsInput02	TRUE – Input 02 has active diagnostics	-
		-		FALSE – Input 02 has no active diagnostics	
	3	INPUT 03 W/ DIAG	bActiveDiagnosticsInput03	TRUE – Input 03 has active diagnostics	-
		-		FALSE – Input 03 has no active diagnostics	
	4	INPUT 04 W/ DIAG	bActiveDiagnosticsInput04	TRUE – Input 04 has active diagnostics	-
		-		FALSE – Input 04 has no active diagnostics	
	5	INPUT 05 W/ DIAG	bActiveDiagnosticsInput05	TRUE – Input 05 has active diagnostics	-
		-		FALSE – Input 05 has no active diagnostics	
	6	INPUT 06 W/ DIAG	bActiveDiagnosticsInput06	TRUE – Input 06 has active diagnostics	-
		-		FALSE – Input 06 has no active diagnostics	
	7	INPUT 07 W/ DIAG	bActiveDiagnosticsInput07	TRUE – Input 07 has active diagnostics	-
		-		FALSE – Input 07 has no active diagnostics	
%QB(n+1)	0	MODULO W/ DIAGNOSTICS	bActiveDiagnostics	TRUE – Module has active diagnostics	-
		-		FALSE – Module has no active diagnostics	
	1	MODULE W/ FATAL ERROR	bFatalError	TRUE – Fatal error	25
		-		FALSE – No fatal error	
	2	CONFIG. MISMATCH	bConfigMismatch	TRUE – Parameterization error	26
		-		FALSE – Parameterization ok	
	3	WATCHDOG ERROR	bWatchdogError	TRUE – Watchdog has been detected	27
		-		FALSE – No watchdog detected	
	4	OTD SWITCH ERROR	bOTDSwitchError	TRUE – Module has OTD switch failure	28
		-		FALSE – OTD switch ok	

	5	CALIBRATION ERROR	bCalibrationError	TRUE – Module without calibration	29
		-		FALSE – Module calibrated	
	6	COLD JUNC. SENS. ERROR	bColdJunctionSensorError	TRUE – High temperature in the cold junction sensor	30
		-		FALSE – Normal temperature in the cold junction sensor	
	7	Reserved			

Detailed Diagnostics

Direct Representation Variable		Diagnostic Message	Symbolic Variable DG_modulename.tDetailed. tAnalogInput_XX	Description	PROFIBUS Message Code
Variable	Bit				
%QB(n+2+X X*2)	0..7	Reserved			
%QB(n+2+2 *XX+1)	0	OVER RANGE	bOverRange	TRUE – Over range condition at the input	24
		-		FALSE – No over range condition at the input	
	1	UNDER RANGE	bUnderRange	TRUE – Under range condition at the input	25
		-		FALSE – No under range condition at the input	
	2	OPEN LOOP	bOpenLoop	TRUE – Open loop condition in the input signal	26
		-		FALSE – Input signal connected	
	3	-	bInpuNotEnable	TRUE – Input is not enabled	27
				FALSE – Input is enabled	
	4..7	Reserved			

Notes:

Under range: This diagnostics turns true when the input value is 1% of the end of scale rating below the scale. E.g. for the thermocouple type J -210 to 1200 °C scale, under range diagnostics turns true for measurements below -222 °C.

Over range: This diagnostics turns true when the input value is 1% of the end of scale rating above the scale. E.g. for the thermocouple type J -210 to 1200 °C scale, over range diagnostics turns true for measurements above 1212 °C.

Open loop: This diagnosis is true when the module detects that there is a condition of broken cable, the diagnosis of this condition over range can also occur due to the form of open loop detection.

Direct representation variable: “n” is the address defined in the field %Q Start Address of Diagnostic Area on the NX6010's configuration screen – Modules Parameters tab in the MasterTool IEC XE, “XX” is the channel of analog input.

Symbolic Variable: Some symbolic variables serve to accessing diagnostics. This diagnostics are stored into the addressing memory, then the AT directive is used to map the symbolic variables in the addressing memory. The directive AT is a reserved word in the MasterTool IEC XE that uses this directive to declares the diagnostics automatically on a symbolic variables. All symbolic variables declared automatically can be found inside of Diagnostics object.

Manuals

For a proper use and application, Nexto Series CPUs User Manual - MU214605 should be consulted.

For further technical details, configuration, installation and programming of Nexto Series the table below should be consulted.

The table below is only a guide of some relevant documents that can be useful during the use, maintenance, and programming of NX3010, NX3020 and NX3030 modules. The complete and updated table containing all documents of Nexto Series can be found at Nexto Series User Manual – MU214600.

Document Code	Description	Language
CE114000 CT114000 CS114000	Nexto Series – Technical Characteristic Série Nexto – Características Técnicas Série Nexto – Especificaciones y Configuraciones	English Portuguese Spanish
MU214600 MU214000 MU214300	Nexto Series User Manual Manual de Utilização Série Nexto Manual Del Usuario Serie Nexto	English Portuguese Spanish
MU214605 MU214100 MU214305	Nexto Series CPUs User Manual Manual de Utilização UCPs Série Nexto Manual del Usuario UCPs Serie Nexto	English Portuguese Spanish
MU299609 MU299048 MU299800	MasterTool IEC XE User Manual Manual de Utilização MasterTool IEC XE Manual del Usuario MasterTool IEC XE	English Portuguese Spanish
MP399609 MP399048 MP399800	MasterTool IEC XE Programming Manual Manual de Programação MasterTool IEC XE Manual de Programación MasterTool IEC XE	English Portuguese Spanish
MU214608 MU214108 MU214308	Nexto PROFIBUS-DP Head Utilization Manual Manual de Utilização da Cabeça PROFIBUS-DP Nexto Manual de Utilización Cabeça PROFIBUS Nexto	English Portuguese Spanish