1. Product Description

Nexto Series is a powerful and complete Programmable Logic Controller (PLC) Series 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.

The NX6014 module offers 8 analog current inputs with individually configurable HART, occupying only one position in the rack. In addition to enabling the reading of signals from field instruments (pressure, temperature, etc...) through the conventional 0-20 mA signal, these inputs also allow HART communication with the instruments to be carried out via the CPU's Ethernet port using a asset management with support for DTM technology. The Nexto Series DTM is available for download on the website www.altus.com.br.



Its main features are:

- 08 inputs in a single width module
- Different current scales support: 0 to 20 mA and 4 to 20 mA
- HART Protocol (4-20mA)
- Individual configuration per input
- Software configurable filters
- Galvanic isolation between inputs and internal logic
- Protection against surge voltage
- Open loop diagnostics
- Under range and over range diagnostics
- Display for module diagnostics and input state indication
- Easy Plug System
- One Touch Diag
- Electronic Tag on Display

2. Ordering Information

2.1. Included Items

The product package contains the following items:

- NX6014 module
- 20-terminals connector with wire holder

2.2. Product Code

The following code should be used to purchase the product:

Code	Description	
NX6014	8 AI Current Module with HART	

Table 1: Product Code



3. Related Products

The following product must be purchased separately when necessary:

Code	Description	
NX9403	20-terminal connector with cable guides	

 Table 2: Related Products

4. Innovative Features

Nexto Series brings to the user many innovations regarding utilization, supervision and system maintenance. These features were developed focusing a new concept in industrial automation.



Easy Plug System: Nexto Series has an exclusive method to plug and unplug I/O terminal blocks. The terminal blocks can be easily removed with a single movement and with no special tools. In order to plug the terminal block back to the module, the frontal cover assists the installation procedure, fitting the terminal block 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 brings the process of checking the tag names of any I/O pin or module used in the system directly to 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..

5. Product Features

5.1. General Features

	NX6014		
Backplane rack occupation	1 slot		
Number of inputs	8 analog inputs		
Input type	Current input, single ended, individually configured		
Data format	16 bits in two's complement, justified to the left		
Converter resolution	24 bits monotonicity guaranteed, no missing codes		
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 protections	Yes, protection against surge voltages		
•	(maximum permanent voltage without damage: 30 Vdc)		
Wire gauge	0,5 mm ² (20 AWG)		
Minimum wire temperature rating	75 °C		
Wire material	Copper only		
Isolation			
Input to logic	1500 Vdc / 1 minute (1000 Vac / 1 minute)		
Input to protective earth 🖶	1500 Vdc / 1 minute (1000 Vac / 1 minute)		
Logic to protective earth 🖶	1500 Vdc / 1 minute (1000 Vac / 1 minute)		
Current consumption from backplane rack	300 mA		
power supply			
Maximum power dissipation	3 W		
IP level	IP 20		
Operating temperature	0 to 60 $^{\circ}$ C		
Storage temperature	-25 to 75 °C		
Operating and storage relative humidity	5% to 96%, non-condensing		
Conformal coating	Yes		
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		
Weight	200 g		
Weight with package	250 g		

 Table 3: General Features

Note:

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

Wire gauge: Crimp terminals for 0.5 mm^2 wire in each way respecting as described at Nexto Series User Manual - MU214600.



5.2. Standards and Certifications

	Standards and Certifications					
IEC	61131-2: Industrial-process measurement and control - Programmable controllers - Part 2: Equipment requirements and tests					
CE	2014/30/EU (EMC) 2014/35/EU (LVD) 2011/65/EU and 2015/863/EU (ROHS)					
	UL/cUL Listed – UL 61010-1 UL 61010-2-201 (file E473496)					
EHE	TR 004/2011 (LVD) CU TR 020/2011 (EMC)					

Table 4: Standards and Certifications



5.3. Analog Inputs

	Current Mode		
	Range	Resolution	
Scale	0 to 20 mA	333 nA	
	4 to 20 mA	266 nA	
Precision	\pm 0.1 % of full scale rating@ 25 °C		
	$\pm \ 0.01 \ \%$ of full s	cale rating / °C	
Influence of HART signal on	+0.1% of fu	Ill scale rating	
input measurement			
Over scale	3 % of full	scale rating	
Maximum input current	30	mA	
Update time			
Disabled		channel enabled	
	80 ms with all channels enabled		
50 Hz	25 ms with one channel enabled		
	200 ms with all channels enabled		
	21 ms with one	abannal anablad	
60 Hz	21 ms with one channel enabled 168 ms com with all channels enabled		
Settling time		b of final value	
		300Ω	
Input impedance			
	0 11	e per input	
Configurable parameters		range per input	
	Filters		
Noise suppression filter	Open loop value		
Noise suppression filter	60 Hz, 50 Hz or disabled		
Low pass filter	1st order digital filter		
Low pass filter time constant	100 ms, 1 s, 10 s or disabled		

Table 5: Analog Input Features

Notes:

Resolution: The presented resolutions are the optimal delivered by the hardware.

Update time: The update time depends on the configuration of Noise Suppression Filter.

Settling time: It is related to the 1st order low-pass filter present on the hardware of each input.

Noise Suppression Filter: When this parameter is configured, the filter value is applied to all analog inputs.

5.4. HART

	NX6014	
Operation mode	Master/Slave (point to point)	
Allows secondary master	Yes	

Table 6: HART Features

5.5. Compatibility with Other Products

The following table provides information regarding the compatibility of the module NX6014 and other Nexto Series products.

	NX6014	Software Version Compatible		
Version Revision Feature		MasterTool IEC XE	Nexto CPU's	
1.0.0.0	AA	-	3.20 or higher	1.8.0.0 or higher

Table 7: Compatibility with Other Products

Note:

Revision: If the software is upgraded in the field the product reviewing indicated on the label will no longer match the actual review of the product.

5.6. Physical Dimensions

Dimensions in mm.

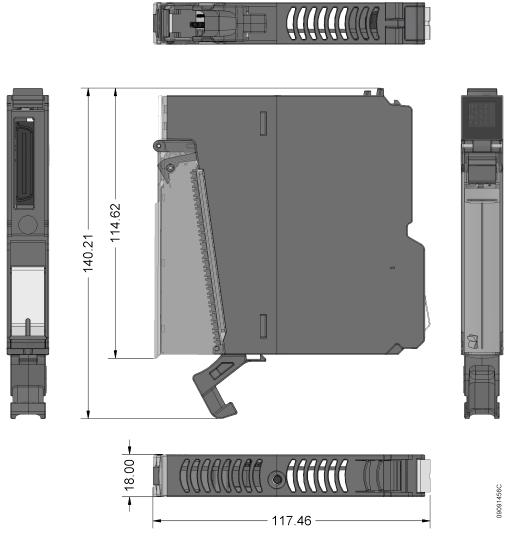


Figure 1: Physical Dimensions

6. Installation

For the correct installation of this product, it is necessary to use a rack (backplane rack) and it must be carried out according to the mechanical and electrical installation instructions that follow.

6.1. Product Identification

This product has some parts that must be observed before installation and use. The following figure identifies each of these parts.

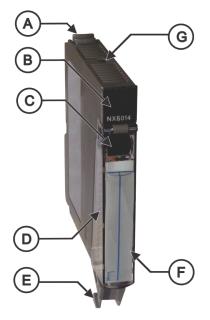


Figure 2: NX6014

- Fixing lock.
- B Status and diagnostic display.
- © Terminal block extraction lever.
- D Front cover.
- E 20 pin terminal block with wire holder.
- (E) Label for module identification.
- G Diagnostic switch.

The product has in its mechanics a label that identifies it and in it are presented some symbols whose meaning is described below:

Attention! Before using the equipment and installing, read the documentation.

— Direct Current.

/ľ

6.2. Electrical Installation

The figure below shows an example using two inputs: input I0 and input I2. Each entry has a different connection, as explained below.



8 AI Current Module with HART Nexto Series

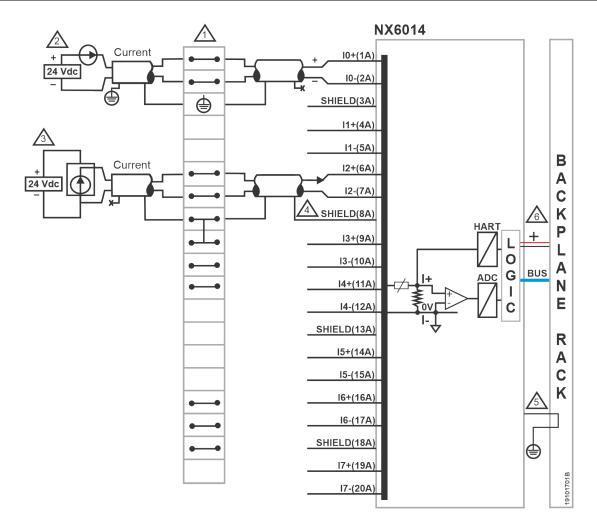


Figure 3: Electrical Installation

Diagram Notes

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.

- Input I0 is connected to a current output module, usually a transducer. This type of transducer, unlike the example above, uses the same pins for power supply and current output. In this case, only a 4 to 20 mA scale is possible.
- Input I2 is connected to a current output module, usually a transducer. This type of transducer has different pins for power supply and current output.
- 4 There is a shield pin for each pair of analog inputs.
- \triangle The NX6014 is connected to protective earth \oplus through the backplane rack.
- The module power supply is derived from the connection to the backplane rack, not requiring external connections.



Protective conductor terminal.



6.3. Connector Pinout

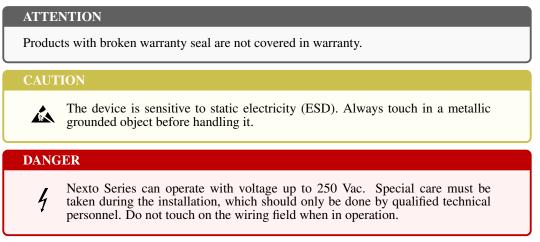
Terminal Number	Description		
1	Current Input 00		
2	Reference input 00		
3	Shield		
4	Current Input 01		
5	Reference input 01		
6	Current Input 02		
7	Reference input 02		
8	Shield		
9	Current Input 03		
10	Reference input 03		
11	Current Input 04		
12	Reference input 04		
13	Shield		
14	Current Input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

The following table shows the description of each connector terminal.

 Table 8: Connector Pinout

6.4. Mechanical and Electrical 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.



7. Configuration

This module 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.

7.1. Process Data

Process Data are the variables used to access the module. The table below describes all the variables made available by this module when declared on the CPU or MODBUS Head bus.

In addition to the data in the table, this product also provides a set of variables containing information related to diagnostics, which are also described in this document.

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

Table 9: Process Data

Note:

Update: The field "Update" indicates if the respective process data is updated by CPU and NX6014 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 NX6014 through the bus, to improve CPU performance, it's recommended to update only the process data that will be used in the application.

7.1.1. PROFIBUS Data

When the module is inserted on the bus of a PROFIBUS Head, the variable type will be WORD. In this case, we recommend using symbolic variables of type INT, declared with the AT directive at the same addresses as the direct variables. Example, considering the direct variable %IW(n) from the previous table:

```
iChannel_0 AT %IW(n): INT;
```

The values sent by PROFIBUS are of the integer type and are fixedly configured in the -30,000 to +30,000 range. For example, on a channel configured as current 0 to 20 mA, the current value of 0 mA will be converted to -30,000, while the current value of 20 mA will be converted to +30,000.



7.2. Module Parameters

Name	Description	Standard Value	Options	Configuration
Noise Suppression Filter	Frequency of the noise filter	60 Hz	Disabled 50 Hz 60 Hz	Per module
Туре	Type and scale of a given input	Current 4 - 20 mA with HART	Not Configured Current 0 - 20 mA Current 4 - 20 mA Current 4 - 20 mA with HART	Per input
Min Value	Minimum value for engineering scale	0	(see note)	Per input
Max Value	Maximum value for engineering scale	30000	(see note)	Per input
Digital Filter	First order digital filter time constant (ms)	Disabled	Disabled 100 ms 1 s 10 s	Per input
Open Loop Value	Value when in open loop condition (only valid for 4 – 20 mA scale)	Min Value	0 Min Value Max Value Disabled	Per input
%Q Start Address of Module Diagnostics Area	Defines the start address of the module diagnostics area	-	-	Per module

Table 10: Modules Parameters

Notes:

Noise Suppression Filter: For further information about this parameter, consult Noise Suppression Filter section. If a signal is present on a channel with filter enabled and a hot-swap is performed in the module, the channel will start with a value of zero to dynamically, according to the selected time constant, reach the present value at the input.

Configuration: Configuration indicates if the parameter is related to the entire module (per module) or if the parameter is related to a single input (per input). In case of input wise parameters, all parameters will be repeated for each available input.

Min and Max Value: These parameters can be configured in any value from -30000 to 30000, as long as the Max Value is larger than the Min Value. In PROFIBUS-DP remotes, the minimum and maximum values are fixed at -30000 and 30000, respectively.

7.3. 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 as informed on Analog Input Features table. It is important to consider these delays while developing an application.



8. Module Usage

8.1. General Purpose Input Read

NX6014 has one variable for each input. The parameters Min Value and Max Value are used by the module to convert the analog input value to the corresponding engineering value.

9. 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.

This module 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 diagnostics mapped to internal memory.

9.1. 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 and One Touch Diag can be found at User Manual of each respective CPU (listed at manual of Nexto Series - MU214600).

9.2. Status and Diagnostics Indicators

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

9.2.1. D and E States

D	Е	Description	Cause	Solution	Priority
Off	Off	Display failure or module off	 Module disconnected; External power supply failure; Hardware failure. 	Check: - If the module is com- pletely connected to the rack; - If the rack is powered by an external source; - If the module has external power.	-
On	Off	Normal use	-	-	9 (Lower)
Blinking 1x	Off	Active diagnostics	There is at least one active diagnostic re- lated to the module.	Check what the active di- agnostic is. More informa- tion can be found at section Diagnostics Through Vari- ables.	8



D	Е	Description	Cause	Solution	Priority
Blinking 2x	Off	No I/O data update	 CPU in STOP mode; Head/Remote in non-ACTIVE state. 	Check: - If the CPU is in operation; - If the Fieldbus Master is in operation; - The integrity of the net- work between the MOD- BUS Client and the Head- /Remote.	7
Blinking 3x	Off	Reserved	-	-	6
Blinking 4x	Off	Non-fatal fault	Failure in some hardware or soft- ware component, which does not have impact on the basic functionality of the product.	Check the module's diag- nostic information. If it is a hardware failure, have the part replaced. If it's software, contact Technical Support.	5
Off	Blinking 2x	Loss of bus master	Loss of communica- tion between: - The module and the CPU; - The module and the Head/Remote; - The Head/Remote and the Field Net- work Master.	Check: - If the module is com- pletely connected to the rack; - If the CPU is in RUN mode; - If the Fieldbus Master is in operation; - Network integrity be- tween PROFIBUS Master and Head/Remote.	4
Off	Blinking 3x	Module without calibration	 The module is not calibrated; There was an error with the calibration value. 	The module must return to the manufacturer.	3
Off	Blinking 1x	Missing or parameterization error	The module isn't pa- rameterized.	Check: - If the module parameteri- zation is correct; - Network integrity be- tween PROFIBUS Master and Head/Remote; - Network integrity be- tween PROFINET Con- troller and Head/Remote.	2
Off	Blinking 4x	Fatal hardware fault	Hardware fault.	The module must return to the manufacturer.	1 (Higher)

Table 11: Status of Symbols D and E

Notes:

Field net master: There are different field net solutions, using different nomenclatures to refer to the net master. Examples: Profibus Master, MODBUS Client, PROFINET Controller, etc.

Module without calibration: Only valid for modules that have calibration, typically analog modules. Modules that do not have calibration will never show such an indication through the symbols D and E.



9.2.2. 0, 1 and Numerical Characters

The meaning of the numerical characters can be different for specific modules. In case of analog modules, the numerical characters show the respective state of each input. When the numerical character is on, the respective input is configured and enabled, and if the numerical character is off, the respective input is disabled. The relationship between the input number and its respective numerical character can be found on the following figure.

The segments \square and \square 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 NX6014 only the character \square is on. The figure below shows the relation between numerical characters and the respective input.

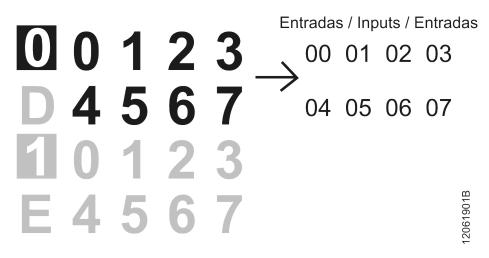


Figure 4: Numerical Character

9.3. Web Page 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 User Manual of each respective CPU (listed at Nexto Series User Manual - MU214600).

9.4. Diagnostics Through Variables

All diagnostics in this module 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 use symbolic variables for diagnostic accessing. The table below shows all available diagnostics for this module and their respective memory address, description, symbolic variable and string that will be shown on the CPU graphical display and web.



9.4.1. General Diagnostics

Direct Represent.		Diagnostic Message	Variable DG_Module.tGeneral.*	Description
Variable	Bit			
	0	INPUT 00 W/ DIAG	bActiveDiagnosticsInput00	TRUE – Input 00 has active diagnostics
		-		FALSE – Input 00 doesn't have active diagnostics
	1	INPUT 01 W/ DIAG	bActiveDiagnosticsInput01	TRUE – Input 01 has active diagnostics
		-		FALSE – Input 01 doesn't have active diagnostics
	2	INPUT 02 W/ DIAG	bActiveDiagnosticsInput02	TRUE – Input 02 has active diagnostics
		-		FALSE – Input 02 doesn't have active diagnostics
% QB(n)	3	INPUT 03 W/ DIAG	bActiveDiagnosticsInput03	TRUE – Input 03 has active diagnostics
		-		FALSE – Input 03 doesn't have active diagnostics
	4	INPUT 04 W/ DIAG	bActiveDiagnosticsInput04	TRUE – Input 04 has active diagnostics
		-		FALSE – Input 04 doesn't have active diagnostics
	5	INPUT 05 W/ DIAG	bActiveDiagnosticsInput05	TRUE – Input 05 has active diagnostics
		-		FALSE – Input 05 doesn't have active diagnostics
	6	INPUT 06 W/ DIAG	bActiveDiagnosticsInput06	TRUE – Input 06 has active diagnostics
		-		FALSE – Input 06 doesn't have active diagnostics TRUE – Input 07 has active
	7	INPUT 07 W/ DIAG	bActiveDiagnosticsInput07	diagnostics
		-		FALSE – Input 07 doesn't have active diagnostics TRUE – Module has active
	0	MODULE W/ DIAGNOSTIC	bActiveDiagnostics	diagnostics
		NO DIAG MODULE W/		FALSE – Module doesn't have active diagnostic
	1	FATAL ERROR	bFatalError	TRUE – Fatal error FALSE – No fatal error
	2	- CONFIG. MISMATCH	bConfigMismatch	TRUE – Parameterization error
		-	1	FALSE – Parameterization ok
% QB(n+1)	3	WATCHDOG ERROR	bWatchdogError	TRUE – Watchdog has been detected

Direct Represent.		Diagnostic Message	Variable DG_Module.tGeneral.*	Description
Variable	Bit			
		-		FALSE – No watchdog
	4	OTD SWITCH ERROR	bOTDSwitchError	TRUE – Module has switch failure
		-		FALSE – Diagnostics switch ok
	57	Reservado		

Table 12: General Diagnostics

9.4.2. Detailed Diagnostics

Direct Represent.		Diagnostic Message	Variable DG_Module.tDetailed.*	Description
Variable	Bit			
% QB(n+2 +XX*2)	07		Reserved	
	0	OVER RANGE	bOverRange	TRUE – Input data is over range
		-		FALSE – Input data is ok
	1	UNDER RANGE	bUnderRange	TRUE – Input data is under range
		-		FALSE – Input data is ok
%QB(n+2+ 2*XX+1)	2	OPEN LOOP	bOpenLoop	TRUE – Input is open
		-		FALSE – Input is ok
	3	-	bInputNotEnable ⁽¹⁾	TRUE – Input is not enable
		-		FALSE – Input is enable
	47		Reserved	

Table 13: Detailed Diagnostics

Notes:

⁽¹⁾: This diagnosis does not apply to the module when declared on the Profibus Heads or PROFINET Heads bus. It is valid only when the module is declared on the UCPs or MODBUS Heads bus.

Open Loop Diagnostic: This diagnostics only applies to channels configured as 4 - 20 mA input current, and is set when the input current is lower than 3 mA.

Under Range: This diagnosis is true when the input value is 1% of the full scale below the scale, being applicable only for 4 to 20 mA scales. Therefore, it will be true for measurements below 3.8 mA.

Over Range: This diagnosis is true when the input value is 1% of the full scale above the scale. Therefore, it will be true for measurements above 20.2 mA.

Direct Represent.: "n" is the address defined in the field %Q Start Address of Diagnostic Area on the module configuration screen – Modules Parameters tab in the MasterTool IEC XE, "XX" is the channel of analog input.

Symbolic Variable: Some symbolic variables serve to access diagnostics. These 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.



9.5. Hot Swap

This product supports hot swap. For further information about how to correctly perform a hot swap, consult Nexto Series User Manual - MU214600.

10. Manuals

For further technical details, configuration, installation and programming, 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 this product.

Code	Description	Language
CE114000	E114000 Nexto Series – Technical Characteristics	
CT114000	CT114000 Série Nexto – Características Técnicas	
CS114000	S114000 Serie Nexto – Características Técnicas	
MU214600	Nexto Series User Manual	English
MU214000	Manual de Utilização Série Nexto	Portuguese
MU299609	MasterTool IEC XE User Manual	English
MU299048	Manual de Utilização MasterTool IEC XE	Portuguese
MP399609	MasterTool IEC XE Programming Manual	English
MP399048	MP399048 Manual de Programação MasterTool IEC XE	
MU214608	MU214608 Nexto PROFIBUS-DP Head Utilization Manual	
MU214108	MU214108 Manual de Utilização da Cabeça PROFIBUS-DP Nexto	

Table 14: Related Documents

