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.

In this context, Nexto Jet is a selection of I/O modules that uses the existing CPUs and modules from Nexto Series to provide the best solution for applications in verticals like infrastructure, building, water, wastewater, food, machines and several OEM projects. Nexto Jet is ideal for systems with no hot-swapping and conformal coating requirements.

Finally, the module NJ6001 is a module that offers 6 individually configurable voltage or current analog inputs, which allow the reading of field sensors, and it is a module that uses one rack position.

Its main features are:

- 6 voltage or current inputs in a single width module
- Voltage scale support: 0 to 10 Vdc
- Current scale support: 0 to 20 mA and 4 to 20 mA
- Individual configuration per input
- Software configurable filters
- Galvanic isolation between inputs and internal logic
- Protection against surge voltage and polarity inversion
- External power supply fault diagnostic
- Individual diagnostic per channel
- Display for module diagnostics and input state indication
- Easy Plug System

ATTENTION

Starting from product revision AF, it was included the connector frontal cover (which was previously exclusive of NX models), thus adding the Easy Plug System feature to this product.

2. Ordering Information

2.1. Included Items

The product package contains the following items:

- NJ6001 module
- 20-terminal connector with wire holder

2.2. Product Code

The following code should be used to purchase the product:

Code	Description
NJ6001	6 AI Voltage/Current Module 12 Bits

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.

5. Product Features

5.1. General Features

	NJ6001
Backplane rack occupation	1 slot
Number of inputs	6 analog inputs
Input type	Voltage or current input, single ended, individually configured
Data format	12 bits in two's complement, justified to the left
Converter resolution	12 bits monotonicity guaranteed, no missing codes
Scanning time	1 ms with one channel enabled 2 ms with all channels enabled
Input state indication	Yes
One Touch Diag (OTD)	No
Electronic Tag on Display (ETD)	No
Status and diagnostic indication	Display, web pages and CPU's internal memory
Hot swap capability	No

	NJ6001
Module protections	Yes, protection against surge voltages and polarity inversion
Wire gauge	0,5 mm^2 (20 AWG)
Minimum wire temperature rating	75 °C
Wire material	Copper only
Isolation **Analog to logic** **Analog to protective earth** ⏚ **Logic to protective earth** ⏚	 1500 Vac / 1 minute 1000 Vac / 1 minute 1500 Vac / 1 minute
Current consumption from backplane rack power supply	200 mA
External Power Supply	19.2 to 30 Vdc
Maximum power dissipation	6 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
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:

External power supply: The terminals 19 and 20 are used to supply power to the analog inputs. NJ6001 internal logic is supplied by the Power Supply Module placed on the Nexto Backplane Rack.

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)
UKCA	S.I. 2016 No. 1091 (EMC) S.I. 2016 No. 1101 (Safety) S.I. 2012 No. 3032 (ROHS)
c UL us LISTED	UL/cUL Listed – UL 61010-1 UL 61010-2-201 (file E473496)

Table 4: Standards and Certifications

5.3. Voltage Mode Features

	NJ6001 – Voltage Input Mode		
	Range	Engineering Scale	Resolution
Scale	0 to 10 Vdc	0 to 30,000	2.5 mV
Precision	±0.3% of full scale rating @ 25 °C ±0.01% of full scale rating / °C		
Over scale	±3% of full scale rating		
Maximum input voltage	12 Vdc		
Scanning time	1 ms with one channel enabled 2 ms with all channels enabled		
Input impedance	> 1 MΩ		
Configurable parameters	Input Type Digital Filter Open Loop Value		
Low pass filter time constant	100 ms, 1 s, 10 s or disabled		

Table 5: Voltage Input Mode Features

5.4. Current Mode Features

	NJ6001 – Current Input Mode		
Scale	Range	Engineering Scale	Resolution
	0 to 20 mA	0 to 30,000	5.12 μA
	4 to 20 mA	0 to 30,000	5.12 μA
Precision	±0.3% of full scale rating @ 25 °C ±0.015% of full scale rating / °C		
Over scale	+3% of full scale rating		
Maximum input current	30 mA		
Input impedance	119 Ω		
Configurable parameters	Input Type Digital Filter Open Loop Value		
Low pass filter time constant	100 ms, 1 s, 10 s or disabled		

Table 6: Current Input Mode Features

5.5. Compatibility with Other Products

The following table provides information regarding the compatibility of the module NJ6001 and other Nexto Series products.

NJ6001		Compatible Software Version			
Version	**Revision**	**NX3004**	**NX3005**	**NX30x0**	**MasterTool IEC XE**
1.0.0.9 or higher	AA	1.6.1.0 or higher	1.6.1.0 or higher	1.6.1.0 or higher	3.02 or higher
1.1.0.0 or higher	AE	-	-	-	3.14 or higher to use the 4 to 20 mA scale

Table 7: Compatibility with Other Products

Note:

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

ATTENTION

The CPUs and racks of Nexto Series support the use of Nexto Jet Modules. The Nexto Jet is formed by I/Os modules and when used in configuration with CPUs of Nexto Series, no other I/O type of Nexto Series can be used in the same bus.

5.6. Physical Dimensions

Dimensions in mm.

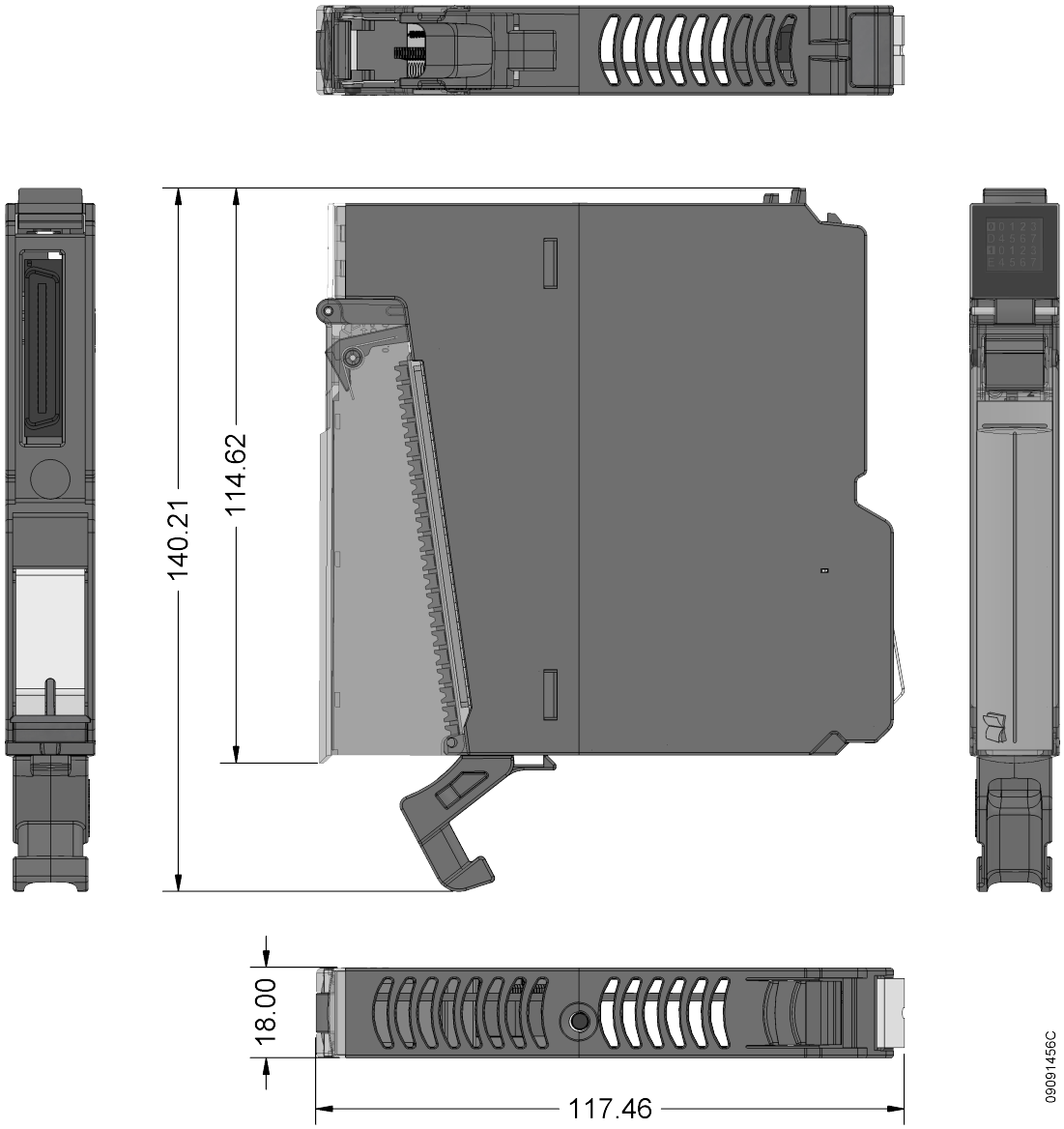

Figure 1: Physical Dimensions

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.

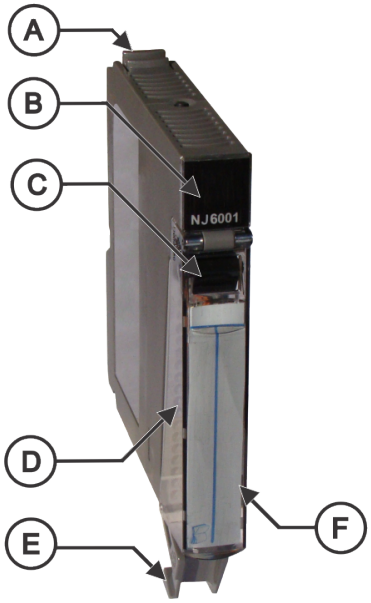

Figure 2: NJ6001

Ⓐ Fixing lock.
Ⓑ Status and diagnostic display.
Ⓒ Terminal block extraction lever.
Ⓓ Front cover.
Ⓔ 20 pin terminal block with wire holder.
Ⓕ Label for module identification.

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.

6.2. Electrical installation

The figure below shows an example where some inputs of NJ6001 are used: input 00, input 01 and input 03. Each input presents a different connection, explained below.

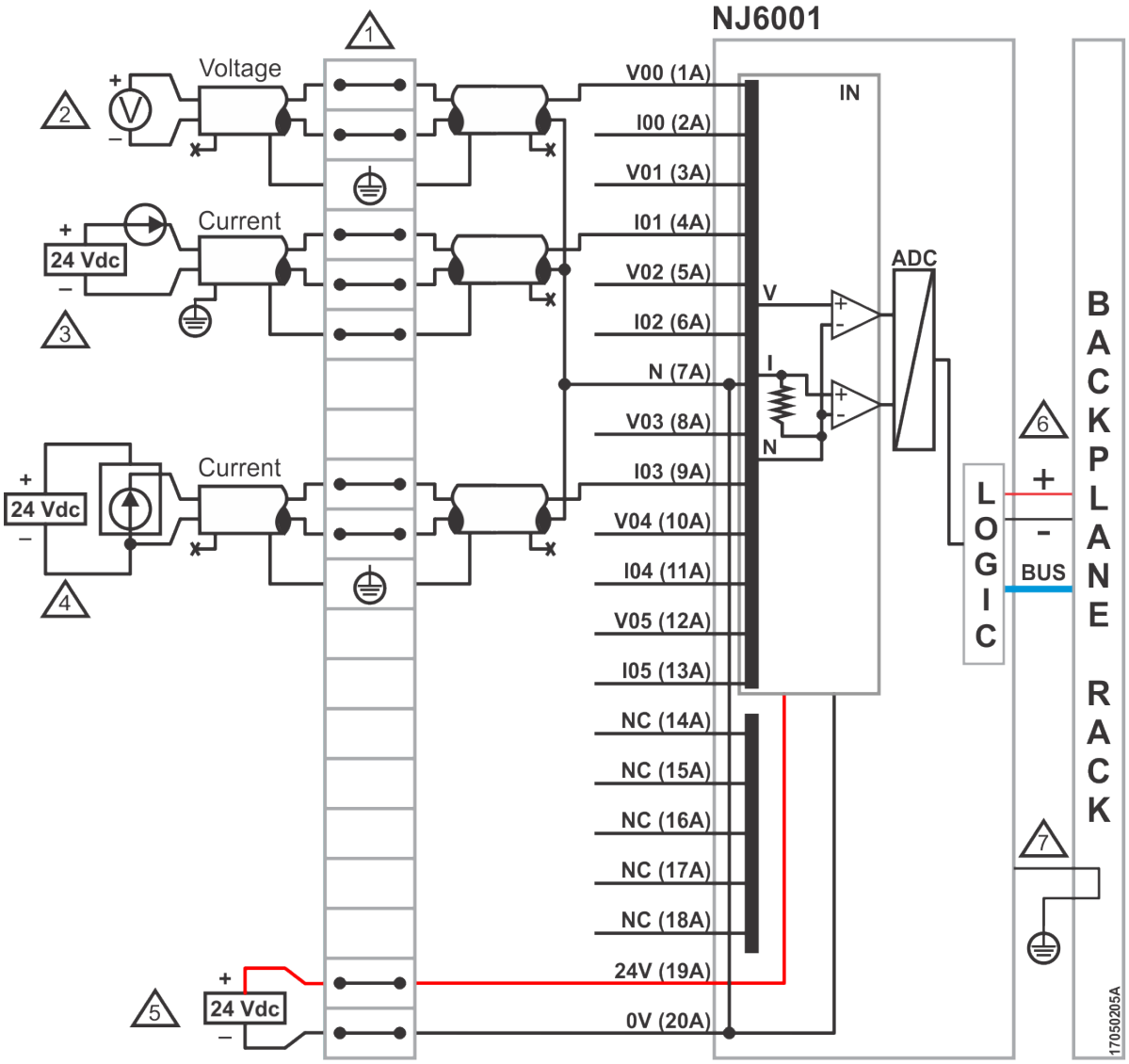

Figure 3: Electric Diagram

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 and ⏚ represents a grounding terminal block.

2. Input 00 is connected to a standard voltage output module, normally a transducer placed on the field. The cable shielding is connected to the grounding terminal block.

3. Input 01 is connected to a current output module, normally a transducer. This kind of transducer uses the same pins for power supply and current output. The cable shielding is connected to the earth close to the device on the field.

4. Input 03 is connected to a current output module, normally a transducer. This kind of transducer has different pins for power supply and for current output. The cable shielding is connected to the grounding terminal block.

5. The external power supply is connected to the pins 19A and 20A.

6. The power supply of the module internal logic is derived from the connection to the backplane rack, not requiring external connections.

7. NJ6001 module is connected to the protective earth ⏚ through the backplane rack.

⏚ Protective conductor terminal.

6.3. Connector Pinout

The following table shows the description of each connector terminal:

Terminal	Description
1A	Voltage input 00
2A	Current input 00
3A	Voltage input 01
4A	Current input 01
5A	Voltage input 02
6A	Current input 02
7A	Reference
8A	Voltage input 03
9A	Current input 03
10A	Voltage input 04
11A	Current input 04
12A	Voltage input 05
13A	Current input 05
14A	Not Connected
15A	Not Connected
16A	Not Connected
17A	Not Connected
18A	Not Connected
19A	24 Vdc
20A	0 Vdc

Table 8: Connector Pinout

Note:

NJ6001 module has no grounding terminals through the connector. The grounding is done through the terminal board or in the field sensor as described in the Electrical installation.

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.

ATTENTION

Products with broken warranty seal are not covered in warranty.

CAUTION

The device is sensitive to static electricity (ESD). Always touch in a metallic grounded object before handling it.

DANGER

Nexto Series can operate with voltage up to 250 Vac. Special care must be taken during the installation, which should only be done by qualified technical personnel. Do not touch on the wiring field when in operation.

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 that are used to access and control the module. The list below describes all variables delivered by NJ6001.

The table below presents the variables organizational structure in the CPU memory.

Besides these data, NJ6001 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	Analog Input 00	INT (Read)	Always
%IW(n+2)	WORD	AI 01	Analog Input 01	INT (Read)	Always
%IW(n+4)	WORD	AI 02	Analog Input 02	INT (Read)	Always
%IW(n+6)	WORD	AI 03	Analog Input 03	INT (Read)	Always
%IW(n+8)	WORD	AI 04	Analog Input 04	INT (Read)	Always
%IW(n+10)	WORD	AI 05	Analog Input 05	INT (Read)	Always

Table 9: Process Data

Note:

Update: The field “Update” indicates if the respective process data is updated by CPU and NJ6001 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 NJ6001

through the bus, to improve CPU performance, it's recommended to update only the process data that will be used in the application.

7.2. Module Parameters

Name	Description	Standard Value	Options	Configuration
Input Type	Set the Analog Input Type	Not Configured	Not Configured Voltage 0 - 10 Vdc Current 0 - 20 mA Current 4 - 20 mA	Per input
Digital Filter	Set the First order digital filter time constant	Disabled	Disabled 100 ms 1 s 10 s	Per input
Open Loop Value	Set value when in open loop condition (Only valid for 4 - 20 mA scale)	Disabled	0 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: Module Parameters

Notes:

Configuration: Indicates if the parameter is related to the entire module (per module) or if the parameter is related to a single input (per channel).

Input Type: Current 4 – 20 mA configuration is only available for firmware version 1.1.0.0 or higher.

Digital Filter: This parameter makes it possible to disable or enable, by input channel, a first order low pass digital filter with a time constant of 100 ms, 1 s or 10 s. If a signal is present on a channel with filter enabled and a terminal block 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.

Open Loop Value: Configures the behavior of the input variable when configured as a 4 – 20 mA input and the current is below 3 mA. For the NJ6001, Max Value is 30000. This configuration is only available for firmware version 1.1.0.0 or higher.

8. Usage

8.1. General Purpose Analog Read

NJ6001 has one variable for each input.

9. Maintenance

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

This module offers important features to assist users during the maintenance: Status and Diagnostics Indicators, Web Page with Complete Status and Diagnostics List, and Diagnostics Mapped to Variables.

9.1. Status and Diagnostics Indicators

Nexto I/O modules have a display with the following symbols: D, E, 0, 1 and numerical characters. The states of the symbols D, E, 0 and 1 are common for all Nexto Series I/O modules. These states can be consulted in the table below.

9.1.1. D and E States

D	E	Description	Cause	Solution	Priority
Off	Off	Display failure or module off	- Module disconnected; - External power supply failure; - Hardware failure.	Check: - If the module is completely 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 related to the module.	Check what the active diagnostic is. More information can be found at section Diagnostics Through Variables.	8
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 network between the MODBUS Client and the Head/Remote.	7
Blinking 3x	Off	Reserved	-	-	6
Blinking 4x	Off	Non-fatal fault	Failure in some hardware or software component, which does not have impact on the basic functionality of the product.	Check the module's diagnostic 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 communication between: - The module and the CPU; - The module and the Head/Remote; - The Head/Remote and the Field Network Master.	Check: - If the module is completely connected to the rack; - If the CPU is in RUN mode; - If the Fieldbus Master is in operation; - Network integrity between PROFIBUS Master and Head/Remote.	4

D	E	Description	Cause	Solution	Priority
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 parameterized.	Check: - If the module parameterization is correct; - Network integrity between PROFIBUS Master and Head/Remote; - Network integrity between PROFINET Controller 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.

9.1.2. 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 0 and 1 are used to group the numerical characters used for inputs. In NJ6001 module's case, only the character 0 is used and the characters that are placed at the right side of character 0 represent the inputs from 00 to 05, where character 0 represents the input 00 and character 5 represents the input 05. The figure below shows the relationship between the numerical characters and the respective inputs.

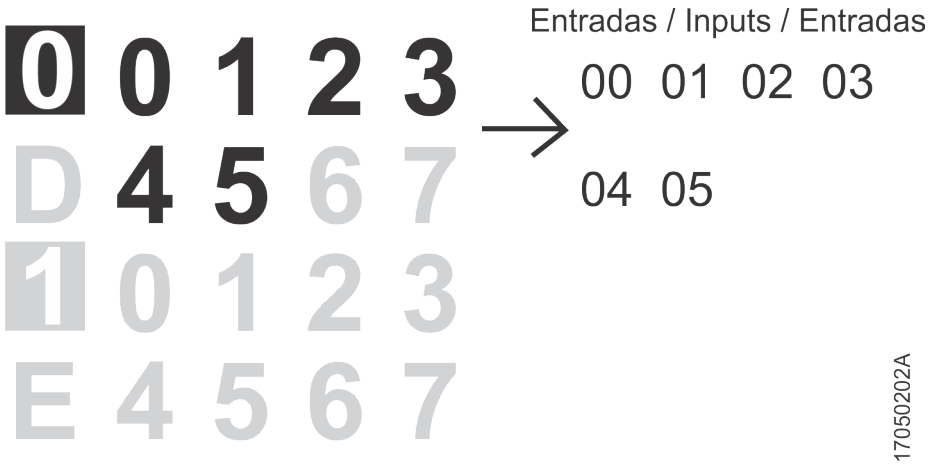

Figure 4: Display

9.2. 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).

9.3. 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.

9.3.1. General Diagnostics

Direct Variable		Diagnostic Message	Symbolic Variable DG_NJ6001.tGeneral.*	Description
Variable	**Bit**			
%QB(n)	0..7	Reserved		
%QB(n+1)	0	MODULE W/ DIAGNOSTIC	bActiveDiagnostics	TRUE – Module has active diagnostics
		NO DIAG		FALSE – Module doesn't have active diagnostic
	1	MODULE W/ FATAL ERROR	bFatalError	TRUE – Fatal error
		-		FALSE – No fatal error
	2	CONFIG. MISMATCH	bConfigMismatch	TRUE – Parameterization error
		-		FALSE – Parameterization ok
	3	WATCHDOG ERROR	bWatchdogError	TRUE – Watchdog has been detected
		-		FALSE – No watchdog
	4	Reserved		
	5	Reserved		
	6	NO EXTERNAL SUPPLY	bNoExternalSupply	TRUE – No external voltage
		-		FALSE – Power supply ok
	7	Reserved		

Table 12: General Diagnostics

9.3.2. Specific Diagnostics

Direct Variable		Diagnostic Message	Symbolic Variable DG_NJ6001.tSpecific.*	Description
Variable	**Bit**			
%QB(n+2)	0..7	Reserved		
%QB(n+3)	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 diagnosticsos
	6..7	Reserved		

Table 13: Specific Diagnostics

9.3.3. Detailed Diagnostics

Direct Variable		Diagnostic Message	Symbolic Variable DG_NJ6001.tDetailed.*	Description
Variable	**Bit**			
%QB(n+4+2*XX)	0..7	Reserved		
%QB(n+4+2*XX+1)	0	OVER RANGE	tAnalogInput_XX. bOverRange	TRUE – Input data is over range
		-		FALSE – Input data is ok
	1	Reserved		
	2	OPEN LOOP	tAnalogInput_XX. bOpenLoop	TRUE – Input is in open loop condition
		-		FALSE – Input is not in open loop condition
	3	-	tAnalogInput_XX. bInputNotEnable	TRUE – Input is not enabled
		-		FALSE – Input is enabled
	4..7	Reserved		

Table 14: Detailed Diagnostics

Notes:

Over Range: This diagnostic turns true when the input value is 1% of the full scale rating above the scale. E.g. for the 0 to 10 Vdc scale, over range diagnostic turns true for measurements above 10.1 Vdc.

Open Loop: This diagnostic turns true when the input is configured as a 4 – 20 mA input and its value is lower than 3 mA.

Direct Representation Variable: "n" is the address defined in the field %Q Start Address of Module Diagnostics Area on the NJ6001's configuration screen – Module 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 declare the diagnostics automatically on symbolic variables. All symbolic variables declared automatically can be found inside of Diagnostics object.

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	Nexto Series – Technical Characteristics	English
CT114000	Série Nexto – Características Técnicas	Portuguese
CS114000	Serie Nexto – Características Técnicas	Spanish
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	Manual de Programação MasterTool IEC XE	Portuguese
MU214608	Nexto PROFIBUS-DP Head Utilization Manual	English
MU214108	Manual de Utilização da Cabeça PROFIBUS-DP Nexto	Portuguese

Table 15: Related Documents