1. Product Description

NJ Line 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, NJ Line 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 NJ Line to be applied in small automation systems with high performance requirements, such as manufacturing applications and industrial machines.

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

Finally, the module NJ6000 is a module that offers 8 individually configurable voltage or current analog inputs and it is a module that uses one rack position.



Its main features are:

- 08 inputs in a single width module
- Different voltage scales support: 0 to 10 Vdc, -5 to 5 Vdc and -10 to 10 Vdc
- Different current scales support: 0 to 20 mA and 4 to 20 mA
- Individual configuration per input
- 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

ATTENTION

Starting from product revision AK, 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:

- NJ6000 module
- 20-terminal connector with wire holder

2.2. Product Code

The following code should be used to purchase the product:

Code	Description
NJ6000	8 AI Voltage/Current Module 16 Bits
NJ6000-C	8 AI Voltage/Current Module 16 Bits with Conformal Coating

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

This product 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: This product 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

	NJ6000
Backplane rack occupation	1 slot
Number of inputs	8 analog inputs
Input type	Voltage or 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)	No
Electronic Tag on Display (ETD)	No
Status and diagnostic indication	Display, web pages and CPU's internal memory
Hot swap capability	No
Module protections	Yes, protection against surge voltages
Wire gauge	0,5 mm^2 (20 AWG)
Minimum wire temperature rating	75 °C
Wire material	Copper only
Isolation **Input to logic** **Input to protective earth** ⏚ **Logic to protective earth** ⏚	 1500 Vac / 1 minute 1500 Vac / 1 minute 1250 Vac / 1 minute
Current consumption from backplane rack power supply	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	Optional, ordering code NJ6000-C
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: The conformal coating protects the electronics inside the product from moisture, dust and other harsh elements in electronic circuits.

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)
EAC	TR 004/2011 (LVD) CU TR 020/2011 (EMC)

Table 4: Standards and Certifications

5.3. Voltage Mode Features

	NJ6000 – Voltage Mode	
Scale	Range	Resolution
	0 to 10 Vdc	159.80 μV
	-5 to 5 Vdc	159.80 μV
	-10 to 10 Vdc	319.60 μV
Precision	$\pm$ 0.1% of full scale rating @ 25 °C $\pm$ 0.005% of full scale rating / °C	
Over scale	$\pm$ 4.8% of full scale rating	
Maximum input voltage	30 Vdc	
Scanning time	1 ms with one channel enabled 6 ms with all channels enabled	
Input impedance	> 1 MΩ	
Configurable parameters	Signal type per input Measurement range per input Filters Open loop value	
Noise suppression filter	60 Hz, 50 Hz, 16.6 Hz, 10 Hz or disabled	
Low pass filter	First order digital filter	
Low pass filter time constant	100 ms, 1 s, 10 s or disabled	

Table 5: Voltage Mode Features

5.4. Current Mode Features

	NJ6000 – Current Mode	
Scale	Range	Resolution
	0 to 20 mA	322.18 nA
	4 to 20 mA	322.18 nA
Precision	$\pm$ 0.1% of full scale rating @ 25 °C $\pm$ 0.005% of full scale rating / °C	
Over scale	$\pm$ 4.8% of full scale rating	
Maximum input current	30 mA	
Scanning time	1 ms with one channel enabled 6 ms with all channels enabled	
Input impedance	135 Ω, when in current input or non-configured mode	
Configurable parameters	Signal type per input Measurement range per input Filters Open Loop Value	
Noise suppression filter	60 Hz, 50 Hz, 16.6 Hz, 10 Hz or disabled	
Low pass filter	First order digital filter	
Low pass filter time constant	100 ms, 1 s, 10 s or disabled	

Table 6: Current Mode Features

Notes:

Input ranges: The presented resolutions are the optimal delivered by the hardware.

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

5.5. Compatibility with Other Products

The following table provides information regarding the compatibility of the module and programming tool Mastertool.

NJ6000		Software Version Compatible			
Version	**Revision**	**NX3004**	**NX30x0**	**NX5110**	**Mastertool**
1.3.0.0 or higher	AA or higher	1.5.1.0 or higher	1.5.1.0 or higher	1.1.1.0 or higher	2.03 or higher
1.4.0.0 or higher	AJ or higher	-	-	-	3.14 or higher to use “Disabled” as “Open Loop Value” option

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, racks and the PROFIBUS NX5110 remote head of NX Line support the use of Nexto Jet Modules. The Nexto Jet is formed by I/Os modules and when used in configuration with CPUs or PROFIBUS remote head of NX Line, no other I/O type of NX Line can be used in the same bus.

5.6. Physical Dimensions

Dimensions in mm.

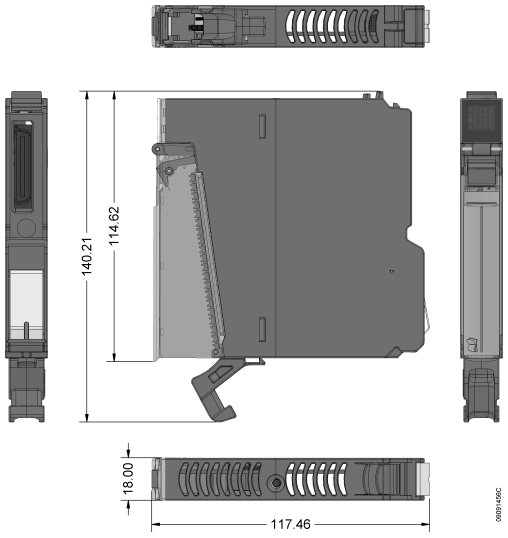


Figure 1: 18 mm I/O Module

6. Installation

For the correct installation of this product, it is necessary to use a 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.

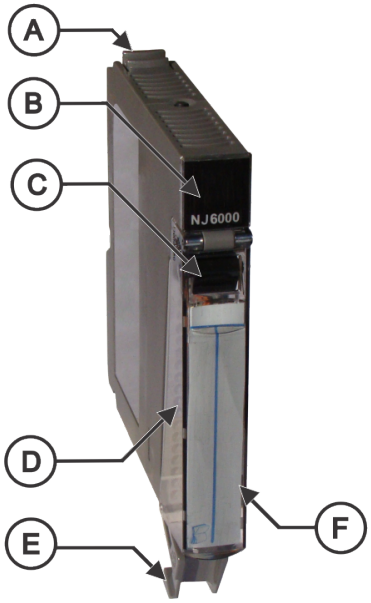


Figure 2: NJ6000

Ⓐ 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 four inputs are used: input 00, input 02, input 03 and input 06. Each input presents a different connection, explained below.

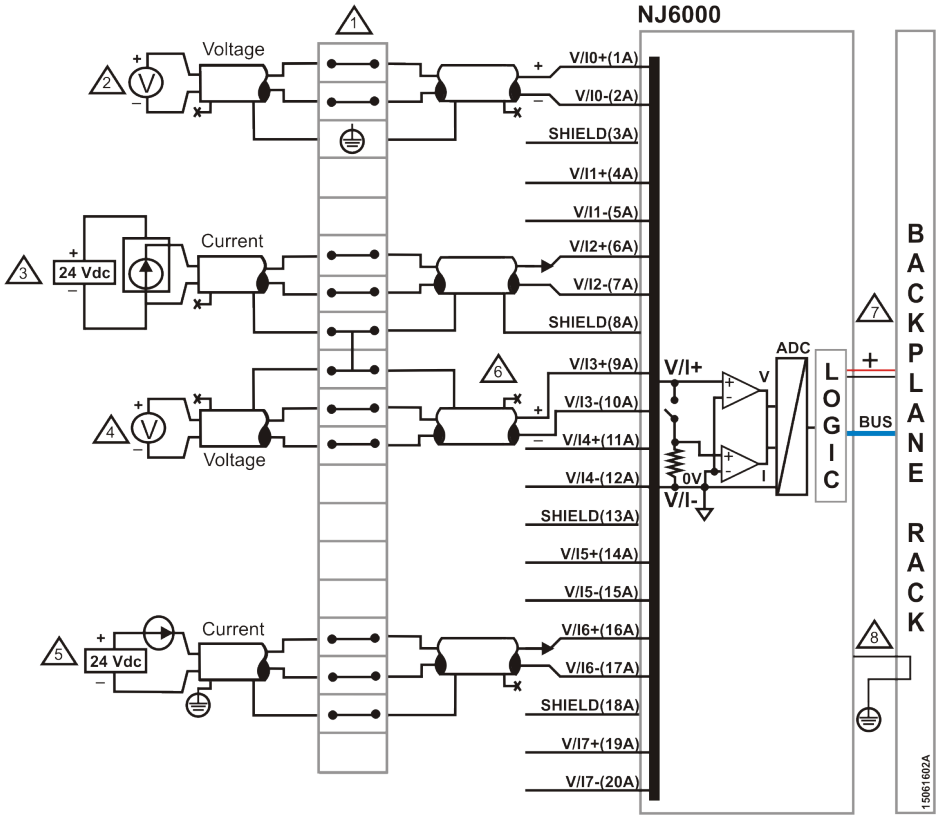


Figure 3: Electric Diagram

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

3. Input 02 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 SHIELD pin, which is shared with the input 03.

4. Input 03 is connected to a standard voltage output module, normally a transducer placed on the field. The cable shielding is connected to the SHIELD pin, which is shared with the input 02.

5. Input 06 is connected to a current output module, normally a transducer. This kind of transducer, different than the example above, uses the same pins for power supply and current output. In this case, only 4 to 20 mA scale is possible to be used. The cable shielding is connected to the earth close to the device on the field.

6. There is one SHIELD pin for each pair of analog inputs.

7. The module power supply is derived from the connection to the backplane rack, not requiring external connections.

8. NJ6000 is connected to the protective earth ⏚ through the backplane rack.

⏚ Protection earth terminal.

6.3. Connector Pinout

The following table shows the description of each connector terminal:

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

Table 8: Connector Pinout

6.4. Mechanical Assembly

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 System 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.

6.4.1. Module Insertion

The following example shows a generic module, this procedure must be followed for any module.

First the module lower part, which is used as a guide for the correct insertion, must be fit in the backplane rack, and then the guide pins are correctly placed in the right rack keyways for a specified position. Modules that use only one position in the rack has only one guide pin. The figure below shows how the module lower part must be positioned in relation to the rack for the correct insertion.

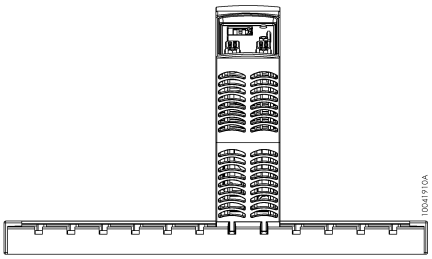


Figure 4: Module and Backplane Rack

After fitting the module lower part as described above, a rotation movement must be executed in order to fit the fixation lock in the rack upper part, as shown on figure below.

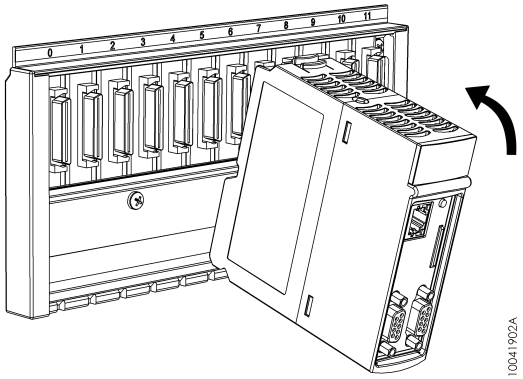


Figure 5: Backplane Rack Fitting Movement

If the user follows the described procedures correctly, the module will have been perfectly connected to the bus, as presented on figure below.

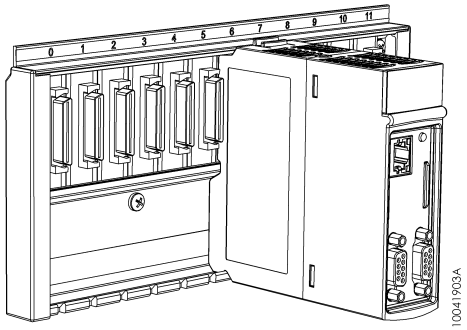


Figure 6: Module Correctly Placed in the Backplane Rack

The module mustn't be connected to the rack any other way. Wrong insertion of the module may cause irreversible damage to it. The figure below show how to NOT connect the modules to the rack.

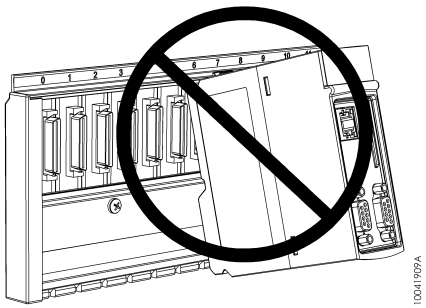


Figure 7: Wrong Insertion Way

6.4.2. Modules Removal

The following example shows a generic module, this procedure must be followed for any module.

First the fixation lock must be pressed (1), in order to unlock the module from the bus, then it must be rotate as shown on figure below(2).

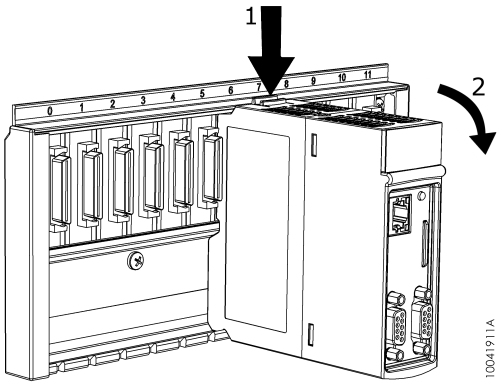


Figure 8: Bus Unlock

If the user follows the described procedures correctly, the module will have been perfectly disconnected from the bus and it can be taken off as presented on figure below.

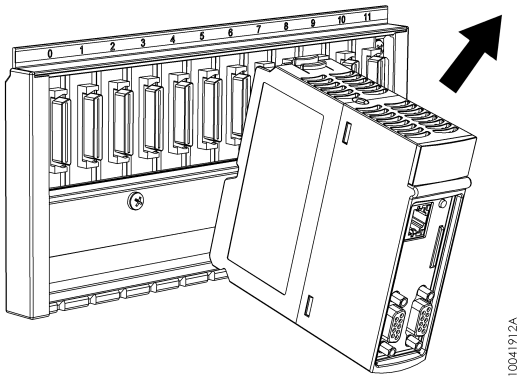


Figure 9: Module being Removed from the Backplane Rack

6.4.3. I/O Modules

6.4.3.1. Frontal cover

I/O modules have a frontal cover which has as main objective to protect the I/O connectors. Besides, the frontal cover has other functions which are described throughout the I/O Modules item.

To access the I/O connector the frontal cover must be opened pulling its lower extremity. The figure below indicated how it must be done.

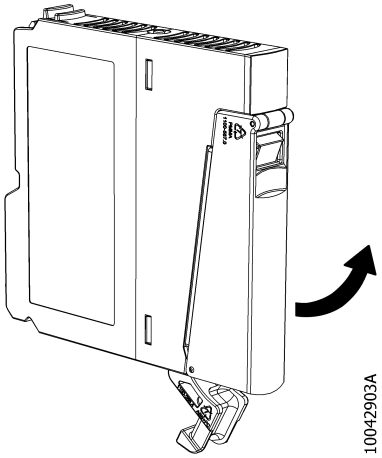


Figure 10: Opening the Frontal Cover

The figure below shows an I/O module with its frontal cover opened.

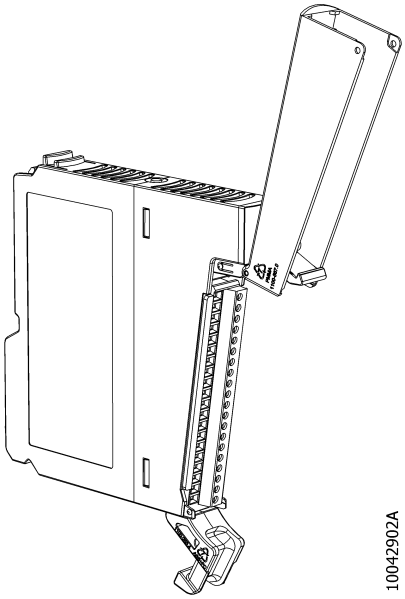


Figure 11: Frontal Cover Opened

6.4.3.2. I/O Connector Insertion

The simple width modules have an extra feature which helps the I/O terminal block insertion, described below. In case of double width module the insertion must be executed manually.

With the frontal cover opened, the terminal block must be inserted partially in the module, taking care to insert it in the right position. Then the frontal cover must be closed as indicated on figure below. Observe the connector partially connected.

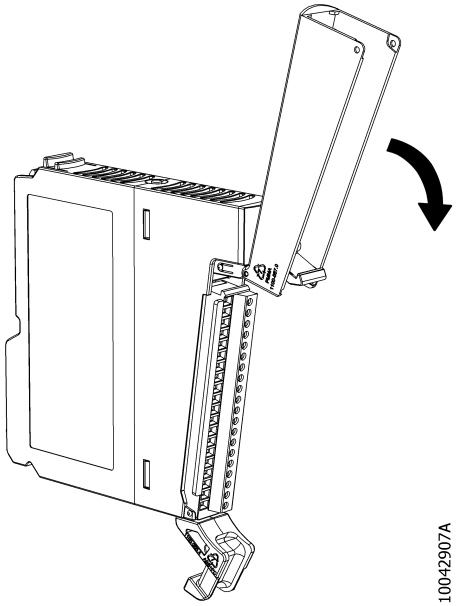


Figure 12: Closing the Frontal Cover

At closing the frontal cover the I/O connector block is inserted in the module. The movement must be done all the way down until the cover is in the final position, as presented on figure below.

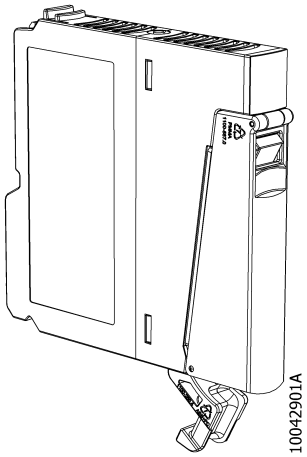


Figure 13: Module with the Frontal Cover Closed

6.4.3.3. I/O Connector Removal

The I/O modules have a feature to help the connector block removal, which is described below.

As described previously, to open the frontal cover, it's necessary to pull it by its lower part. When the I/O connector block must be removed, it's necessary to execute the same opening movement besides pressing the connector block extraction lever as shown on figure below. It's important to keep the extraction lever pressed during the whole movement since the beginning.

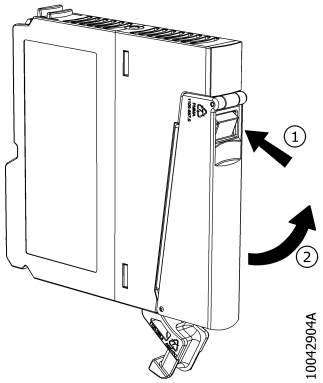


Figure 14: Movement to Remove the I/O Connector Block Modules

After the described movement, the I/O connector block is partially removed, simplifying the rest of its extraction. Such functionality is available both for the simple width modules as for the double width modules. In case of double width modules, each I/O connector has its own extraction lever. Therefore each connector must be removed individually.

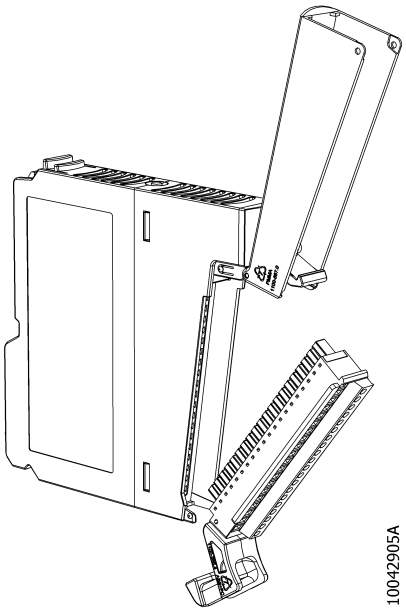


Figure 15: I/O Connector Block Removal Modules

6.4.3.4. I/O connector block

The connectors block from the I/O modules use the spring-connection for cable fixation, not needing screws for cable holding.

6.4.3.4.1. Identification

All I/O connector block pins are numbered. The 10 pins connectors are numbered from 1 to 10 and the 20 pins connectors block are numbered from 1 to 20. The relation between the pin number and its function is defined in the Connector Pinout section.

6.4.3.5. I/O module labels

6.4.3.5.1. Identification number and description

The modules have a frontal label, which has two functions: allow the user to identify and describe each module and indicate on a short way its installation diagram.

When the I/O modules frontal cover is closed, its identification number and description is visible, as shown on figure below. In this example the identification number is indicated by “XXXX” and the module description by “Description Altus S/A”.

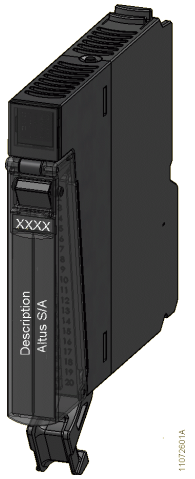


Figure 16: Module Identification

6.4.3.5.2. Installation Diagram

At opening the I/O frontal covers, the module installation diagram becomes visible, as presented on figure below.

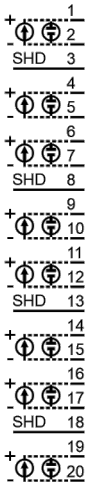


Figure 17: Installation Diagram

On table below are described all symbols used in the installation diagram.

Symbol	Meaning
1 2 3	The numbers on the left indicate the connector block pin number, e.g. on the figure on the left the pins 1, 2 and 3 are indicated.

Symbol	Meaning
	This symbol indicates a direct current power supply source. On this symbol the power supply polarity isn't specified. This means the user can choose the polarity according to his demands. The voltage must be compatible with the module characteristics.
	This symbol indicates a direct current source. On this symbol the conventional current flux is indicated by the direction of the arrow inside the circle.
-----	This symbol indicates that exist options to connect an input or output, according with the module characteristics.

Table 9: Installation Diagram Symbols

6.4.3.5.3. Label insertion and removal

To add the identification number and module description it's necessary to remove the I/O module frontal label as shown on figure below. This figure shows an I/O module frontal cover which uses one slot in the rack. The same procedure must be executed for modules that use two slots.

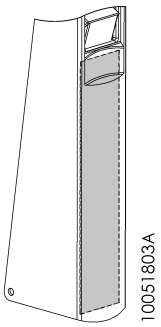


Figure 18: Label (1)

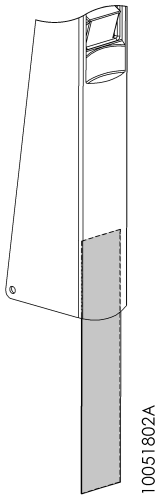


Figure 19: Label (2)

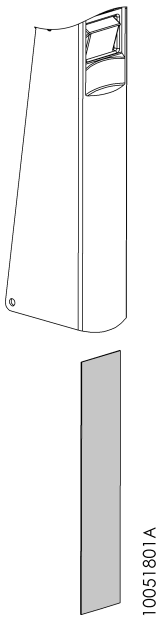


Figure 20: Label (3)

Care must be taken for a little lock existent in the frontal cover inner part. The label removal is only possible when it is directed over the lock. Besides, at inserting it again, the label must be placed over the frontal cover side locks in order to remain fixed. The figure below indicates the side lock position where 3 locks can be observed on each side.

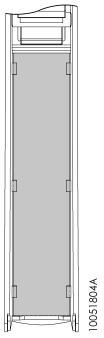


Figure 21: Label Fixation Locks

6.4.4. Spring-Connectors

This type of connector has a fixation system based on a high reliability spring even under vibration subjected environment. For its assembly it's recommended the use of a 3.5 mm wide screwdriver with isolated handle. The advantage of using this connector is the quick and easy electric cable assembly.

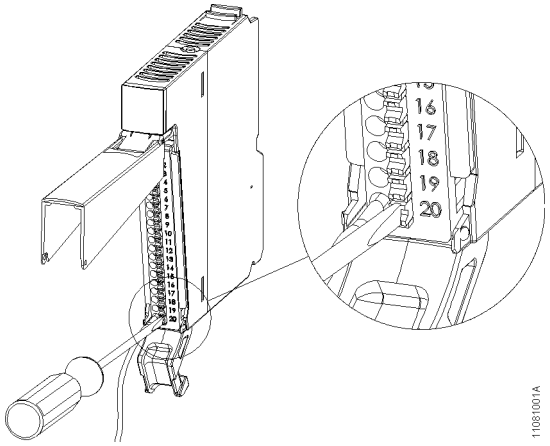


Figure 22: Spring Connection I/O Module

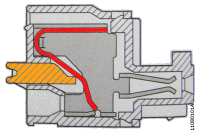


Figure 23: Spring Terminal Block

To assembly the cable in the connector:

- Insert the screwdriver in the terminal lever to open the spring
- Insert the cable terminal in the connector
- Remove the screwdriver to close the connector

6.4.4.1. Cable Insertion

In order to obtain an equal length in all cables connected to a same I/O connector block, it's recommended the following definition regarding the length difference which each cable beside another must obey before installation. It's important to stress that the biggest cable must be always the cable connected to the I/O connector pin 1.

6.4.4.2. 20-Pin Connector Block - NX9403

It's recommended the use of 0.5 mm^2 cables. Each cable must be cut with a difference of 4 mm as indicated on Figure 24. Each pin must have 0.5 mm^2 terminals crimped.

ATTENTION

Use single terminal with length A = 8 mm to guarantee the effective contact (see Figure 25).

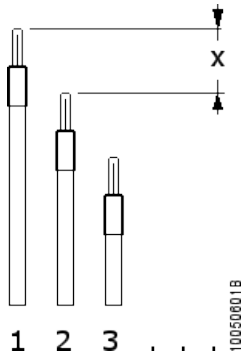


Figure 24: Wire Cutting

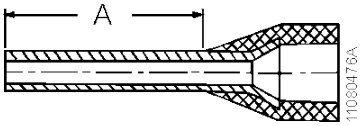


Figure 25: Terminal

6.4.4.3. Cable assembly

Insert the terminals in the connector block starting by pin 10, for the 10-pin connector block, or by pin 20, for 20-pin connector block. Certify that the terminals are completely inserted in the connector and correctly connected.

6.4.4.4. Cable fixation and Identification

It is recommended to use numbered wiring or cables with numbered conductors for wiring identification and Conexel identifier WKM 8/30 (PN: 1631910000) for cable identification. Turn the cables to place then under the I/O module frontal cover. Then, tie them together using plastic tie fixing in the wire holder placed on the connector lower part (see figure below).

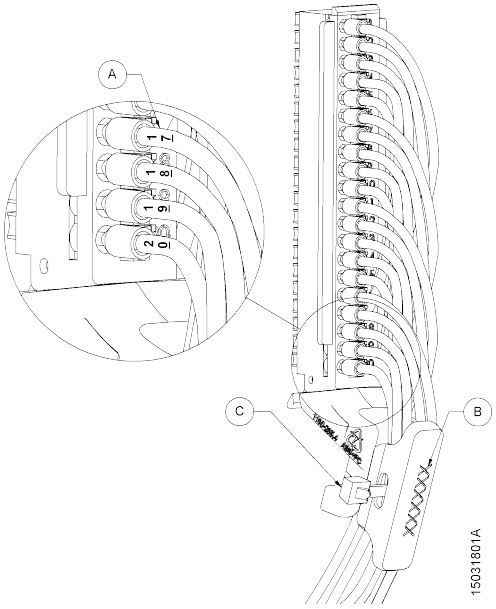


Figure 26: Cabling ID and Fixation

To identify the wiring:

- (A) Use numbered wiring or cables with numbered conductors

- (B) Use Conexel identifier WKM 8/30 (PN: 1631910000) for cable identification
- (C) Fix with plastic tie the identifier of the wires on the support (wire holder) located at the bottom of the connector

6.4.4.5. Cable removal

To remove the cables from the connector block it's recommended the use of a 3.5 mm wide screwdriver with isolated handle. It must be inserted in the lever beside the cable while the cable is pulled off.

7. Configuration

This module was developed to be used with NJ Line products. All Nexto System products are configured in Mastertool. 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	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
%IW(n+12)	WORD	AI 06	Analog Input 06	INT (Read)	Always
%IW(n+14)	WORD	AI 07	Analog Input 07	INT (Read)	Always

Table 10: Process Data

Note:

Update: The field "Update" indicates if the respective process data is updated by CPU and NJ6000 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 NJ6000 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 integers and can be configured in two ranges, from -30,000 to +30,000 (default) or from 0 to +30,000 using the new parameter introduced in Mastertool 3.75 and firmware version 1.14.71.0 of the NX5x10 module.

7.2. Module Parameters

Name	Description	Standard Value	Options	Configuration
Noise Suppression Filter	Frequency of the noise filter	60 Hz	Disabled 10 Hz 16.6 Hz 50 Hz 60 Hz	Per module
Type	Type and scale of a given input	Voltage 0 - 10 Vdc	Not configured Voltage 0 - 10 Vdc Voltage ±5 Vdc Voltage ±10 Vdc Current 0 - 20 mA Current 4 - 20 mA	Per input
Min Value	Minimum value for engineering scale	0 (see note)	-	Per input
Max Value	Maximum value for engineering scale	30000	-	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 11: Module 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 define the engineering scale value that corresponds to the initial and end points of selected analog scale. They can be configured to any value between -30,000 and +30,000, as long as the maximum value is greater than the minimum value.

Open Loop Value: “Disabled” option only available for firmware version 1.4.0.0 or higher.

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. It is important to consider the delays presented in the table below while developing an application.

Noise Suppression Frequency	Conversion Time (per Input)
Disabled	600 μs
10 Hz	200 ms
16.6 Hz	120 ms
50 Hz	40 ms
60 Hz	35 ms

Table 12: Noise Suppression Filter

8. Usage

8.1. General Purpose Input Read

NJ6000 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 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

All 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 this line of 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
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 13: 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 and outputs. In NJ6000 module's case, the characters that are placed at the right side of character 0 represent the inputs from 00 to 07, where character 0 represents the input 00 and character 7 represents the input 07. The characters that are placed at the right side of character 1 and the segment 1 itself are not used in NJ6000 module. The figure below shows the relationship between the numerical characters and the respective inputs.

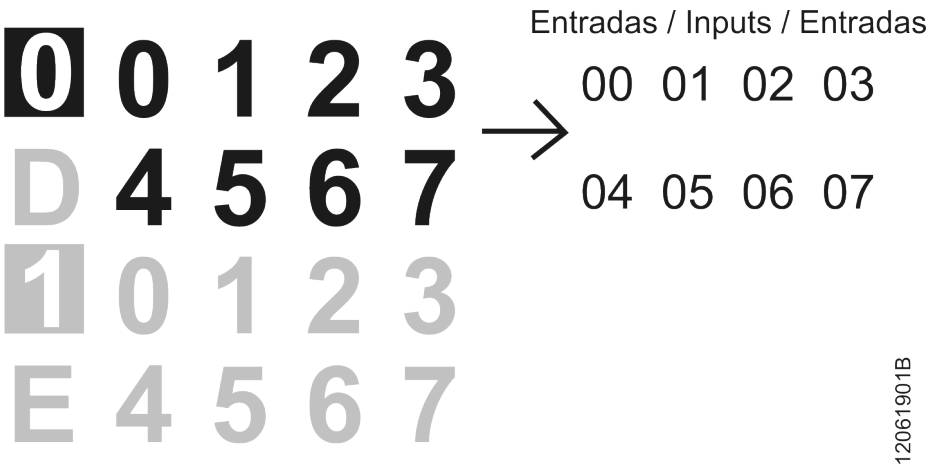


Figure 27: Display

9.2. Web Page with Complete Status and Diagnostics List

Another way to access diagnostics information is via web pages. The CPU's has an embedded web page server that provides all 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.

9.3. Diagnostics Through Variables

All diagnostics can be accessed through symbolic variables that can be handled by the user application or even forwarded to a supervisory system using a communication channel. The tables below show all available diagnostics and their respective symbolic variables, description and string that will be shown on the CPU graphical display and web.

9.3.1. General Diagnostics

Diagnostic Message	Symbolic Variable DG_NJ6000.tGeneral.*	Description	PROFIBUS Message Code
INPUT 00 W/ DIAG	bActiveDiagnosticsInput00	TRUE – Input 00 has active diagnostics	-
-		FALSE – Input 00 has no active diagnostics	
INPUT 01 W/ DIAG	bActiveDiagnosticsInput01	TRUE – Input 01 has active diagnostics	-
-		FALSE – Input 01 has no active diagnostics	
INPUT 02 W/ DIAG	bActiveDiagnosticsInput02	TRUE – Input 02 has active diagnostics	-
-		FALSE – Input 02 has no active diagnostics	
INPUT 03 W/ DIAG	bActiveDiagnosticsInput03	TRUE – Input 03 has active diagnostics	-
-		FALSE – Input 03 has no active diagnostics	
INPUT 04 W/ DIAG	bActiveDiagnosticsInput04	TRUE – Input 04 has active diagnostics	-
-		FALSE – Input 04 has no active diagnostics	
INPUT 05 W/ DIAG	bActiveDiagnosticsInput05	TRUE – Input 05 has active diagnostics	-
-		FALSE – Input 05 has no active diagnostics	
INPUT 06 W/ DIAG	bActiveDiagnosticsInput06	TRUE – Input 06 has active diagnostics	-
-		FALSE – Input 06 has no active diagnostics	
INPUT 07 W/ DIAG	bActiveDiagnosticsInput07	TRUE – Input 07 has active diagnostics	-
-		FALSE – Input 07 has no active diagnostics	
MODULE W/ DIAGNOSTIC	bActiveDiagnostics	TRUE – Module has active diagnostics	-
NO DIAG		FALSE – Module has no active diagnostics	
MODULE W/ FATAL ERROR	bFatalError	TRUE – Fatal error	25
-		FALSE – No fatal error	
CONFIG. MISMATCH	bConfigMismatch	TRUE – Parameterization error	26
-		FALSE – Parameterization ok	
WATCHDOG ERROR	bWatchdogError	TRUE – Watchdog has been detected	27
-		FALSE – No watchdog	
CALIBRATION ERROR	bCalibrationError	TRUE – Module without calibration	29
-		FALSE – Module calibrated	

Table 14: General Diagnostics

9.3.2. Detailed Diagnostics

Diagnostic Message	Symbolic Variable DG_NJ6000.tDetailed .tAnalogInput_XX.*	Description	PROFIBUS Message Code
OVER RANGE	bOverRange	TRUE – Input data is over range	24
-		FALSE – Input data is ok	
UNDER RANGE	bUnderRange	TRUE – Input data is under range	25
-		FALSE – Input data is ok	
OPEN LOOP	bOpenLoop	TRUE – Input is open	26
-		FALSE – Input is ok	
-	bInputNotEnable(1)	TRUE – Input is not enable	-
-		FALSE – Input is enable	

Table 15: 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 diagnostic 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 diagnostic turns true when the input value is 1% of the full scale rating below the scale. E.g. for the 0 to 10 Vdc scale, under range diagnostic turns true for measurements below -0.1 Vdc.

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.

Symbolic Variable: Diagnostics are accessed through the symbolic variables listed in the tables above. Mastertool declares them automatically, and all of them can be found in the 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	Technical Characteristics of the NX and NJ Lines	English
CT114000	Características Técnicas das Linhas NX e NJ	Portuguese
MU299611	Mastertool X User Manual	English
MU299049	Manual de Utilização Mastertool X	Portuguese
MU299609	MasterTool IEC XE User Manual	English
MU299048	Manual de Utilização MasterTool IEC XE	Portuguese
MP399609	IEC 61131 Programming Manual	English
MP399048	Manual de Programação IEC 61131	Portuguese
MU214608	Nexto NX NX5110, NX5210 User Manual	English
MU214108	Manual de Utilização Nexto NX NX5110, NX5210	Portuguese

Table 16: Related Documents