1. Features of the Nexto Series

Figure 1: Nexto Series

Nexto Series is a powerful and complete Programmable Logic Controller (PLC) series with exclusive and innovative features. Due to its flexibility, functional design, advanced diagnosis resources and modular architecture, Nexto PLC can be used for control systems in small, medium and large applications.

Nexto Series architecture has a great variety of input and output modules. These modules combined with a powerful high performance CPU and a high speed bus based on Ethernet, fit to several applications such as high speed control for small machines, complex distributed processes, redundant applications and systems with a large number of I/O as building automation. Furthermore, Nexto Series has modules for motion control, communication and interface to the most popular field networks among other features.

Nexto Series uses an advanced technology in its bus, which is based on a high speed Ethernet, allowing input and output information and data to be shared among all modules of the system. The I/O modules can be easily divided and distributed throughout the whole field, allowing the use of bus expansion with the same performance of a local module.

Furthermore Nexto Series presents a complete tool for user programming, configuring, simulation and debug: MasterTool IEC XE. It's flexible and easy-to-use software which offers six programming languages defined by IEC 61131-3 standard: Structured Text (ST), Sequential Function Chart (SFC), Function Block Diagram (FBD), Ladder Diagram (LD), Instructions List (IL) and Continuous Function Chart (CFC). MasterTool IEC XE allows the use of different languages in the same application providing to the user a powerful way to organize the application and reuse codes from previous applications.

Other modules of Nexto Series made the Nexto Jet solution, which is an ideal set of inputs and outputs for small and medium application size, beyond distributed systems. The solution presents high performance and compact modules that are used together with the CPUs, racks, communication and fieldbus modules, besides MasterTool IEC XE software. The Nexto Jet modules add more versatility and competitiveness to the consecrated Nexto Series, keeping the flexibility, modular architecture and advanced diagnosis resources.

2. Module List

Following is the complete list of modules. Please contact your sales representative to check availability and lead times. For further information, please refer to the product documentation of each module.

2.1. CPUs – Central Processing Units

- **NX3003:** CPU, 1 Ethernet port, 1 serial channel, 14 digital inputs, 10 digital outputs, local I/O modules support and power supply integrated
- **NX3004:** CPU, 1 Ethernet port, 1 serial channel, remote rack expansion support and power supply integrated
- **NX3005:** CPU, 1 Ethernet port, 1 serial channel, remote rack expansion support, power supply integrated and user web pages support
- **NX3008:** CPU, 3 Ethernet port, 1 USB, 1 serial, 1 CAN, memory card interface, remote rack expansion support, power supply integrated and user web pages support
- **NX3010:** High-speed CPU, 1 Ethernet port, 2 serial channels, memory card interface and remote rack expansion support
- **NX3020:** High-speed CPU, 2 Ethernet ports, 2 serial channels, memory card interface and remote rack expansion support
- **NX3030:** High-speed CPU, 2 Ethernet ports, 2 serial channels, memory card interface, remote rack expansion and redundancy support
- **NX3035:** High-speed CPU, 6 Ethernet ports, 2 SFP ports, 1 serial channel, memory card interface, remote rack expansion and redundancy support

2.2. Fieldbus Interfaces

- **NX5000:** Ethernet Module
- **NX5001:** PROFIBUS-DP Master Module
- **NX5100:** MODBUS TCP Head
- **NX5101:** MODBUS TCP Head without hot swap, with 14 digital inputs and 10 digital outputs
- **NX5110:** PROFIBUS-DP Head
- **NX5210:** PROFIBUS-DP Redundant Head

2.3. Input Modules

Nexto:

- **NX1001:** 24 Vdc 16 DI Module
- **NX1006:** 24 Vdc 8 DI Monitored Module
- **NX6000:** 8 AI Voltage/Current Module 16 Bits
- **NX6010:** 8 AI Thermocouple Module
- **NX6014:** 8 AI Current Module with HART
- **NX6020:** 8 AI RTD Module

Nexto Jet:

- **NJ1001:** 24 Vdc 16 DI Module
- **NJ6000:** 8 AI Voltage/Current Module 16 Bits
- **NJ6001:** 6 AI Voltage/Current Module 12 Bits
- **NJ6010:** 8 AI Thermocouple Module
- **NJ6011:** 4 AI Thermocouple Module
- **NJ6020:** 8 AI RTD Module

2.4. Mixed I/O Modules

Nexto:

- **NX1005:** 24 Vdc 8 DO Transistor / 8 DI Mixed Module

Nexto Jet:

- **NJ1005:** 24 Vdc 8 DO Transistor / 8 DI Mixed Module
- **NJ6005:** 6 AI & 4 AO Voltage/Current Mixed Module 12 Bits

2.5. Output Modules

Nexto:

- **NX2001:** 24 Vdc 16 DO Transistor Module
- **NX2020:** 16 DO Relay Module
- **NX2025:** 24 Vdc 8 DO Monitored Module
- **NX6100:** 4 AO Voltage/Current Module 16 Bits
- **NX6134:** 4 AO Current Module 16 Bits with HART

Nexto Jet:

- **NJ2001:** 24 Vdc 16 DO Transistor Module
- **NJ6100:** 4 AO Voltage/Current Module 16 Bits
- **NJ6101:** 4 AO Voltage/Current Module 12 Bits

2.6. Power Supply Modules

- **NX8000:** 30 W 24 Vdc Power Supply Module

2.7. Racks

- **NX9000:** 8-Slot Backplane Rack
- **NX9001:** 12-Slot Backplane Rack
- **NX9002:** 16-Slot Backplane Rack
- **NX9003:** 24-Slot Backplane Rack
- **NX9010:** 8-Slot Backplane Rack (No Hot Swap)
- **NX9020:** 2-Slot base for panel assembly

2.8. Special Modules

- **NX4000:** Bus Expansion Module
- **NX4010:** Redundancy Link Module

2.9. Software

- MT8500 MasterTool IEC XE LITE
- MT8500 MasterTool IEC XE BASIC
- MT8500 MasterTool IEC XE PROFESSIONAL
- MT8500 MasterTool IEC XE ADVANCED
- MT8800 MasterTool Safety

2.10. Accessories

- **NX9100:** Left/Right Side Rack Ends
- **NX9101:** 32 GB microSD memory card with miniSD and SD adapters
- **NX9102:** Rack Connector Cover
- **NX9202:** RJ45-RJ45 2 m Cable
- **NX9205:** RJ45-RJ45 5 m Cable
- **NX9210:** RJ45-RJ45 10 m Cable
- **NX9401:** 6-terminal connector
- **NX9402:** 10-terminal connector with cable guides
- **NX9403:** 20-terminal connector with cable guides
- **NX9404:** 6-terminal connector with fixing
- **NX9405:** 12-terminal connector with fixing
- **NX9406:** 18-terminal connector with fixing
- **NX9500:** Gigabit SFP multimode fiber transceiver (550m)
- **NX9501:** Gigabit SFP single-mode fiber transceiver (10Km)

3. 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.

VPN: Nexto products have an embedded VPN service, which creates a private tunnel that connects directly to the CPU. This functionality, available on some models of the family, allows accessing a control network remotely and completely securely..

FTP: Supporting FTP-type connections, the series equipment is able to exchange data with a server that uses this same technology model. This functionality allows the files generated by the controller, such as logs collected through a datalogger function, to be accessed remotely.

Linux: Another innovative feature of the series is its embedded Linux platform. The feature makes possible the virtualization of software developed for operating systems with Unix technology. The feature gives more versatility and speed to the operation of the system, as it allows the processing of multiple data within the CPU itself.

Battery Free Operation: Nexto Series does not require any kind of battery for memory maintenance and real time clock operation. This feature is extremely important because it reduces the system maintenance needs and allows the use in remote locations where maintenance can be difficult to be performed. Besides, this feature is environmentally friendly.

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.

Multiple Block Storage: Several kinds of memories are available to the user in Nexto Series CPUs, offering the best option for any user needs. These memories are divided in volatile memories and non-volatile memories. For volatile memories, Nexto Series CPUs offer addressable input (%I), addressable output (%Q), addressable memory (%M), data memory and redundant data memory. For applications that require non-volatile functionality, Nexto Series CPUs bring retain addressable memory (%Q), retain data memory, persistent addressable memory (%Q), persistent data memory, program memory, source code memory, CPU file system (doc, PDF, data) and memory card interface.

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.

OFD – On Board Full Documentation: Nexto Series CPUs are capable of storing the complete project documentation in its own memory. This feature can be very convenient for backup purposes and maintenance, since the complete information is stored in a single and reliable place.

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.

DHW – Double Hardware Width: Nexto Series modules were designed to save space in user cabinets or machines. For this reason, Nexto Series delivers two different module widths: Double Width (two backplane rack slots are required) and Single Width (only one backplane rack slot is required). This concept allows the use of compact I/O modules with a high-density of I/O points along with complex modules, like CPUs, fieldbus masters and power supply modules.

High-speed CPU: All Nexto Series CPUs were designed to provide an outstanding performance to the user, allowing the coverage of a large range of applications requirements.

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..

4. Architecture

Nexto Series is capable of addressing many different applications ranging from small high-speed machinery automation to large complex process automation. For this reason, the system is very flexible and modular enabling many different configurations without compromising cost and performance.

The modules Nexto and Nexto Jet cannot be used together in the same bus, it means that, the usage of mixed modules in the same bus local/remote is not valid, consequently the application will not be executed by the chosen CPU.

The architecture is divided in the following main components:

4.1. CPU

The CPU is responsible for the execution of all logic and control functions. The basic CPU cycle is composed by: reading inputs, running application algorithms and logic, writing outputs and providing communication processes with the supervision system and fieldbus networks.

4.2. Power Supply Module (PSU)

The power supply module provides power to the modules installed on the backplane racks. Each rack must have its own power supply module. Application power requirements are shown in the configuration tool.

4.3. Backplane Bus

A typical system consists of a local rack (CPU and its local I/O modules) and remote racks (sets of remote I/O modules). For the local rack, Nexto Series architecture delivers a state-of-the-art high-speed real-time 100 Mbps Ethernet backplane bus technology. Since it is Ethernet based, the local rack bus can be easily extended to remote racks using standard Ethernet cables (up to 100 m) and devices called bus expansion modules. These devices convert the internal signals to the standard Ethernet 100BASE-TX media. Bus expansions can be used in redundant mode to obtain an extremely reliable architecture. Each backplane rack can have up to 24 modules and the system can address up to 25 racks.

4.4. Backplane Racks

The backplane racks have special aluminum chassis with a printed circuit board where all modules are connected. They are assembled directly to the panel and deliver high immunity against EMI and ESD (if the recommended grounding rules are performed during installation phase).

4.5. I/O Modules

The I/O modules are plugged into the racks for adapting the different types of field signals to the CPU or fieldbus heads. Nexto Series supports a wide variety of I/O types and operating ranges, thus covering all the typical needs for an automation system. The Nexto modules are hot-swappable, meaning that they can be unplugged without turning the system off or removing the power and the modules that make part of Nexto Jet solution does not support this functionality. Due to isolation features, some I/O modules must be supplied by external power supplies.

4.6. Fieldbus Head

The fieldbus heads connect Nexto Series modules to different fieldbus networks. They can communicate with CPUs from different vendors, supporting several protocols like MODBUS, PROFINET, PROFIBUS-DP and others.

4.7. Fieldbus Interface

The fieldbus interfaces are fieldbus master nodes and allow the access to remote modules or other equipment based on major industry fieldbus, like PROFIBUS-DP, MODBUS and others. The fieldbus interfaces are plugged into local racks and use two I/O module slots.

4.7.1. Application Examples

4.7.1.1. Compact CPU

This architecture explores the needs of compact applications. A CPU with integrated power supply (NX3003, NX3004, NX3005 or NX3008), 8 positions rack and input and output modules enable the reduction of space and cost in your project.

These architectures presented in Figure 2 and Figure 3 are the most indicated to be used in machinery automation. It is important to note that the Nexto and Nexto Jet modules cannot be used simultaneously at the same bus, or the architecture is formed with Nexto or Nexto Jet modules.

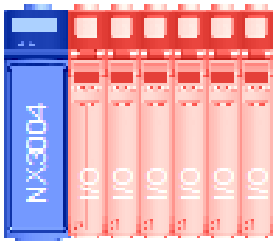

Figure 2: Compact CPU with Nexto Modules

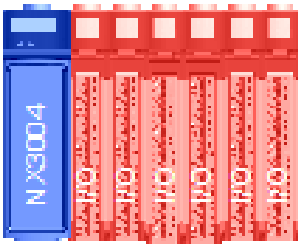

Figure 3: Compact CPU with Nexto Jet Modules

4.7.1.2. Single CPU

This architecture is based on a single rack, called base rack. This rack is populated with a CPU, a power supply module (PSU) and the required I/O modules for the application, as shown on Figure 4. The modules order must follow the configuration rules presented in the configuration tool.

This architecture is intended for use in small applications, like machinery automation.

The same architecture using Nexto Jet modules can be checked in Figure 5 following.

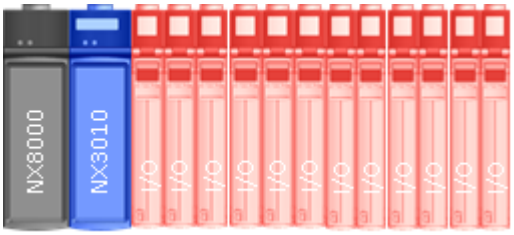

Figure 4: Single CPU with Nexto Modules

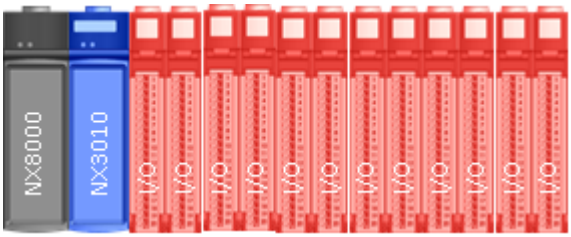

Figure 5: Single CPU with Nexto Jet Modules

4.7.1.3. Single CPU with Remote Rack Expansion

This architecture is based on a base rack (where the CPU is placed) and remote racks. The communication between the base rack and remote racks is done via the bus expansion module. Each remote rack needs its own power supply module (PSU) and bus expansion module. Each expansion module can be located 100 m far from the other using standard shielded CAT5 Ethernet cables. The expansion module has two RJ45 ports, where one port is for incoming data and another one for outgoing data. In this application example, the base rack expansion module is connected using only one cable and leaving the incoming data port open. The last remote rack has the outgoing data port open. The remote racks in between, will have both ports connected: one port connected to previous rack and the other to the next rack. Each expansion module has a switch for selecting the rack number. Each rack must have a unique address.

When this kind of architecture is used, it is important to remember that in case of Nexto modules usage, only this type of module can be used in the local and/or expansion rack. The same is true in case of Nexto Jet modules usage. The next architectures that follow in Figure 6 and Figure 7 are examples with Nexto and Nexto Jet modules.

This architecture is intended for medium to large applications, where the number of I/O points is high.

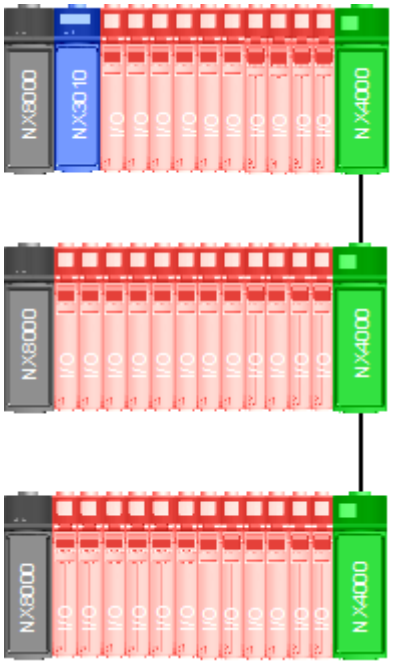

Figure 6: Single CPU with Remote Rack Expansion and Nexto Modules

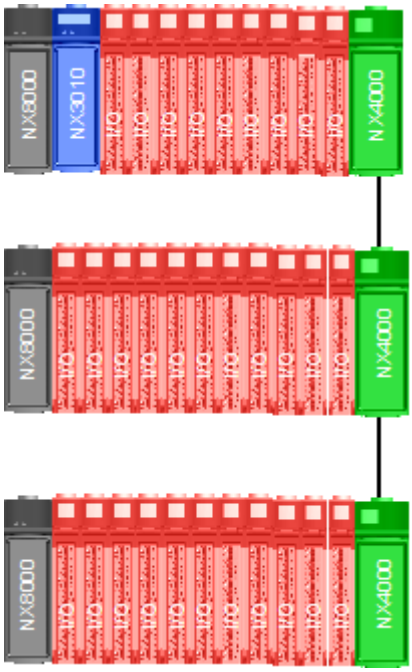

Figure 7: Single CPU with Remote Rack Expansion and Nexto Jet Modules

4.7.1.4. Single CPU with Remote Rack Expansion and Loopback

This architecture is based on the previous one with a base rack (where the CPU is placed) and remote racks. The communication between the base rack and remote racks is also made via the bus expansion module. The only difference is that the outgoing data port in the last bus expansion module is connected to the base rack expansion module incoming data port. This architecture allows the system to keep the I/O access even in the case of a single failure on extension cables. The CPU will detect the damaged cable, re-route the internal data paths to override this failure and generate user diagnostics. This feature is interesting for fast maintenance with the system powered on and it increases the overall system availability.

When this kind of architecture is used, it is important to remember that in case of Nexto modules usage, only this type of module can be used in the local and/or expansion rack. The same is true in case of Nexto Jet modules usage. The next architectures that follow in Figure 8 and Figure 9 are examples with Nexto and Nexto Jet modules.

This architecture is intended for medium to large applications, where the number of I/O points is high and there is the need of higher availability.

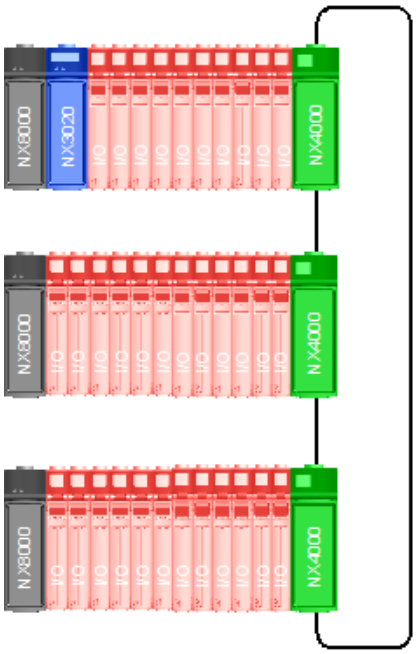

Figure 8: Single CPU with Remote Rack Expansion, Loopback and Nexto Modules

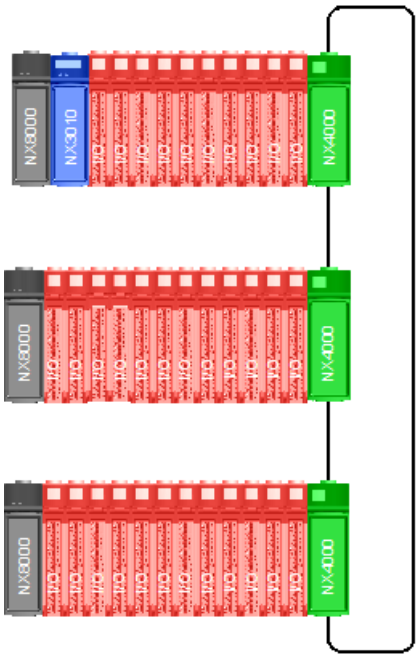

Figure 9: Single CPU with Remote Rack Expansion, Loopback and Nexto Jet Modules

4.7.1.5. Single CPU with Redundant Rack Expansion and Loopback

This architecture is based on the use of two bus expansion modules in the racks. With more than one expansion module, the system has an outstanding availability, because it supports single cable failure or expansion module failure. Just as the previous architecture, this is intended for systems where maintenance is an issue and the system must be available for a longer time. In this architecture, the racks must be mounted as the following diagram, where the expansion modules are located side by side on the last slot positions. Besides, there are unused expansion module ports that must be left unconnected.

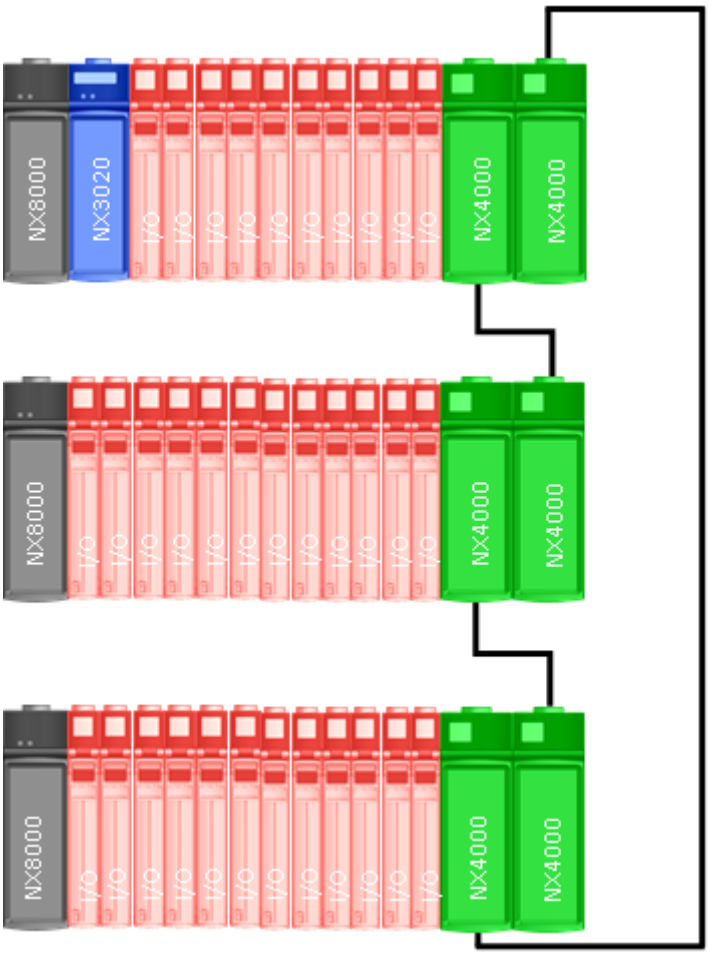

Figure 10: Single CPU with Redundant Rack Expansion and Loopback Bus

4.7.1.6. Fieldbus Interfaces

This architecture is based on the use of fieldbus interfaces to access networks for distributing remote I/Os and other third-party devices.

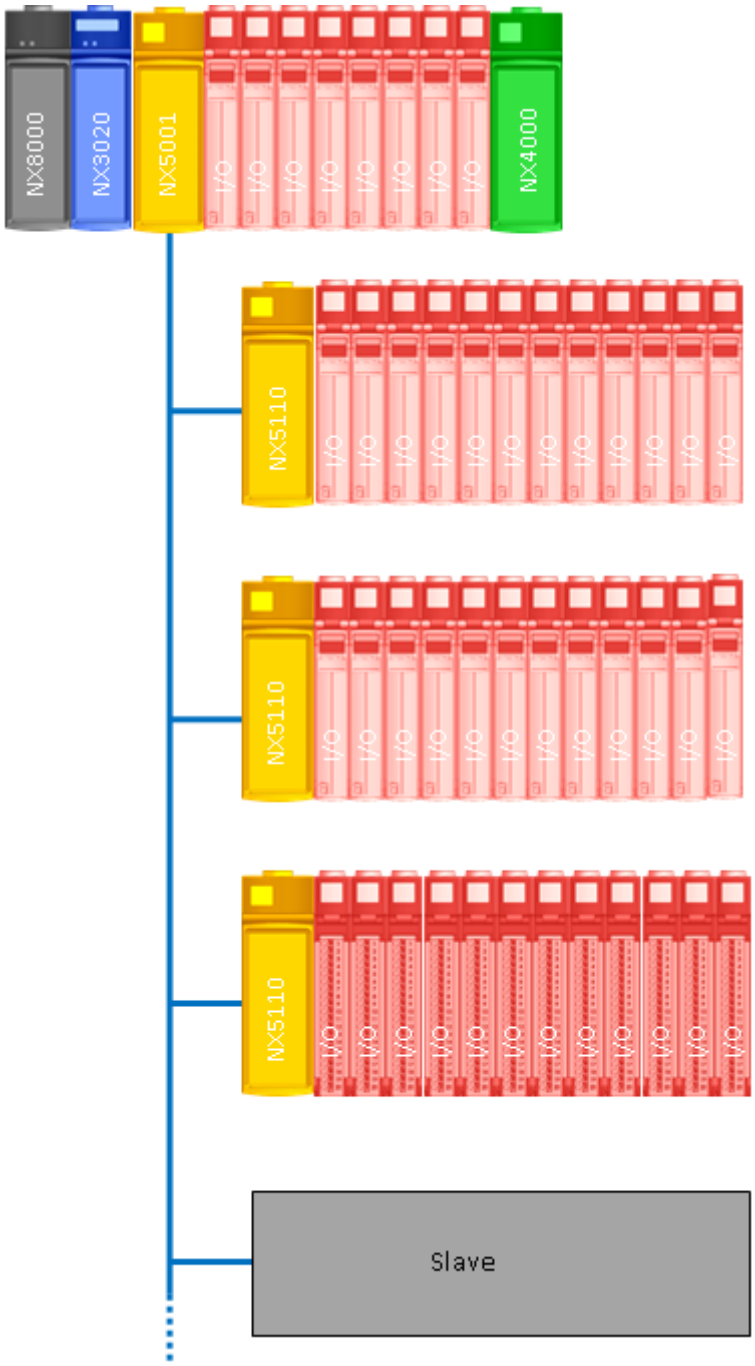

Figure 11: Fieldbus Interfaces

4.7.1.7. Fieldbus Interfaces with Redundancy

This architecture is based on the previous one with the difference of using two fieldbus interfaces for accessing the same network. Since it has two interfaces, the network is redundant, providing a system with higher availability.

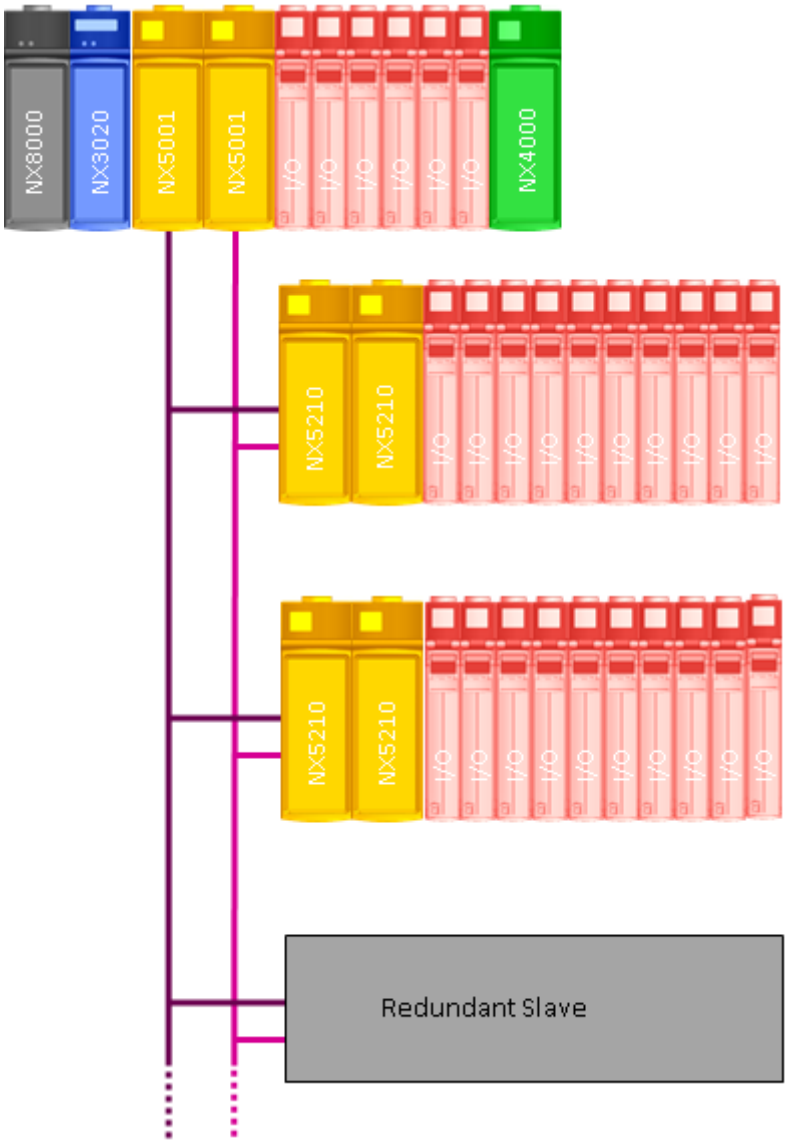

Figure 12: Fieldbus Interfaces with Redundancy

ATTENTION

The modules that comprise the solution Nexto Jet not support any kind of redundancy, so its use is not allowed in architectures as described in this section.

4.7.1.8. MODBUS TCP Head

This architecture is based on the use of fieldbus MODBUS interfaces to access networks for distributing remote I/Os and other third-party devices.

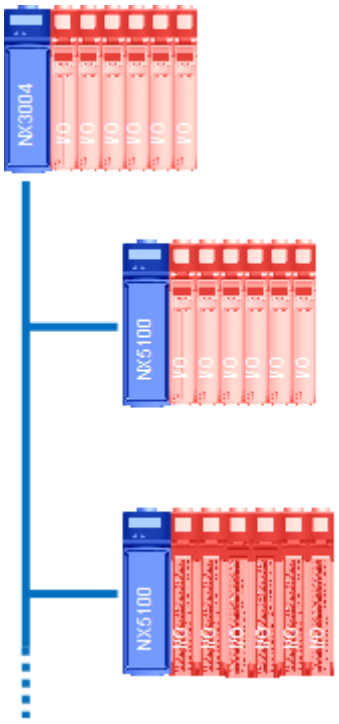

Figure 13: MODBUS TCP Head

4.7.1.9. CPU Redundancy

For very critical applications, Nexto Series is capable of having redundancy of CPUs. The CPU models with these features are the CPU NX3030 and NX3035. These CPUs can be located in different racks (known as half clusters). In this architecture, the system will have one controller running the control task (primary controller) and another one acting as the standby controller with all current system status for automatic switchover in the event of a primary controller failure. This means that critical processes are not affected by control system hardware failures. The results are: an increased productivity, a minimized downtime and low maintenance times.

The communication between the controllers is established at the end of each CPU cycle through two high-speed redundancy links.

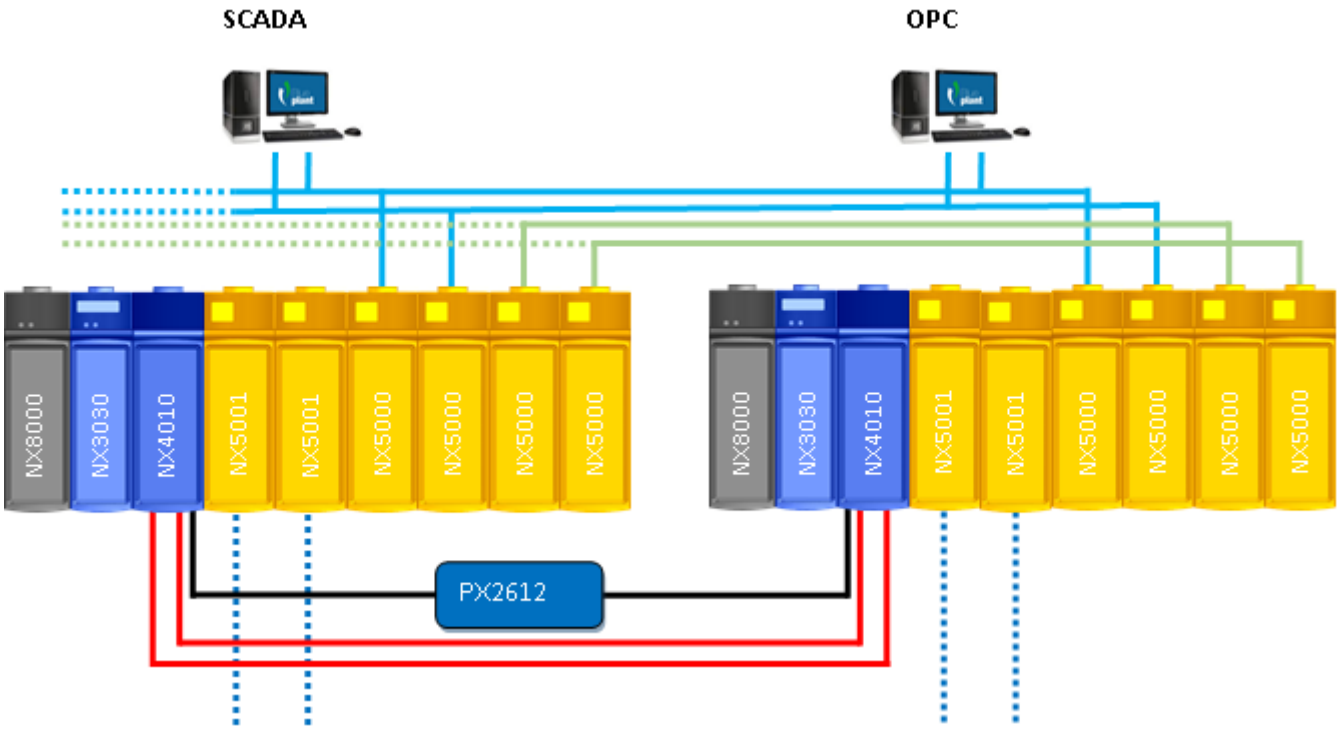

Figure 14: NX3030 - CPU Redundancy

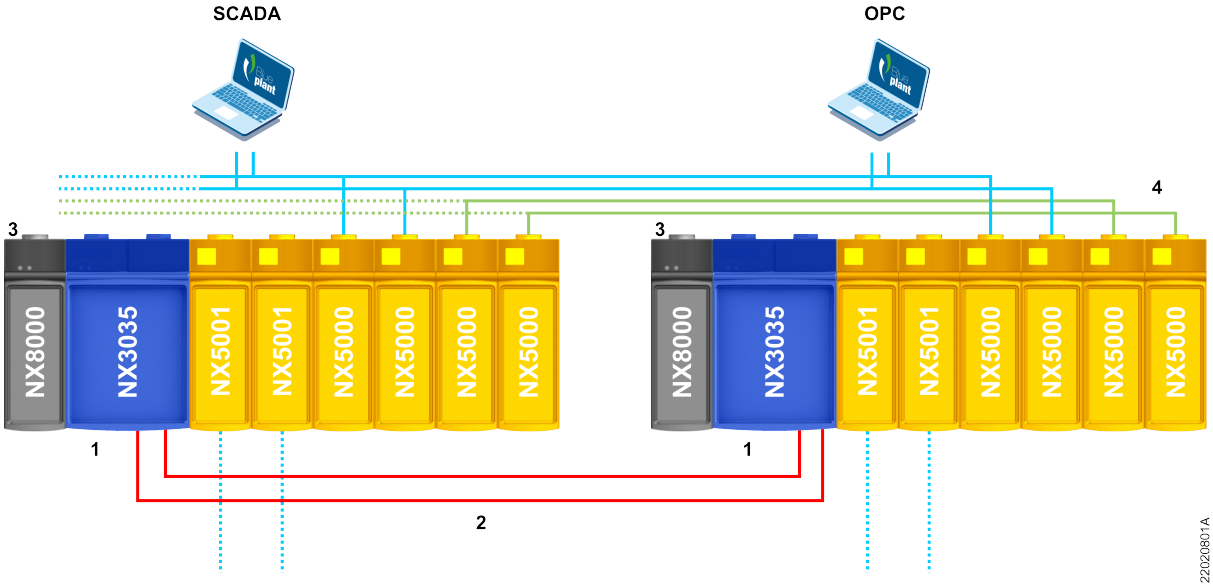

Figure 15: NX3035 - CPU Redundancy

At the center of a two half cluster redundant system, there is a pair of redundant CPUs. The redundancy links – between the two CPUs – have two channels, so single failures on each channel will not affect system performance.

The Active CPU executes the application program and controls the remote I/O. The Standby CPU is put as a background resource, ready to take over if necessary. In the case of the NX3030, the standby CPU is connected to the active CPU via a high-speed link in the Redundancy Link Module. This module must be located on the right side of the CPU, in rack positions that support this functionality. For the NX3035, the standby CPU is connected to the active CPU via fiber optics through two 1 Gbps communication ports, called NETA and NETB. In the event of an unexpected failure affecting the active CPU, the standby system switches over automatically, changing execution of the application program and control of the I/O over to the standby CPU, with an up-to-date data context. Once they had switched over, the standby CPU becomes the active CPU.

Configuration of both systems shall be identical. CPU modules will be placed at identical slots in both systems. After power on, one of the CPUs operates as active and another CPU enters standby mode. Active CPU will update the system status of standby CPU at the end of every scan. So the standby CPU is always updated with latest I/O status and results of program execution in the active CPU. This application is easy to set up, with no special programming or parameterization needed by the user.

4.7.1.10. NX3030 - Minimum Configuration of a Redundant PLC (Without PX2612 Panel Usage)

The redundant PLC is composed at least by two half-clusters identically, where each half-cluster is formed of the following modules:

- rack where the modules are inserted, and can be NX9000, NX9001, NX9002 and NX9003
- power supply NX8000
- the CPU NX3030
- the module NX4010

The Figure 16 shows an example of minimum configuration of a redundant PLC, that can be used with the NX9000 rack.

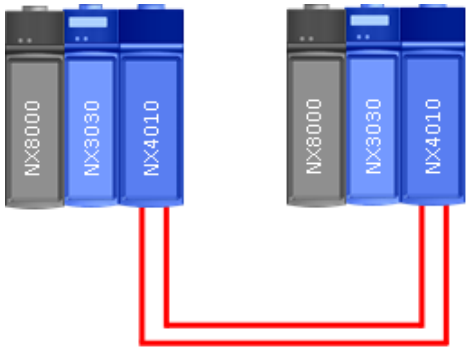

Figure 16: Minimum Configuration of a Redundant PLC - NX3030

4.7.1.11. NX3035 - Minimum Configuration of a Redundant PLC

The redundant PLC is composed at least by two half-clusters identically, where each half-cluster is formed of the following modules:

- rack where the modules are inserted, and can be NX9000, NX9001, NX9002 and NX9003
- power supply NX8000
- the CPU NX3035

The Figure 17 shows an example of minimum configuration of a redundant PLC, that can be used with the NX9000 rack.

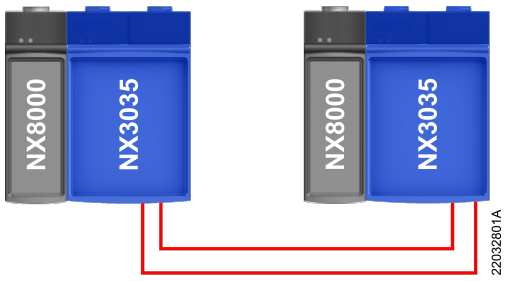

Figure 17: Minimum Configuration of a Redundant PLC - NX3035

4.7.1.12. CPU & Network Interface Modules Redundancy

As shown in the previous diagram, this architecture has network modules with protocols based on Ethernet. There are two network modules for each purpose: a control network for CPU to CPU communication and a supervision network for SCADA and OPC usage. Both half clusters must have two interfaces for each network, forming a full redundant system with CPU, network interface and physical layer redundancy.

5. Dimensions

There are different module sizes in Nexto Series, depending on the module type.

5.1. 18 mm Nexto I/O Module

This module size is used in I/O modules which fills one slot in the backplane rack.
Dimensions in mm.

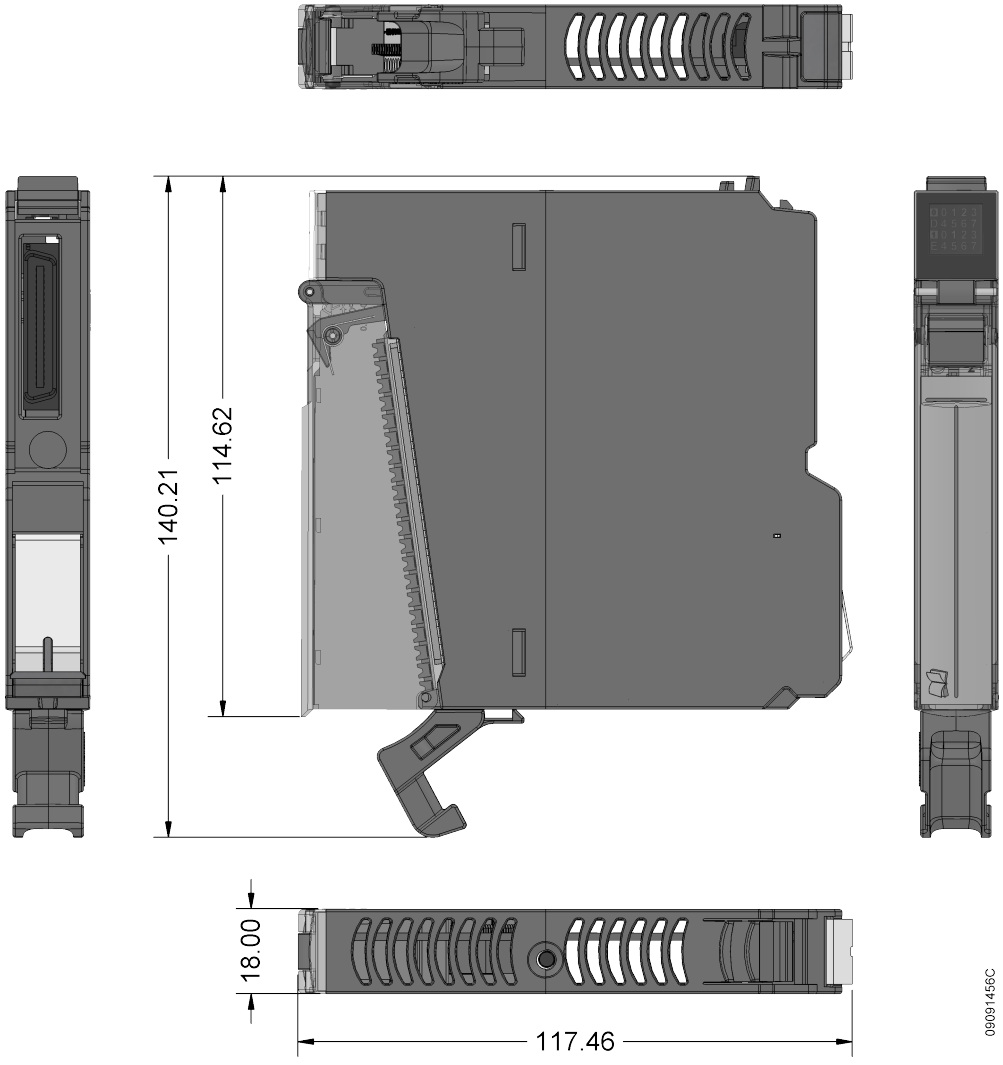

Figure 18: Nexto 18mm I/O Module

5.2. 18 mm Nexto Jet I/O Module

This module size is used in I/O modules that composes the Nexto Jet solution and which fills one slot in the backplane rack.

Dimensions in mm.

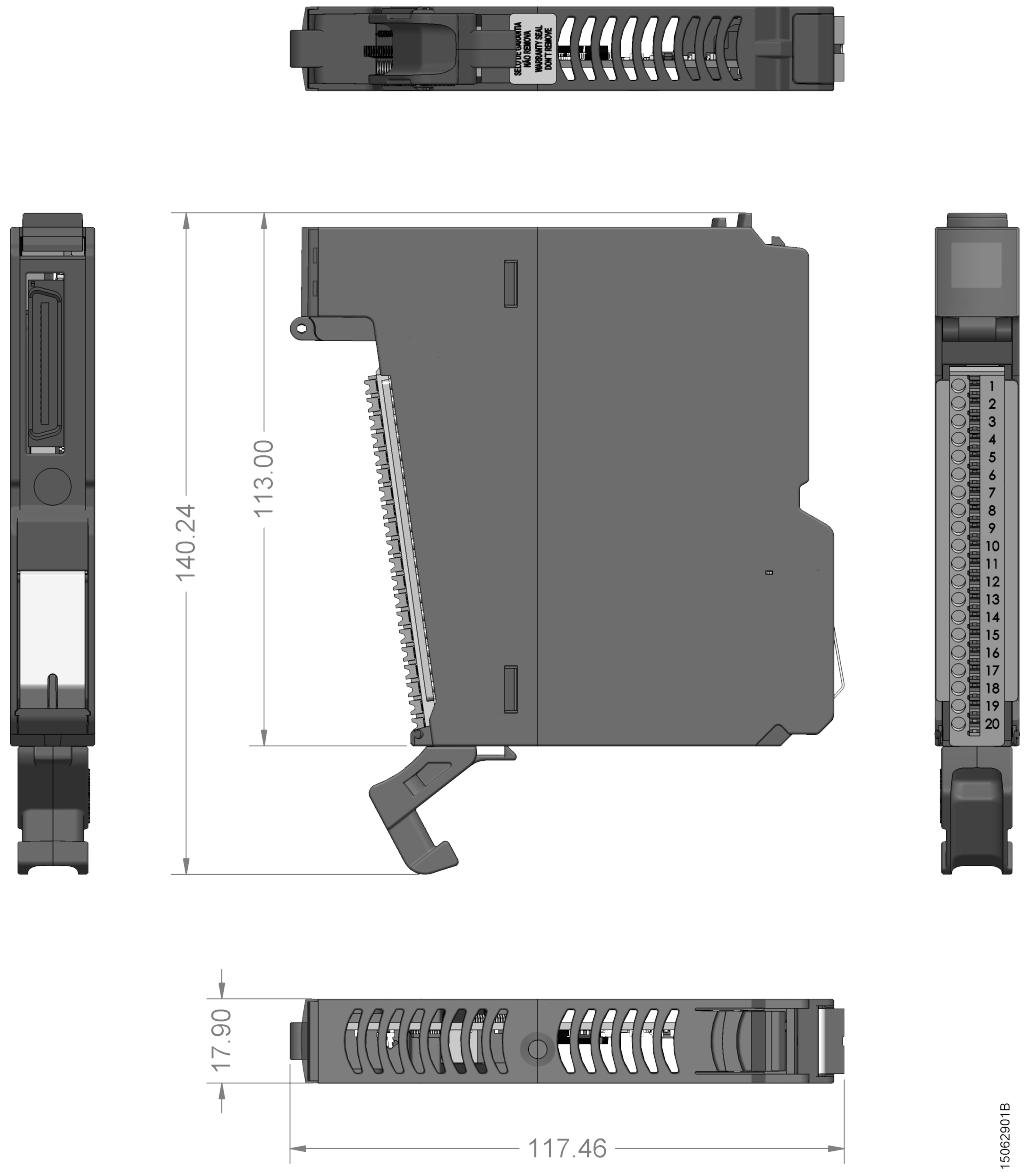

Figure 19: Nexto Jet 18mm I/O Module

5.3. 36 mm Nexto I/O Module

This module size is used in I/O modules which fills two slots in the backplane rack.
Dimensions in mm.

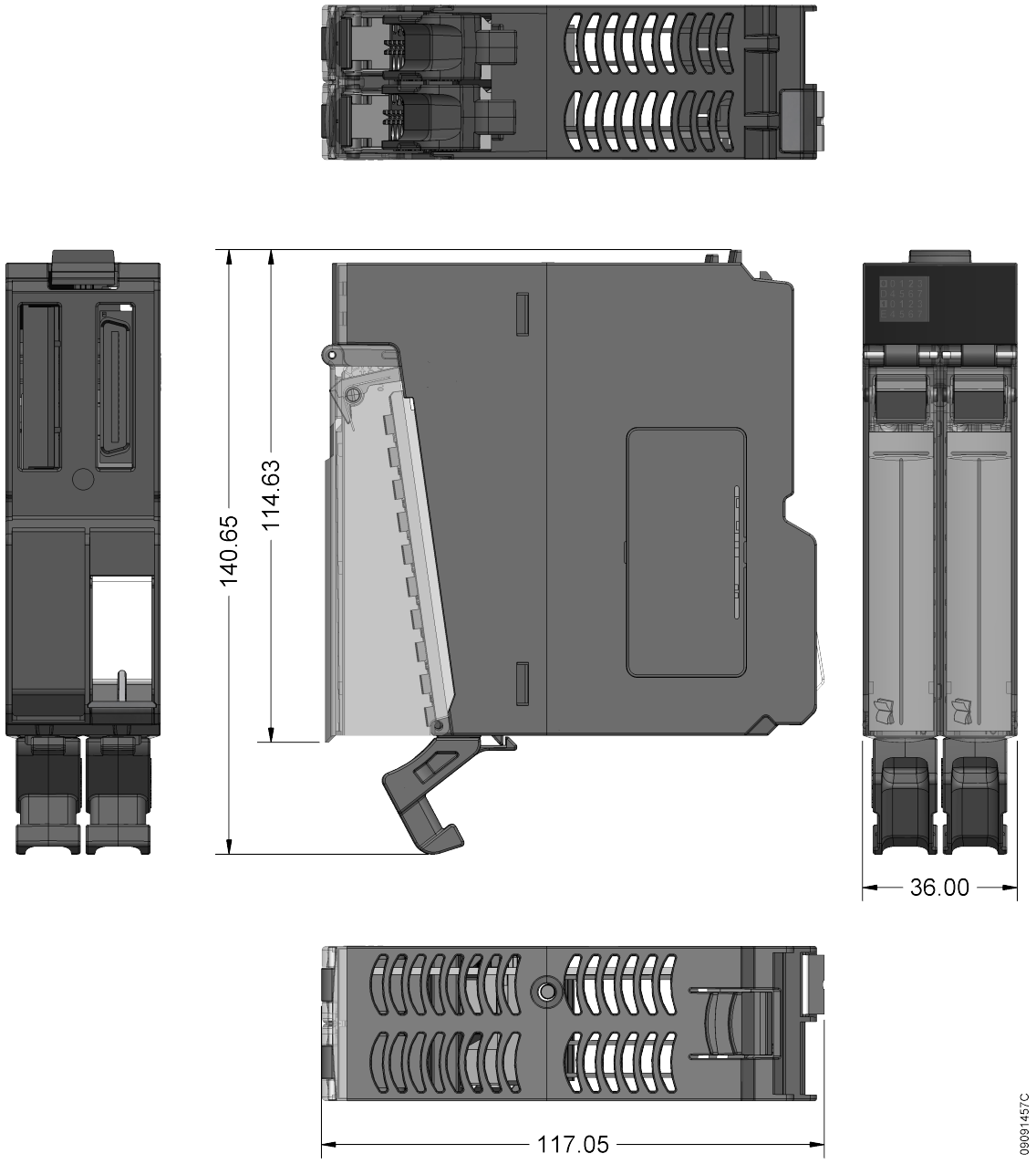

Figure 20: Nexto 36 mm I/O Module

5.4. CPU, Fieldbus Interfaces, Power Supply and Special Modules

This module size is used for all other modules from the Nexto Series.
Dimensions in mm.

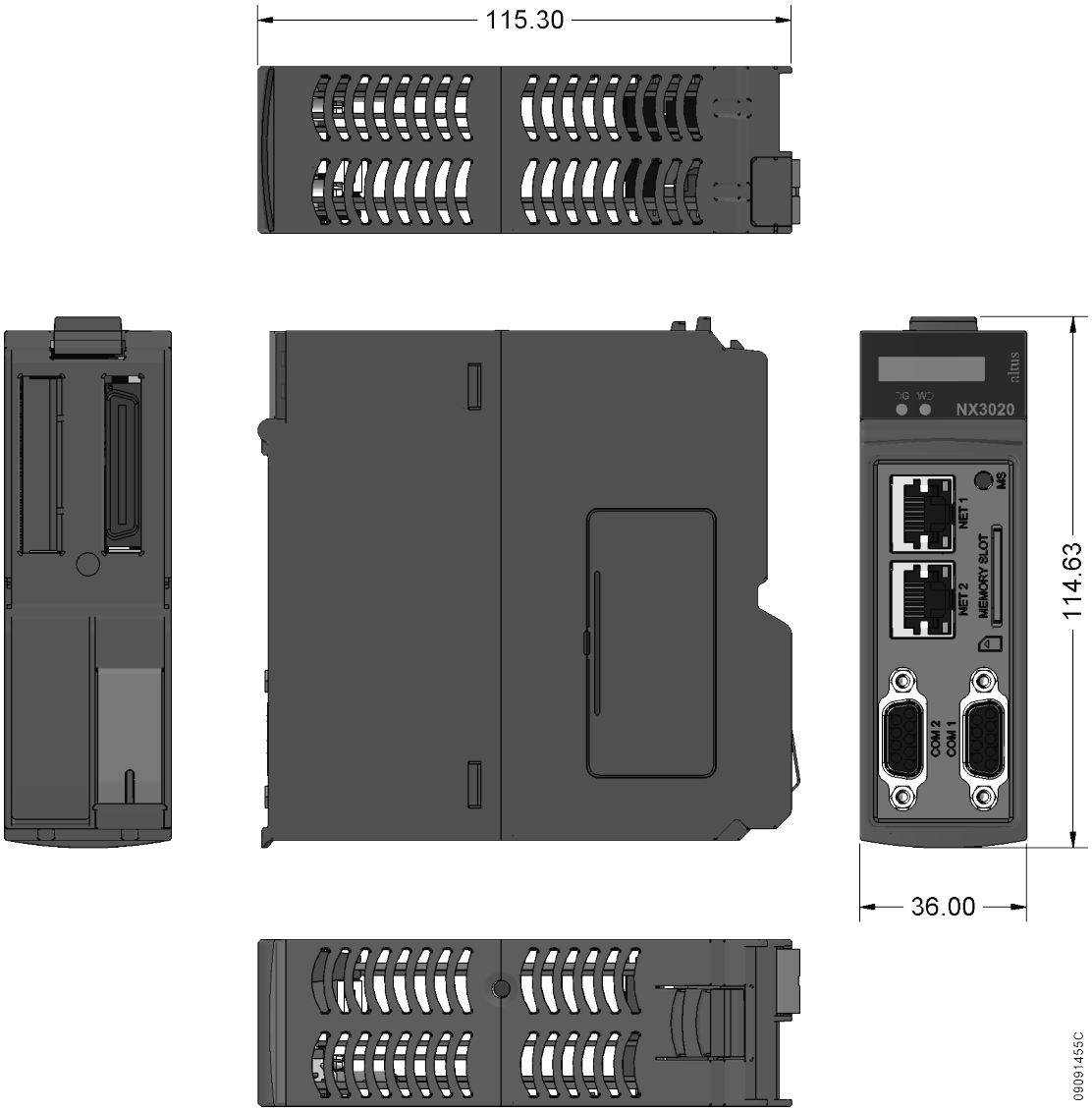

Figure 21: 36 mm NX3020 CPU module

5.5. 2-Slot base for panel assembly

Dimensions in mm.

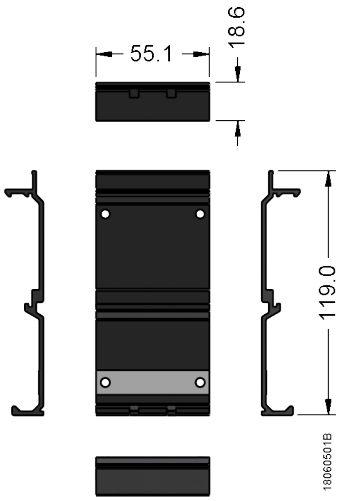

Figure 22: 2-Slot base for panel assembly

5.6. 8 Slot Backplane Rack (Without Hot Swap)

Dimensions in mm.

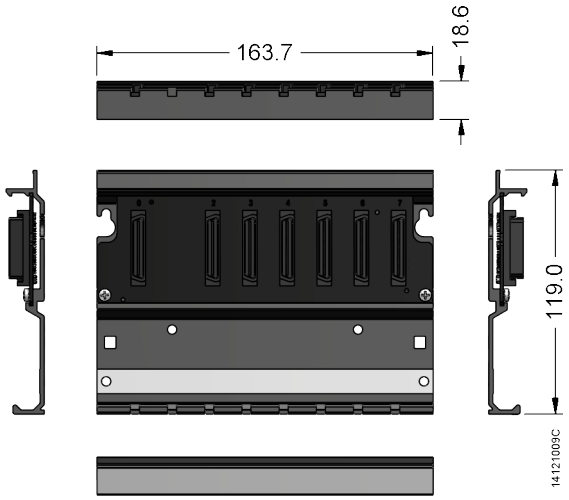

Figure 23: 8-Slot Backplane Rack (Without Hot Swap)

5.7. 8 Slot Backplane Rack

Dimensions in mm.

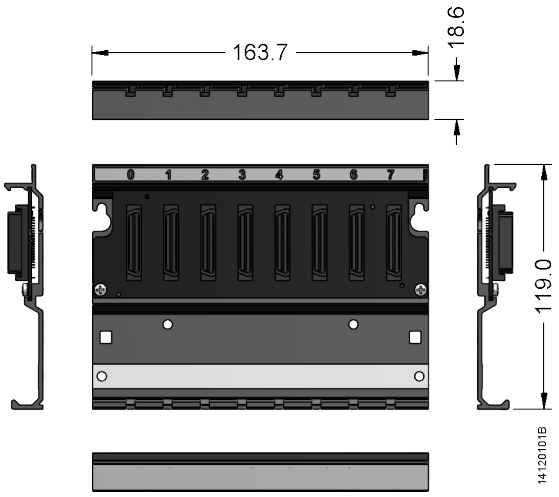

Figure 24: 8-Slot Backplane Rack

5.8. 12-Slot Backplane Rack

Dimensions in mm.

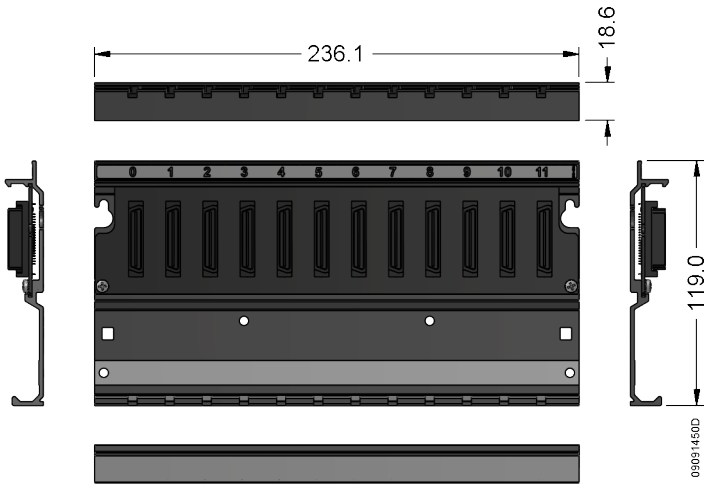

Figure 25: 12-Slot Backplane Rack

5.9. 16-Slot Backplane Rack

Dimensions in mm.

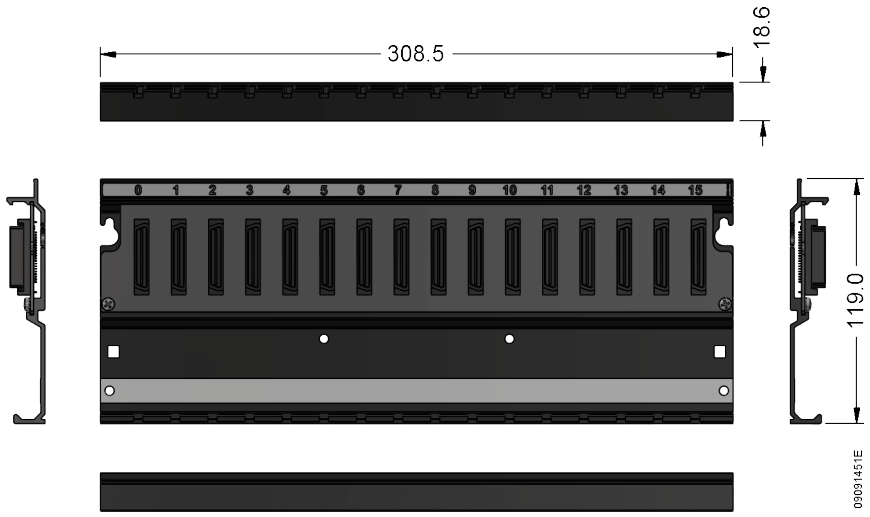

Figure 26: 16-Slot Backplane Rack

5.10. 24-Slot Backplane Rack

Dimensions in mm.

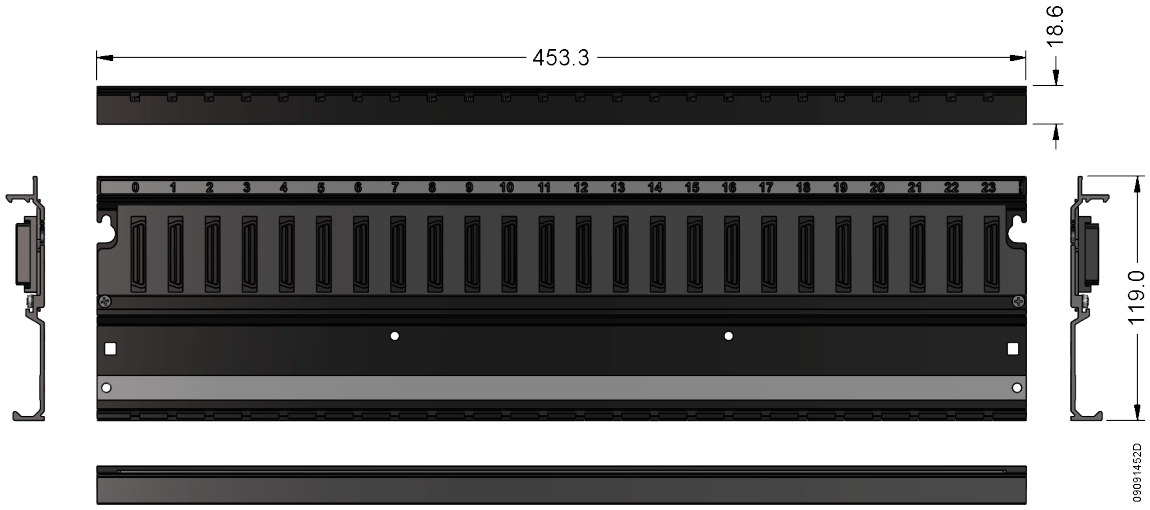

Figure 27: 24-Slot Backplane Rack

6. Main Features

6.1. CPUs

CPUs feature several built-in functions, online programming, high memory capacity and multiple serial channels. These devices have a modern high-performance processor that provide excellent performance and the integration of various features. Even the simplest CPU version has an Ethernet port for programming, use in TCP MODBUS networks and an embedded web server. All CPUs have web pages with complete status and list of diagnostics, firmware update, among other features.

6.2. Modules

The modules carry high density I/Os. Nexto Series delivers two module form factors – slim and full size modules – allowing the best I/O combination for many applications where high-density and panel size can be an issue. Every I/O module has a display for local diagnosis, where each I/O point state is presented. There is also multifunctional diagnosis about the module status. All diagnostics information is also accessible remotely by CPU, fieldbus head or by MasterTool IEC XE configuration tool.

The Nexto I/O modules with frontal cover have labels where the user can identify the modules and the terminal blocks.

6.3. High-Speed Backplane Bus

Nexto Series architecture has a state-of-the-art 100 Mbps Ethernet based backplane bus. This backplane bus has real-time behavior, allowing predicted and cyclic data exchanges. The high throughput enables the update of large quantities of inputs in a short time window. Besides, time critical applications like motion control are possible with this technology. The modules are addressed and identified automatically, avoiding errors during application setup and field maintenance. The backplanes NX9000, NX9001, NX9002 and NX9003 provide special features in order to allow CPU redundancy in the same rack or in different racks using the Redundancy Link Modules:

- Automatic module addressing and identification
- Hot-swap (except NX9010)
- 100 Mbps Ethernet-based serial bus
- Extremely accurate time synchronization for I/O update or time stamping
- Single chip hardware solution

6.4. Terminal Block Insertion & Removal

Nexto Series has an innovative and patented mechanism for inserting and extracting the I/O modules terminal blocks. In many automation applications, the density of I/Os is high, making the field wiring complicated and unfriendly. When maintenance comes to the picture, the difficulties are higher, because reaching the wires is not an easy job. Sometimes, it's necessary to disassembly some close modules to access the desired one. In Nexto Series, these problems were solved by combining a special connector shape with a front cover. Besides the easy removal and insertion of terminal blocks, the design makes the panel look nice and organized.

6.5. Robustness

Nexto Series delivers an extremely rugged design allowing the use in applications where mechanical vibration is present. Transportation applications or moving places are examples that require this feature, which is provided without the use of screws or special mounting. The whole product design was developed in such a way to deliver this feature without compromising the installation and maintenance procedures.

6.6. Hot-Swapping

The hot-swapping feature allows module replacement without the need of shutting the system down (power off). The CPU keeps controlling the whole process and the modules can be replaced whenever needed.

ATTENTION

The modules that make part of Nexto Jet solution do not support this functionality.

6.7. High Availability

Nexto Series delivers several different redundant architectures, where CPUs, PSUs and Fieldbus Interfaces can be mounted in a redundant application. With this flexibility, the system can be tailored from simple systems with no redundancy at all to very complex and critical applications where high availability plays an important role.

6.8. Enhanced Diagnostics

Every module has its own diagnostics. The CPUs, Fieldbus Interfaces, PSUs and I/O modules have various diagnostics available. Each module has a multifunctional display for enhanced visual status. Besides, each module that has a switch on its top can provide different diagnostics information for maintenance personnel. These diagnostics can be monitored on the field through the visual displays or via configuration tool. Some examples are:

- Wrong module placed on a rack position
- No field power supply
- Short circuit in outputs
- No configuration for a module that needs to be configured for normal operation
- I/O tag and description visualization on the PLC for modules with OTD
- IP address visualization

6.9. Capacities

In Nexto Series, each rack can fit up to 24 18-mm modules or 12 36-mm modules. With this architecture, a single CPU can control 320 I/O points using a single rack. This can be expanded up to 25 racks (according the CPU model) using bus expansion modules.

6.10. CPU Programming & Firmware Update

Nexto Series allows the programming of CPU and firmware update through the embedded CPU Ethernet port. This approach delivers some features:

- Multi-functional Ethernet port, used to share programming, point-to-point data exchange, third party device protocol at application layer, network variable data exchange, etc.
- Direct access to local CPU variables
- Remote access and change via Ethernet interface
- Firmware updating through Ethernet interface

7. MT8500 – MasterTool IEC XE

The MT8500 is the software suite for programming, configuration, diagnosis and commissioning and offers as mainly features:

- IEC 61131-3 Programming Languages
- Editors for Project Configuration and Hardware Configuration
- Object-Oriented Programming
- Online, Debugging and Commissioning features
- Simulation
- Web page development (accessible through HTTP protocol)
- User Documentation & Help Files
- Enhanced Diagnostics
- Docking View

7.1. IEC 61131-3 Programming Languages

MasterTool IEC XE offers all editors defined in the IEC standard for application development: Structured Text (ST), Sequential Function Chart (SFC), Function Block Diagram (FBD), Ladder Diagram (LD), Instruction List (IL) and Continuous Function Chart (CFC).

All editors were specially designed to ensure optimal handling. Ideas and suggestions from experienced users are incorporated into the development process.

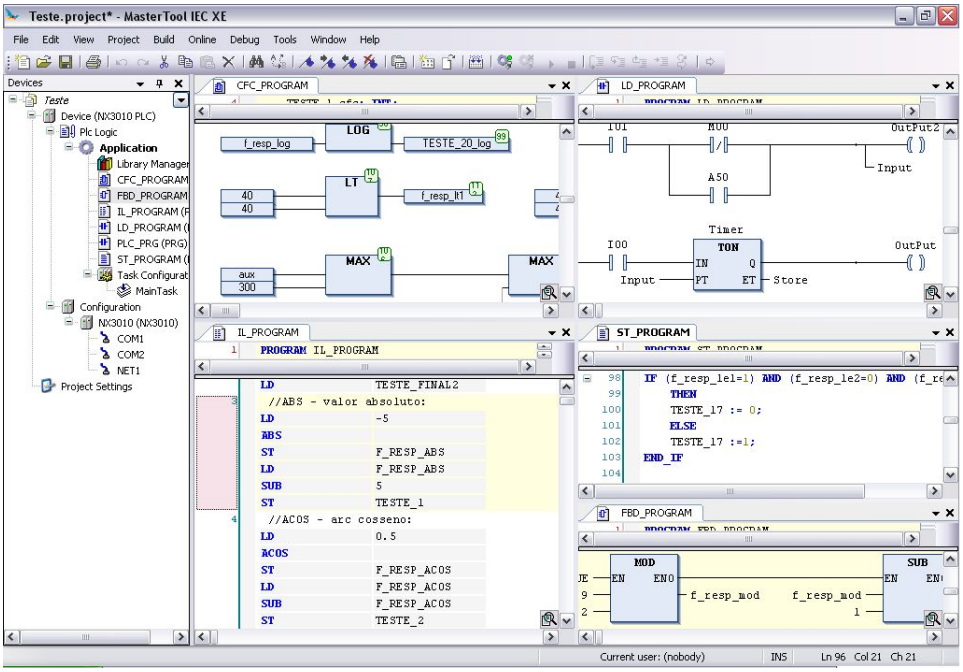

Figure 28: IEC 61131-3 Programming Languages

Some examples:

- When working in FBD, LD or IL you can freely switch between these editors
- Language elements can either be entered directly or dragged into the editor from a tool box
- MT8500 offers an intelligent input assistance and an extended IntelliSense functionality
- Standard language constructs (IF statements, FOR loops, variable classes, etc.) can be folded and unfolded in the text editors
- Language constructs are automatically created (IF ... END_IF)
- The SFC editor can either be used as defined in the standard or in a simplified version
- A comfortable time monitoring for steps as well as online diagnosis functionality is also available in the SFC editor
- Steps and transitions in the SFC editor and all elements in the CFC editor can be encapsulated in macros
- MT8500 implements numerous further functions which support the application developer in his work

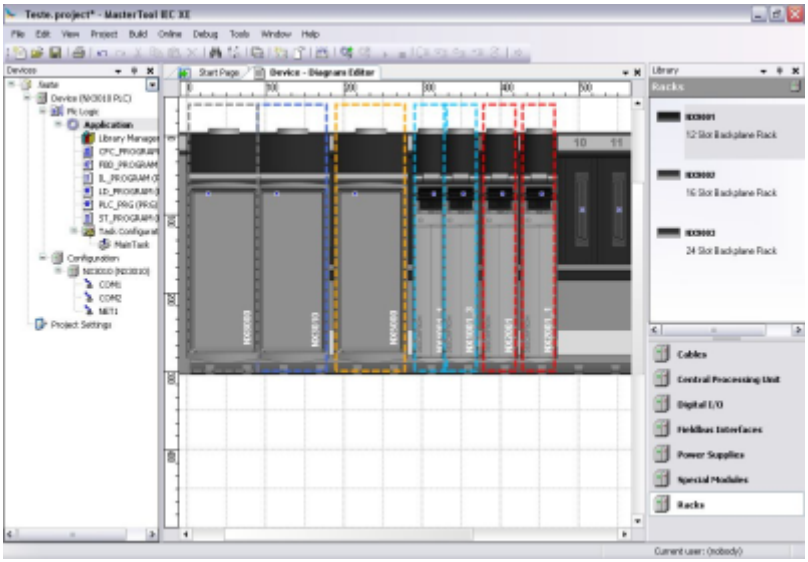

Figure 29: MT8500 working

7.2. Editors for Project Configuration and Hardware Configuration

With the help of special editors a project can be easily configured in MasterTool IEC XE. The graphical tool allows a fast and comprehensive way to configure the system. Additionally, the user has the complete visualization of the application architecture with the physical position and module information.

The configuration of fieldbus networks and standard communication protocols, like PROFIBUS-DP and MODBUS protocols, are integrated in the programming tool. This feature enables the user to set all configuration parameters in a single place, avoiding the need of switching between different software tools.

7.3. Object-Oriented Programming

MasterTool IEC XE offers object-oriented programming with the advantages known from modern high-level languages such as JAVA or C++: classes, interfaces, methods, inheritance and polymorphism/dynamic binding. The IEC function blocks are seamlessly extended and the extensions made available to all engineering aspects. Object-oriented programming offers great advantages to the user for example when wanting to reuse existing parts of the application or when working on an application with several developers.

7.4. Online, Debugging and Commissioning Features

The code generated from the application is downloaded onto the target device with a single mouse click. Once MasterTool IEC XE is online, it offers many important functions for fast and efficient debugging, testing and commissioning.

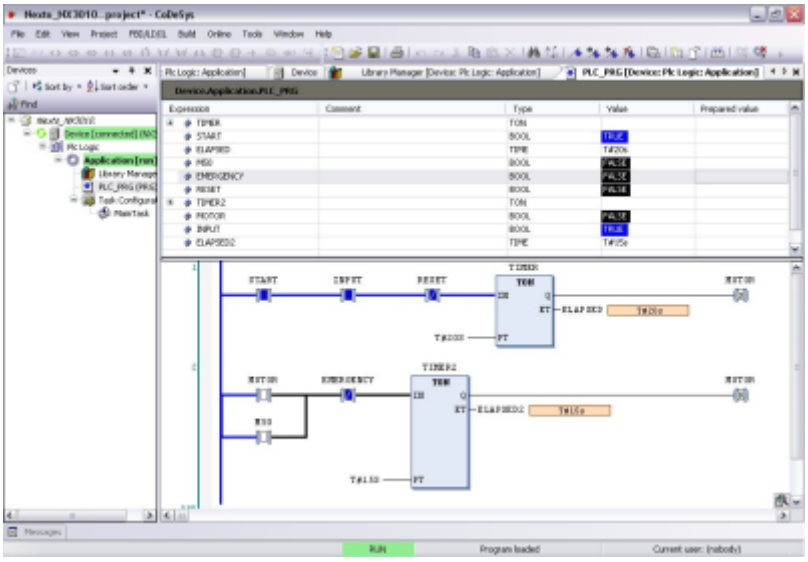

Figure 30: Commissioning Features

The values of declared variables for example are displayed in the program code. These values can be changed or forced without any difficulty. By setting breakpoints and then stepping through the code line by line, errors can easily be detected. Breakpoints in MasterTool IEC XE can be assigned to certain conditions to achieve even more precision in the debugging process. In a single cycle operation, the user can follow the execution of the application through a complete cycle.

If the application is modified, only the actual modifications are compiled, and then loaded and activated without having to stop the controller or running the risk of losing variable values. Changes to several POUs (Program Organization Units), variables or data types are also possible. This functionality is called online change. Shorter development cycles and a faster production process lead to reduced costs and increased competitiveness.

The sampling trace is a very useful tool when the user wants to record data or even trigger events for testing or commissioning purposes. This digital storage media, which is completely integrated in MasterTool IEC XE, can, of course, also be used to visualize application data.

7.5. Simulation

One feature that enables the user to evaluate and test many logic and algorithms is the simulation tool. This feature enables the design and test of user applications without the need of a connected controller. This feature is also interesting for training, documentation and test cases evaluation. Of course, since it is a simulator, some limitations may apply when deploying the application to the end controller.

7.6. Web page development

MasterTool IEC XE supports not only the creation of the user process control logic according to norm IEC61131-3, but it also encompasses a screen development feature to enable supervision and operation of these automated processes. These screens are developed in a simple way through a graphic editor with several predefined objects, which are vectorially stored along with the project's logic. Among these objects you will find geometrical shapes, bar and arrow meters, variable edit and visualization controls, images, and much more.

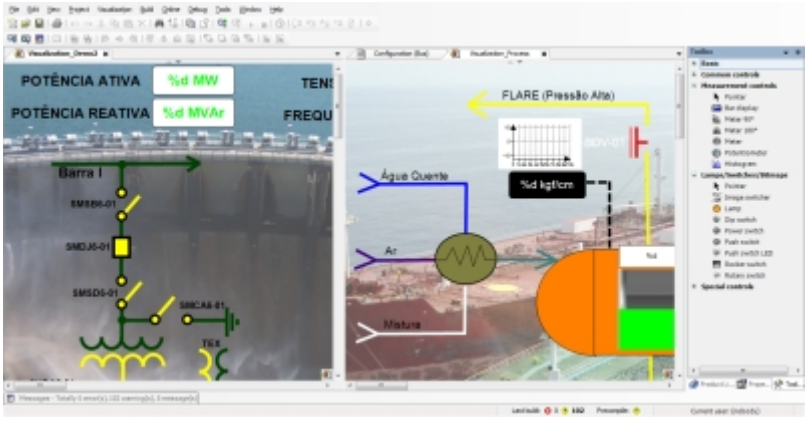

Figure 31: Web page development

The screen editor is embedded at MasterTool IEC XE in a way that its integration with the PLC logic is transparent and intuitive, which reduces the time spent on development and integration. Once the screens are created, they are loaded onto the PLC along with the rest of the program and they are accessed through a web browser via HTTP protocol.

Figure 32: Web page development - Visualization

Although these screens are stored and displayed in a web format, no knowledge of any programing language is required of the users, since all configuration is graphical and intuitive.

7.7. User Documentation & Help Files

Since programming a PLC according the IEC 61131-3 standard languages is a complex task, MasterTool IEC XE offers an extensive help file with many hints and descriptions in order to guide and serve as a first knowledge and troubleshooting database to user while designing the logic codes or using any software feature. Besides, this help file is available in different languages according installation options.

MasterTool IEC XE is also provided to support multiple languages, allowing the user to select the preferred language from the options available. The idea is to minimize understanding issues that might rise when using a foreign language.

As part as user documentation, MT8500 can print out user application documents, like bill of materials (BOM), POUs and configuration parameters.

7.8. Enhanced Diagnostics

One of the key innovative features of Nexto Series is an extensive support of diagnostics. This idea comes from requirements of large and complex applications, where the correct use of such information is important for maintenance, troubleshooting and to predict potential issues. This feature is also present in MasterTool IEC XE where user can access the complete diagnostics structures via watch windows and the diagnostics web pages, when connected to a running CPU.

7.9. Docking View

The Docking View technology allows the user to customize MasterTool IEC XE environment to meet his personal needs. Additionally the user can edit the menu structure, the key assignments and the toolbar as desired. This feature provides a friendly user interface to maximize the experience with the software tool.

8. I/O System

The list of I/O modules for Nexto Series is presented in the beginning of this document, as well a brief description of each of them.

The following criteria should be considered when selecting the I/O modules:

- Rated voltage for the application (24 Vdc, voltage or current analog points, etc.)
- Type of digital output element: transistor or relay
- Need for isolation on digital I/Os or analog I/Os
- Maximum currents (per I/O, per group of I/Os or per module)
- Filter specifications for all inputs
- Power supply requirements based on the application configuration

Due to the system modularity, the user must order each Nexto Series module individually.

To ensure that the user application and configuration will perform accordingly, each technical features document must be checked for each module used in the application.

9. Environmental Conditions

Nexto Series modules comply with the environmental specifications described on the Table 1.

Operational temperature	0 to 60 °C
Storage temperature	-25 to 75 °C
Relative humidity	5% to 96%, non-condensing

Table 1: Environmental Conditions

10. Standards and Certifications

	IEC 61131-2	CE	UKCA	EAC	cULus LISTED	DNV
CPUs – Central Processing Units						
NX3003	✓	✓	✓	✓	✓	×
NX3004	✓	✓	✓	✓	✓	✓
NX3005	✓	✓	✓	✓	✓	✓
NX3008	✓	✓	✓	✓	✓	✓
NX3010	✓	✓	✓	✓	✓	✓
NX3020	✓	✓	✓	✓	✓	✓
NX3030	✓	✓	✓	✓	✓	✓
NX3035	✓	✓	✓	✓	×	✓
Fieldbus Interfaces						
NX5000	✓	✓	✓	✓	✓	✓
NX5001	✓	✓	✓	✓	✓	✓
NX5100	✓	✓	✓	✓	✓	✓
NX5101	✓	✓	✓	✓	✓	×
NX5110	✓	✓	✓	✓	✓	✓
NX5210	✓	✓	✓	✓	✓	✓
Input Modules						
Nexto						
NX1001	✓	✓	✓	✓	✓	✓
NX1006	✓	✓	✓	✓	×	✓
NX6000	✓	✓	✓	✓	✓	✓
NX6010	✓	✓	✓	✓	✓	✓
NX6014	✓	✓	✓	✓	✓	✓
NX6020	✓	✓	✓	✓	✓	✓
Nexto Jet						
NJ1001	✓	✓	✓	✓	✓	×
NJ6000	✓	✓	✓	✓	✓	×
NJ6001	✓	✓	✓	✓	✓	×
NJ6010	✓	✓	✓	✓	✓	×
NJ6011	✓	✓	✓	✓	✓	×
NJ6020	✓	✓	✓	✓	✓	×
Mixed I/O Modules						
Nexto						
NX1005	✓	✓	✓	✓	✓	✓
Nexto Jet						
NJ1005	✓	✓	✓	✓	✓	×
NJ6005	✓	✓	✓	✓	✓	×
Output Modules						
Nexto						
NX2001	✓	✓	✓	✓	✓	✓
NX2020	✓	✓	✓	✓	×	✓

	IEC 61131-2	CE	UKCA	EAC	cULus LISTED	DNV
NX2025	✓	✓	✓	✓	×	✓
NX6100	✓	✓	✓	✓	✓	✓
NX6134	✓	✓	✓	✓	×	✓
Nexto Jet						
NJ2001	✓	✓	✓	✓	✓	×
NJ6100	✓	✓	✓	✓	✓	×
NJ6101	✓	✓	✓	✓	✓	×
Power Supply Modules						
NX8000	✓	✓	✓	✓	✓	✓
Racks						
NX9000	✓	✓	✓	✓	✓	✓
NX9001	✓	✓	✓	✓	✓	✓
NX9002	✓	✓	✓	✓	✓	✓
NX9003	✓	✓	✓	✓	✓	✓
NX9010	✓	✓	✓	✓	✓	✓
NX9020	✓	✓	✓	✓	✓	×
Special Modules						
NX4000	✓	✓	✓	✓	✓	×
NX4010	✓	✓	✓	✓	✓	✓
Accessories						
NX9100	✓	✓	✓	✓	✓	×
NX9101	✓	✓	✓	✓	✓	×
NX9102	✓	✓	✓	✓	✓	×
NX9401	✓	✓	✓	✓	✓	×
NX9402	✓	✓	✓	✓	✓	×
NX9403	✓	✓	✓	✓	✓	×
NX9404	✓	✓	✓	✓	✓	×
NX9405	✓	✓	✓	✓	✓	×
NX9406	✓	✓	✓	✓	✓	×

Table 2: Certifications

Notes:
IEC 61131-2: Refers to IEC 61131-2:2007, chapter 8 and 11.
CE: Refers to the directives 2011/65/EU (RoHS), 2014/35/EU (LVD) and 2014/30/EU (EMC).
EAC: Refers to the directives CU TR 004/2011 (LVD) and CU TR 020/2011 (EMC).
UL: Refers to the standard UL61010-1 (file E473496).
DNV: Refers to the standard DNV-CG-0339 (Type Approval TAA000013D).
[1]: In process of certification.

11. Manuals

For more technical details, configuration, installation and programming of the Nexto Series, table below must be consulted. The complete and updated table containing all the Nexto Series documents can be found in the Nexto Series User Manual - MU214600.

Code	Description	Language
CE114000	Nexto Series – Technical Characteristics	English
CT114000	Série Nexto – Características Técnicas	Portuguese
CE114100	NX3010 Technical Characteristics	English
CT114100	Características Técnicas NX3010	Portuguese
CE114101	NX3020 Technical Characteristics	English
CT114101	Características Técnicas NX3020	Portuguese
CE114102	NX3030 Technical Characteristics	English
CT114102	Características Técnicas NX3030	Portuguese
CE114103	NX3004 Technical Characteristics	English
CT114103	Características Técnicas NX3004	Portuguese
CE114104	NX3005 Technical Characteristics	English
CT114104	Características Técnicas NX3005	Portuguese
CE114105	NX3003 Technical Characteristics	English
CT114105	Características Técnicas NX3003	Portuguese
CE114109	NX3008 Technical Characteristics	English
CT114109	Características Técnicas NX3008	Portuguese
CE114108	NX3035 Technical Characteristics	English
CT114108	Características Técnicas NX3035	Portuguese
CE114200	NX8000 Power Supply Module Technical Characteristics	English
CT114200	Características Técnicas Fonte de Alimentação NX8000	Portuguese
CE114700	Nexto Series Backplane Racks Technical Characteristic	English
CT114700	Características Técnicas dos Bastidores da Série Nexto	Portuguese
CE114810	Nexto Series Accessories for Backplane Rack Technical Characteristics	English
CT114810	Características Técnicas Acessórios para Bastidor Série Nexto	Portuguese
CE114900	NX4010 Redundancy Link Module Technical Characteristics	English
CT114900	Características Técnicas do Módulo de Redundância NX4010	Portuguese
CE114902	Nexto Series PROFIBUS-DP Master Technical Characteristics	English
CT114902	Características Técnicas do Mestre PROFIBUS-DP da Série Nexto	Portuguese
CE114903	Nexto Series Ethernet Module Technical Characteristics	English
CT114903	Características Técnicas Módulo Ethernet Série Nexto	Portuguese
MU216600	Nexto Xpress User Manual	English
MU216000	Manual de Utilização Nexto Xpress	Portuguese
MU214600	Nexto Series User Manual	English
MU214000	Manual de Utilização Série Nexto	Portuguese
MU214618	NX3003 CPU User Manual	English
MU214106	Manual de Utilização UCP NX3003	Portuguese
MU214616	NX3004 CPU User Manual	English
MU214104	Manual de Utilização UCP NX3004	Portuguese
MU214617	NX3005 CPU User Manual	English
MU214105	Manual de Utilização UCP NX3005	Portuguese
MU214613	NX3010 CPU User Manual	English
MU214101	Manual de Utilização UCP NX3010	Portuguese
MU214614	NX3020 CPU User Manual	English

Code	Description	Language
MU214102	Manual de Utilização UCP NX3020	Portuguese
MU214615	NX3030 CPU User Manual	English
MU214103	Manual de Utilização UCP NX3030	Portuguese
MU214620	NX3008 CPU User Manual	English
MU214109	Manual de Utilização UCP NX3008	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
MU214601	NX5001 PROFIBUS DP Master User Manual	English
MU214001	Manual de Utilização Mestre PROFIBUS-DP NX5001	Portuguese
MU214608	Nexto PROFIBUS-DP Head Utilization Manual	English
MU214108	Manual de Utilização da Cabeça PROFIBUS-DP Nexto	Portuguese

Table 3: Documents Related