

1. Product Description

NX-ERA Series programmable controllers are the ultimate solution for industrial automation and system control. With high technology embedded, the products of the family are able to control, in a distributed and redundant way, complex industrial systems, machines, high performance production lines and the most advanced processes of Industry 4.0. Modern and high-speed, the NX-ERA series uses cutting-edge technology to provide reliability and connectivity, helping to increase the productivity of different businesses.

Compact, robust and with high availability, the series products have excellent processing performance and rack expansion possibilities. Its architecture allows easy integration with supervision, control and field networks, in addition to PLC redundancy. The series equipment also offers advanced diagnostics and hot swapping, minimizing or eliminating maintenance downtime and ensuring a continuous production process.



Its main features are:

- 64 Kbytes of dots %I and 64 Kbytes of dots %Q
- Large memory capacity for user application and user data
- 112 Kbytes of retentive or persistent memory
- 32-bit high-speed processing
- Floating point unit
- 2 serial port
- 2 front panel Ethernet interface
- miniSD Card Interface
- Advanced Diagnostic Services
- System Message Log
- Event-driven data reporting
- OPC DA/UA, IEC 60870-5-104, PROFINET, EtherCAT, SNMP and EtherNet/IP protocols
- Clock Synchronism via SNTP or via IEC 60870-5-104
- Web Server Resources
- One Touch Diag
- Compliance with international standard IEC 61131-3
- Real Time Clock (RTC)
- Compact and modern design
- Free of moving parts (fans, active coolers, etc.)

2. Purchase Data

2.1. Included Items

The product package contains the following items:

- NX3020 module

2.2. Product Code

The following code should be used to purchase the product:

Code	Description
NX3020	High-speed CPU, 2 Ethernet ports, 2 serial channels, memory card interface and remote rack expansion support

Table 1: Product Code

3. Related products

The following products must be purchased separately when necessary:

Code	Description
MT8500	MasterTool IEC XE
AL-2600	RS-485 network branch and terminator
AL-2306	RS-485 cable for MODBUS or CAN network
AL-1729	RJ45-CMDB9 Cable
AL-1748	CMDB9-CFDB9 Cable
AL-1752	CMDB9-CMDB9 Cable
AL-1753	CMDB9-CMDB25 Cable
AL-1754	CMDB9-CFDB9 Cable
AL-1761	CMDB9-CMDB9 Cable
AL-1762	CMDB9-CMDB9 Cable
AL-1763	CMDB9-Terminal Block Cable
AL-1766	CFDB9-Terminal Block Cable
NX9101	32 GB microSD memory card with miniSD and SD adapters
NX9202	RJ45-RJ45 2 m Cable
NX9205	RJ45-RJ45 5 m Cable
NX9210	RJ45-RJ45 10 m Cable
NX9000	8-Slot Backplane Rack
NX9001	12-Slot Backplane Rack
NX9002	16-Slot Backplane Rack
NX9003	24-Slot Backplane Rack
NX8000	30 W 24 Vdc Power Supply Module

Table 2: Related Products

Notes:

- MT8500:** MasterTool IEC XE is available in four different versions: LITE, BASIC, PROFESSIONAL and ADVANCED. For more details, please check MasterTool IEC XE User Manual - MU299609.
- AL-2600:** This module is used for branch and termination of RS-422/485 networks. For each network node, an AL-2600 is required. The AL-2600 that is at the ends of network must be configured with termination, except when there is a device with active internal termination, the rest must be configured without termination.
- AL-2306:** Two shielded twisted pairs cable without connectors, used for networks based on RS-485 or CAN.
- AL-1729:** RS-232C standard cable with one RJ45 connector and one DB9 male connector for communication between CPUs of the NX-ERA Series and other Messung products of the DUO Series, Piccolo Series and Ponto **AL-1729** Series.
- AL-1748:** RS-232C standard cable with one DB9 male connector and one DB9 female connector for communication between CPUs of the NX-ERA Series and Messung products of the Cimrex Series.
- AL-1752:** RS-232C standard cable with two DB9 male connectors for communication between CPUs of the NX-ERA Series and Messung products of the H Series and iX series.
- AL-1753:** RS-232C standard cable with one DB9 male connector and one DB25 male connector for communication between CPUs of the NX-ERA Series and Messung products of the H Series.
- AL-1754:** RS-232C standard cable with one DB9 male connector and one DB9 female connector for communication between CPUs of the NX-ERA Series and Messung products of the Exter Series or Serial port, RS-232C standard, of a microcomputer.
- AL-1761:** RS-232C standard cable with two DB9 male connectors for communication between NX-ERA Series CPUs and Messung products of the AL Series.
- AL-1762:** RS-232C standard cable with two DB9 male connectors for communication between NX-ERA Series CPUs.
- AL-1763:** Cable with one DB9 male connector and terminal block for communication between CPUs of the NX-ERA Series and products with RS-485/RS-422 standard terminal block.
- AL-1766:** Cable with a female DB9 connector and terminals for communication between HMI P2 and NX-ERA Xpress/NX3003 controllers.
- NX9202/NX9205/NX9210:** Cables used for Ethernet communication and to interconnect the bus expansion modules.

4. Innovative Features

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



Battery Free Operation: NX-ERA 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: NX-ERA 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 NX-ERA Series CPUs, offering the best option for any user needs. These memories are divided in volatile memories and non-volatile memories. For volatile memories, NX-ERA 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, NX-ERA 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 NX-ERA 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: NX-ERA 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 NX-ERA 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: NX-ERA Series modules were designed to save space in user cabinets or machines. For this reason, NX-ERA 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 NX-ERA 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: NX-ERA Series was the winner of iF Product Design Award 2012 in industry + skilled trades group. This award is recognized internationally as a seal of quality and excellence, considered the Oscars of the design in Europe..

5. Product characteristics

5.1. General features

	NX3020
Backplane rack occupation	2 sequential slots
Power supply integrated	Yes
Ethernet TCP/IP local interface	2
Serial Interface	2
CAN Interface	No
USB Port Host	No
Memory Card Interface	Yes
Real time clock (RTC)	Yes Resolution of 1 ms and maximum variance of 2 s per day.
Watchdog	Yes
Status and diagnostic Indication	Graphic display LEDs System Web Page CPU internal memory
Programming languages	Structured Text (ST) Ladder Diagram (LD) Sequential Function Chart (SFC) Function Block Diagram (FBD) Continuous Function Chart (CFC)
Tasks	Cyclic (periodic) Triggered by event (software interruption) Triggered by external event (hardware interruption) Freewheeling (continuous) Triggered by status (software interruption)
Online changes	Yes
Maximum number of tasks	24
Maximum number of expansion bus	24
Bus expansion redundancy support	Yes
Maximum number of I/O modules on the bus	128
Maximum number of additional Ethernet TCP/IP interface modules	2
Ethernet TCP/IP interface redundancy support	Yes
Maximum number of PROFIBUS-DP network (using master modules PROFIBUS-DP)	4
PROFIBUS-DP network redundancy support	Yes
Redundancy support (half-clusters)	No
Hot Swap support	Yes
Event oriented data reporting (SOE) Protocol	Yes DNP3
Maximum Event Queue Size	1000
Web pages development (available through the HTTP protocol)	No

	NX3020
One Touch Diag (OTD)	Yes
Electronic Tag on Display (ETD)	Yes

Table 3: Common Features

Notes:

Real Time Clock (RTC): The retention time, time that the real time clock will continue to update the date and time after a CPU power down, is 15 days for operation at 25 °C. At the maximum product temperature, the retention time is reduced to 10 days.

Maximum number of I/O modules on bus: The maximum number of I/O modules refers to the sum of all modules on the local bus and expansions.

Event Log (SOE): Data types are found in the DNP3 Device Profile.

5.2. Standards and Certifications






Standards and Certifications	
IEC	<p>61131-2: Industrial-process measurement and control - Programmable controllers - Part 2: Equipment requirements and tests</p> <p>61131-3: Programmable controllers - Part 3: Programming languages</p>
	DNV Type Approval – DNV-CG-0339 (TAA000013D)
	<p>2014/30/EU (EMC)</p> <p>2014/35/EU (LVD)</p> <p>2011/65/EU and 2015/863/EU (ROHS)</p>
	<p>S.I. 2016 No. 1091 (EMC)</p> <p>S.I. 2016 No. 1101 (Safety)</p> <p>S.I. 2012 No. 3032 (ROHS)</p>
	<p>UL/cUL Listed – UL 61010-1</p> <p>UL 61010-2-201 (file E473496)</p>
	<p>TR 004/2011 (LVD)</p> <p>CU TR 020/2011 (EMC)</p>

Table 4: Standards and Certifications

5.3. Memory

	NX3020
Addressable input variables memory (%I)	64 Kbytes
Addressable output variables memory (%Q)	64 Kbytes
Direct representation variable memory (%M)	32 Kbytes
Symbolic variable memory	5 Mbytes
Persistent or Retain symbolic variables memory	112 Kbytes
Full Redundant Data Memory	-
Direct representation input variable memory (%I)	-
Direct representation output variable memory (%Q)	-
Direct representation variable memory (%M)	-
Symbolic variable memory	-
Program memory	6 Mbytes
Source code memory (backup)	80 Mbytes
User files memory	32 Mbytes

Table 5: Memory

5.4. Protocols

	NX3020	Interface
Open Protocol	Yes	COM1 / COM2
MODBUS RTU Master	Yes	COM1 / COM2
MODBUS RTU Slave	Yes	COM1 / COM2
MODBUS TCP Client	Yes	NET1 / NET2
MODBUS TCP Server	Yes	NET1 / NET2
MODBUS RTU over TCP Client	Yes	NET1 / NET2
MODBUS RTU over TCP Server	Yes	NET1 / NET2
CANopen Master	No	-
CANopen Slave	No	-
CAN low level	No	-
SAE J-1939	No	-
OPC DA Server	Yes	NET1 / NET2
OPC UA Server	Yes	NET1 / NET2
EtherCAT Master	Yes	NET1 / NET2
SNMP Agent	Yes	NET1 / NET2
SOE (Event-oriented data)	Yes	NET1 / NET2
IEC 60870-5-104 Server	Yes	NET1 / NET2
EtherNet/IP Scanner	Yes	NET1 / NET2
EtherNet/IP Adapter	Yes	NET1 / NET2

	NX3020	Interface
MQTT Client	Yes	NET1 / NET2
SNTP Client (for clock synchronism)	Yes	NET1 / NET2
PROFINET Controller	Yes	NET1 / NET2
PROFINET Device	No	-

Table 6: Protocols

Note:

PROFINET Controller: Enabled for use on a simple (not ring) network with up to 8 devices. For larger applications, consult technical support.

5.5. Serial Interfaces

5.5.1. COM 1


	COM 1
Connector	Shielded female DB9
Physical interface	RS-232C
Modem signals	RTS, CTS, DCD
Baud rate	200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
Isolation	
Logic to Serial Port	Not isolated
Serial Port to protection earth 	1000 Vac / 1 minute

Table 7: COM 1 Serial Interface Features

5.5.2. COM 2


	COM 2
Connector	Shielded female DB9
Physical interface	RS-422 or RS-485 (depending on the selected cable)
Communication direction	RS-422: full duplex RS-485: half duplex
RS-422 max. transceivers	11 (1 transmitter and 10 receivers)
RS-485 max. transceivers	32
Termination	Yes (optional via cable selection)
Baud rate	200, 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
Isolation	
Logic to Serial Port	1000 Vac / 1 minute
Serial Port to protection earth 	1000 Vac / 1 minute

Table 8: COM 2 Serial Interface Features

Notes:

Physical interface: Depending on the configuration of the used cable, it's possible to choose the kind of physical interface: RS-422 or RS-485. The list of cables can be found at Related products section.

RS-422 maximum transceivers: It's the maximum number of RS-422 interfaces that can be used on the same bus.

RS-485 maximum transceivers: It's the maximum number of RS-485 interfaces that can be used on the same bus.

5.6. Ethernet interfaces

5.6.1. NET 1

	NET 1
Connector	Shielded female RJ45
Auto crossover	Yes
Maximum cable length	100 m
Cable type	UTP or ScTP, category 5
Baud rate	10/100 Mbps
Physical layer	10/100 BASE-TX (Full Duplex)
Data link layer	LLC (Logical Link Control)
Network layer	IP (Internet Protocol)
Transport layer	TCP (Transmission Control Protocol) UDP (User Datagram Protocol)
Diagnostic	LEDs - green (speed), yellow (link/activity)
Isolation Ethernet interface to Serial Port	1500 Vac / 1 minute

Table 9: Ethernet NET 1 Interface Features

The NET 1 Interface is the interface used for programming using the MasterTool IEC XE tool.

5.6.2. NET 2

	NET 2
Connector	Shielded female RJ45
Auto crossover	Yes
Maximum cable length	100 m
Cable type	UTP or ScTP, category 5
Baud rate	10/100 Mbps
Physical layer	10/100 BASE-TX (Full Duplex)
Data link layer	LLC (Logical Link Control)
Network layer	IP (Internet Protocol)
Transport layer	TCP (Transmission Control Protocol) UDP (User Datagram Protocol)
Diagnostic	LEDs - green (speed), yellow (link/activity)
Isolation	
Ethernet interface to Serial Port	1500 Vac / 1 minute
Ethernet interface to Ethernet interface	1500 Vac / 1 minute

Table 10: Ethernet NET 2 Interface Features

5.7. Memory Card Interface

	Memory Card
Maximum Capacity	32 Gbytes
Minimum Capacity	2 Gbytes
Type	MiniSD
File System	FAT32
Remove card safely	Yes, by pressing MS switch

Table 11: Memory Card Interface Features

Notes:

Maximum Capacity: The memory card capacity must be less than or equal to this limit for correct operation on NX-ERA CPU, otherwise the NX-ERA CPU may not detect the memory card or even present problems during data transfer.

Minimum Capacity: The memory card capacity must be greater than or equal to this limit for correct operation on NX-ERA CPU, otherwise the NX-ERA CPU may not detect the memory card or even present problems during data transfer.

File System: It is recommended to format the memory card using the NX-ERA CPU, otherwise it may result in performance loss in the memory card interface.

5.8. Environmental Characteristics

	NX3020
Current consumption on the power supply rail	1000 mA
Dissipation	5 W
Operating temperature	0 to 60 °C
Storage temperature	-25 to 75 °C
Relative humidity	5% to 96%, non-condensing
Conformal coating	Yes
IP Level	IP 20
Module dimensions (W x H x D)	36.00 x 114.63 x 115.30 mm
Package dimensions (W x H x D)	44.00 x 122.00 x 147.00 mm
Weight	350 g
Weight with package	400 g

Table 12: Environmental Characteristics

Notes:

Conformal coating of electronic circuits: The covering of electronic circuits protects internal parts of the product against moisture, dust and other harsh elements to electronic circuits.

5.9. Performance

Instruction	Language	Variables	Instruction Times (μs)
1000 Contacts	LD	BOOL	6
1000 Divisions	ST	INT	43
		REAL	81
	LD	INT	43
		REAL	81
1000 Multiplications	ST	INT	15
		REAL	23
	LD	INT	15
		REAL	23
1000 Sums	ST	INT	15
		REAL	23
	LD	INT	15
		REAL	23
1000 PID	ST	REAL	< 5000

Table 13: Instruction Times

6. Compatibility with Other Products

To develop an application for NX-ERA Series CPUs, it is necessary to check the version of MasterTool IEC XE. The following table shows the minimum version required (where the controllers were introduced) and the respective firmware version at that time:

NX-ERA Series CPUs	MasterTool IEC XE	Firmware version
NX3010, NX3020, NX3030	1.00 to 2.09	1.2.0.9 to 1.7.0.14
NX3010, NX3020, NX3030	3.00 or above	1.8.3.0 or above

Table 14: Compatibility with other products

Additionally, along the development roadmap of MasterTool IEC XE some features may be included (like special Function Blocks, etc...), which can introduce a requirement of minimum firmware version. During the download of the application, MasterTool IEC XE checks the firmware version installed on the controller and, if it does not meet the minimum requirement, will show a message requesting to update. The latest firmware version can be downloaded from Messung website, and it is fully compatible with previous applications.

7. Physical Dimensions

Dimensions in mm.

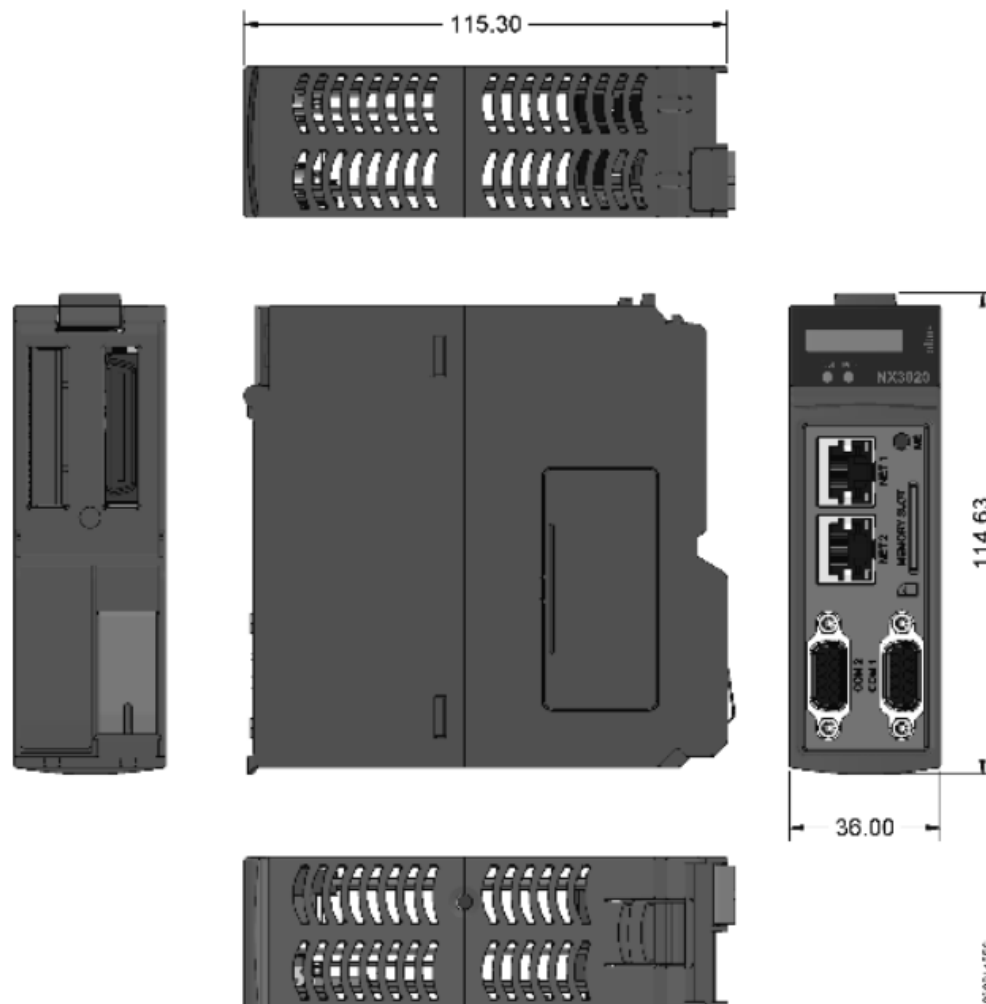


Figure 1: CPU Physical Dimensions

8. Installation

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

8.1. Product Identification

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

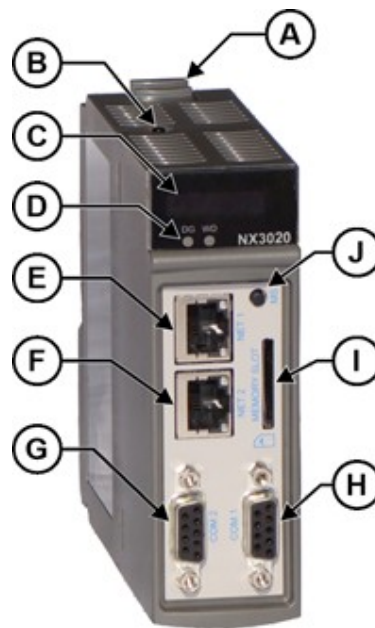


Figure 2: NX3020

- Ⓐ Fixing lock.
- Ⓑ Diagnostic switch.
- Ⓒ Status and diagnostic display.
- Ⓓ Diagnostic and watchdog LEDs.
- Ⓔ RJ45 connector for Ethernet communication.
- Ⓕ RJ45 connector for Ethernet communication.
- Ⓖ Female DB9 connector for RS-485/RS-422.
- Ⓗ Female DB9 connector RS-232C.
- Ⓘ MiniSD card interface.
- ⓵ Switch to remove miniSD card safely.

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.

8.2. Electrical Installation

The figure below illustrates the electrical diagram of the CPU installed in a NX-ERA Series rack. The layout of the connectors and terminals in the figure is merely illustrative.

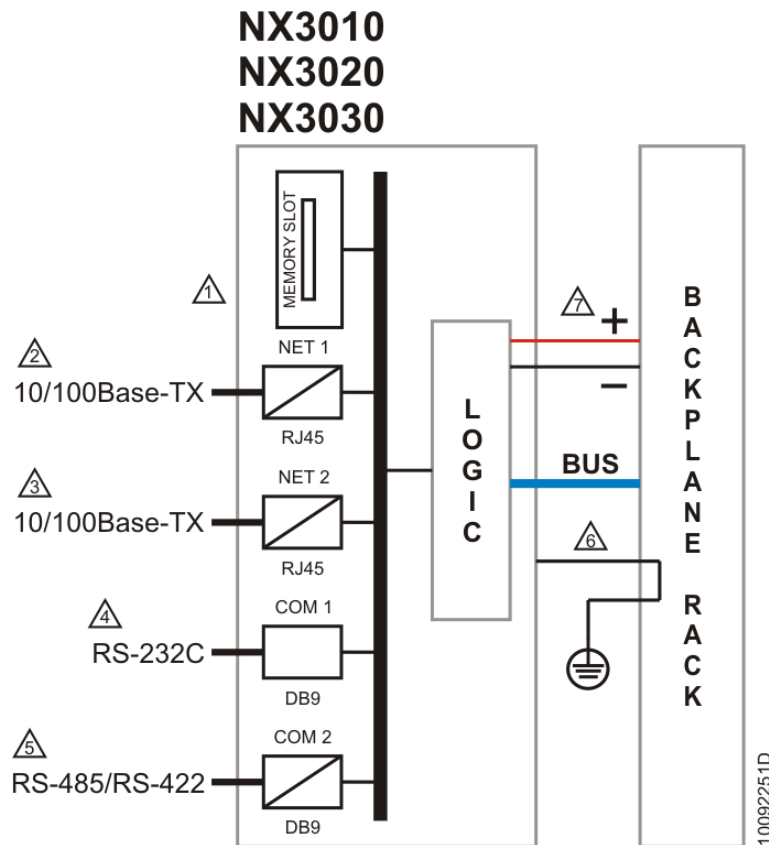


Figure 3: Electrical Diagram of NX-ERA Series NX3010, NX3020 and NX3030 CPUs

Diagram Notes:

- ① MiniSD card interface.
 - ② Ethernet 10/100Base-TX standard interface.
 - ③ Ethernet 10/100Base-TX standard interface (only for NX3020 and NX3030).
 - ④ Serial RS-232C standard interface.
 - ⑤ Serial RS-485/RS-422 standard interface. The choice of physical interface used depends on the cable.
 - ⑥ The module is grounded through the NX-ERA Series backplane racks.
 - ⑦ The module power supply is derived from the connection to the backplane rack, not requiring external connections.
- ⊕ Protective conductor terminal.

8.3. Mechanical Assembly

This product must be positioned in position 2 of the NX-ERA Series rack. Two sequential positions are required, this means that it will occupy positions 2 and 3 of a rack. Requiring an NX8000 - Power Supply Module, in positions 0 and 1 of the rack.

The mechanical assembly of this controller is described in NX3020 CPU User Manual – MU214614.

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

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

9. Manuals

For the correct application and use, the CPU NX-ERA NX3020 Series User Manual – MU214105 must be consulted.

For more technical details, configuration, installation and programming of NX-ERA Series, see the table below. This table is just a guide to some relevant documents that can be useful during the use, maintenance and programming of NX-ERA Series controllers. The complete and updated table containing all NX-ERA Series documents can be found at NX-ERA Series User Manual – MU214600.

Code	Description	Language
CE114000	NX-ERA Series – Technical Characteristics	English
CE114101	NX3020 Technical Characteristics	English
CE114200	NX8000 Power Supply Module Technical Characteristics	English
CE114700	NX-ERA Series Backplane Racks Technical Characteristic	English
CE114810	NX-ERA Series Accessories for Backplane Rack Technical Characteristics	English
CE114902	NX-ERA Series PROFIBUS-DP Master Technical Characteristics	English
CE114903	NX-ERA Series Ethernet Module Technical Characteristics	English
CE114908	NX5110 and NX5210 PROFIBUS-DP Heads Technical Characteristics	English
MU214600	NX-ERA Series User Manual	English
MU214614	NX3020 CPU User Manual	English
MU299609	MasterTool IEC XE User Manual	English
MP399609	MasterTool IEC XE Programming Manual	English
MU214601	NX5001 PROFIBUS DP Master User Manual	English
MU214608	NX-ERA PROFIBUS-DP Head Utilization Manual	English
MU223603	IEC 60870-5-104 Server Device Profile Document	English
MU214603	NX-ERA Series HART Manual	English
MU214606	MQTT User Manual	English
MU214609	OPC UA Server for Messung Controllers User Manual	English
MU214610	Advanced Control Functions User Manual	English
MU214621	NX-ERA Series PROFINET Manual	English

Table 15: Related Documents