Module Description

Nexto Series is a powerful and complete Programmable Logic Controller (PLC) Series with unique and innovative features. Due to its flexibility, smart design, enhanced diagnostics capabilities and modular architecture, Nexto is suitable for control systems ranging from medium to high-end large applications. Finally, its compact size, high density of points per module and superior performance, allow Nexto Series to be applied in small automation systems with high performance requirements, such as manufacturing applications and industrial machines.

The Series has a wide variety of CPUs and I/O modules with features to fit requirements in different kinds of applications. The NX1800 is the Nexto Digital Input model to address functional safety requirements.

Functional safety is the process of using non-standard equipment that has a safe response of the outputs in relation to the inputs. In systems where physical integrity, property or environment are at risk, a superior safety level is necessary to ensure a proper process operation in every aspect. These safety requirements are not only valid for process applications, but also for factory automation. Normally used in systems that need a fast response to light barriers and emergency buttons, as industrial machines and process control, the logic used must provide the best performance as possible without compromising the system integrity. With that concept in mind, NX1800 was developed with the highest technology in industrial automation, representing the state of the art in functional safety engineering.

NX1800 is based in the following standards: IEC 61508, IEC 62061 and EN ISO 13849. The module can be used in certified applications and is capable of achieving SIL 3 and PLe Cat. 4.

Its main features are:

- PROFIsafe slave module
- 8 digital inputs
- Support for solid state sensors (OSSD)
- Support for contact sensor with test pulse output
- Support equivalent and antivalent valency configuration
- Detection of short circuit with power signals and between inputs
- Test pulses overload diagnostic
- Display for module diagnostics and input state indication
- Easy Plug System
- One Touch Diag
- Electronic Tag on Display

Ordering Information

Included Items

The product package contains the following items:

- NX1800 module
- One 20-terminal connector with wire holder
- Installation guide

Product Code

The following code should be used to purchase the product:

Code	Description
NX1800	24 Vdc 8 Safety DI Module

Table 1: Product Code

Related Products

The following products must be purchased separately when necessary:

Code	Description
NX5110	PROFIBUS-DP Head
NX9000	8-Slot Backplane Rack
NX9001	12-Slot Backplane Rack
NX9002	16-Slot Backplane Rack
NX9003	24-Slot Backplane Rack

Table 2: Related Products

Compatibility with Other Products

The following product can be used with this product:

	Software version	Product revision
MT8800	1.00 or higher	AA or higher
MT8500	3.03 or higher	AY or higher
NX5110	1.1.2.3 or higher	AK or higher

Table 3: Compatibility with Other Products

Innovative Features

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

Easy Plug System: Nexto Series has an exclusive method to plug and unplug I/O terminal blocks. The terminal blocks can be easily removed with a single movement and with no special tools. In order to plug the terminal block back to the module, the frontal cover assists the installation procedure, fitting the terminal block to the module.

One Touch Diag: One Touch Diag is an exclusive feature that Nexto Series brings to PLCs. With this new concept, the user can check diagnostic information of any module present in the system directly on CPU's graphic display with one single press in the diagnostic switch of the respective module. OTD is a powerful diagnostic tool that can be used offline (without supervisor or programmer), reducing maintenance and commissioning times.

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.

Product Features

General Features

	NX1800
Backplane rack occupation	1 slot
Input type	Monitored sink type 1 input with integrated test outputs for switches
Safe state	0 logic level sent by PROFIsafe or interruption of communication
Input logic treatment	Switch valence discrepancy and shared test output
Number of inputs	8
Input voltage	24 Vdc 15 to 31.2 Vdc logic level 1 <SRSREQ615> 0 to 5 Vdc logic level 0 <SRSREQ614>
Input current	4.6 mA at 24 Vdc
Input update time (WCDT) <SRSREQ654> **Single input with no external test pulse** **Single input with external test pulse** **Paired inputs with no to external test pulse** **Paired inputs with individual external test pulse** **Paired inputs with shared external test pulse**	 6 ms 9 ms 3 ms 3 ms 9 ms
External power supply **Voltage range** **Consumption** **Type**	 18 to 31.2 Vdc <NSREQ621> 1W + consumption of T0/T1 outputs <NSREQ621> SELV/PELV <SRSREQ633>
Cables	0.5 mm^2 (20 AWG), 200 meter maximum <NSREQ678>
Configurable parameters **Channel**	 Yes, test pulses, input pairing, valence and shared test pulses
PROFIsafe version	V2-mode only (V1-mode is not supported)
PROFIsafe address	Configurable, between 1 and 65534
TBUS	8 ms <NSREQ652>
DAT	2 ms <NSREQ653>
Inputs state indication	Yes
One Touch Diag (OTD)	Yes
Module Protection	Yes, protection against polarity inversion at external power supply, protection against high energy surge, detection of loss of power supply, protection against overtemperature
Channel Protection	Yes, protection against overload at test pulses outputs, detection of input short circuit
Max. current on each test pulse output	300 mA at 24 Vdc <SRSREQ618>
Isolation **Inputs/Pulse Out to logic** **Inputs/Pulse Out to protective earth** ⏚ **Logic to protective earth** ⏚	 1500 Vac / 1 minute <SRSREQ617> <SRSREQ619> 1500 Vac / 1 minute 1500 Vac / 1 minute
Current consumption of backplane rack power supply	200 mA <NSREQ620>

	NX1800
IP Level	IP 20
Operation temperature	0 to 60 °C
Storage temperature	-25 to 70 °C
Operating and storage relative humidity	5% to 96%, non-condensing
Conformal coating	Yes
Classification <SRSREQ656> **IEC 61508** **IEC 62061** **ISO 13849**	 SIL 3 SIL 3 PLe Cat. 4
Proof Test Interval (PTI)	20 years <SRSREQ657>
Failure probability **Low demand (PFD_{avg})** **High demand (PFH)**	 $< 5X10^{-5}$ (5% of PFD_{avg} max. for SIL 3) <SRSREQ658> $< 5X10^{-9}$ (5% of PFH max. for SIL 3) <SRSREQ659>
$MTTF_d$ (Mean Time To Failure dangerous)	High (>30 years) <SRSREQ661>
DC_{avg}	Higher than 99% <SRSREQ662>
Standards <SRSREQ622> <SRSREQ624> **- (Incl. Climatic and Mechanical req.)**	IEC 61131-2:2017 IEC 61131-6:2012 IEC 61508:2010 IEC 62061:2005 EN ISO 13849:2012 IEC 61784-3-3:2010
EMC Compliance <SRSREQ623>	IEC 61131-2:2017 Zone B IEC 61131-6:2012 General EMC Environment IEC61326-3-1:2017 IEC61000-6-4:2006+AMD1:2010 CE –2014/35/EU (LVD) and 2014/30/EU (EMC)
RoHS directive	RoHS 2002/95/EC
Module dimensions (W x H x D)	18.00 x 114.62 x 117.46 mm
Package dimensions (W x H x D)	44.00 x 122.00 x 147.00 mm
Weight	100 g
Weight with package	150 g

Table 4: NX1800 - General Features

Notes:

Input type: Test pulses are two digital outputs (T0 and T1) that generate pulses to detect if the input is short-circuited with power supply lines when connected to an input. They are both replicated on the connector.

Safe state: In case of fault detection, NX1800 will report the input value as 0 logic level or in some cases it will interrupt communication with safety CPU, resulting in PROFIsafe watchdog. <SRSREQ634>

ATTENTION:
Safety function must consider the safe state of NX1800.

Input update time (WCDT): This is the total update time of an input channel (worst case), which also considers (additionally to the internal scan time) the internal low level software filter that rejects pulses with duration shorter than 2ms.

Proof Test Interval (PTI): Period in which the module must be replaced so the PFD limits of SIL-3 is not exceeded.

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

TBUS and DAT: Delay of remote backplane (TBUS) is the maximum time of communication between PROFIBUS head and safety module. PROFIsafe Device Acknowledgement Time (DAT) is the maximum time between the reception of a PROFIsafe request message and the response of a new PROFIsafe telegram.

ATTENTION:
Both TBUS and DAT do not directly impact in safety response time but must be considered for PROFIsafe watchdog definition which is part of system's response time.

Installation

Architecture

Nexto Safety 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 safety architecture is divided in the following main components:

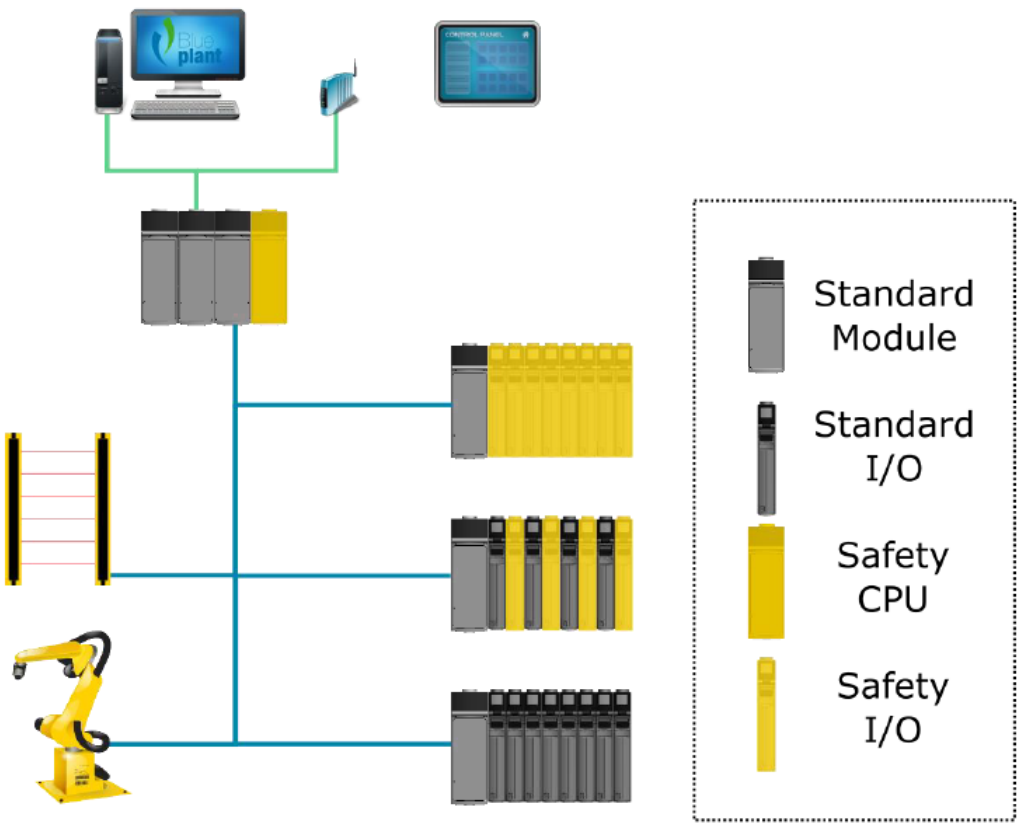

Figure 1: Architecture

Connector Pinout

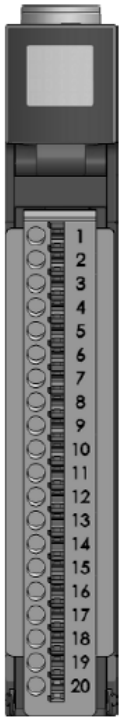

Figure 2: Connector Pinout

The following table shows the description of each connector terminal:

Terminal Number	Name	Description
1	I00	Input 00
2	I01	Input 01
3	I02	Input 02
4	I03	Input 03
5	I04	Input 04
6	I05	Input 05
7	I06	Input 06
8	I07	Input 07
9	T0	Test pulse output 0
10	T1	Test pulse output 1
11	T0	Test pulse output 0
12	T1	Test pulse output 1
13	T0	Test pulse output 0
14	T1	Test pulse output 1
15	T0	Test pulse output 0
16	T1	Test pulse output 1
17	V1	External power supply input (24 Vdc)
18	V1	External power supply input (24 Vdc)
19	N1	External power supply input (0 Vdc)
20	N1	External power supply input (0 Vdc)

Table 5: Connector Pinout NX1800

Mechanical and Electrical Assembly

The mechanical and electrical mounting and the connector insertion and removing for I/O modules are described at Nexto Series User Manual – MU214600.

Physical Dimensions

Nexto User Manual – MU214600 should be consulted for general measurement of installation panel.

Dimensions in mm.

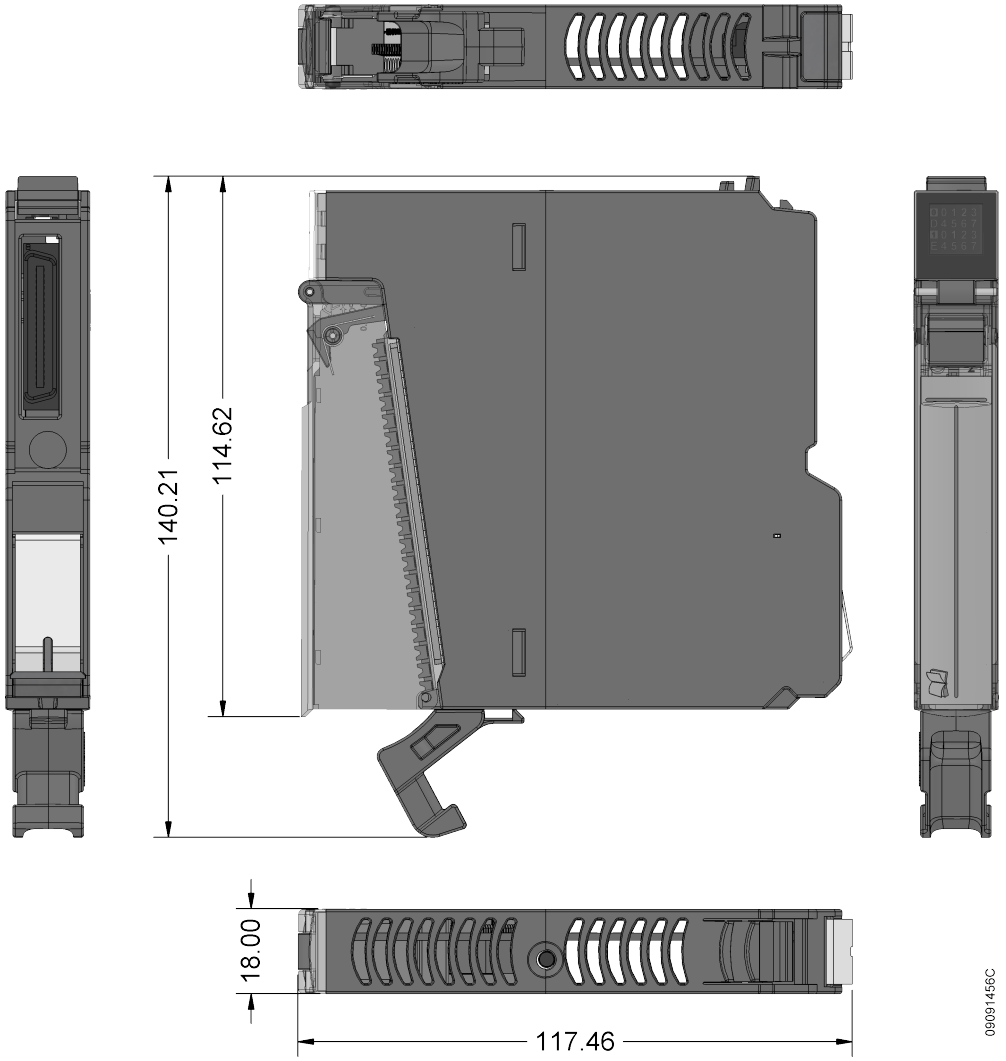

Figure 3: Physical Dimensions

Configuration

The information related to module configuration can be found on Nexto Safety User Manual - MU214602.

Module Usage

Inputs Read

NX1800 has one variable to read its inputs (Digital Inputs byte 0). This variable has eight bits where each bit represents the input logical state. The relationship between each bit and its respective input can be found on the Bus I/O Mapping tab.

When using paired inputs, only the respective even bit will represent the input value while the odd bit will keep with 0 logical level.

Maintenance

The maintenance and diagnostic information can be found on Nexto Safety User Manual - MU214602.

Manuals

For further technical details, configuration, installation and programming of Nexto Series the table below should be consulted.

Code	Description	Language
MU214602	Nexto Safety User Manual	English
CE114699	Nexto Safety CPU – Technical Characteristic	English
CT114699	Nexto UCP de Segurança – Características Técnicas	Portuguese
CS114699	Nexto UCP de Seguridad – Especificaciones y Configuraciones	Spanish
CE114305	Safety 24 Vdc 8 DI Module – Technical Characteristic	English
CT114305	Módulo 24 Vdc 8 ED de Segurança – Características Técnicas	Portuguese
CS114305	Módulo 24 Vdc 8 ED de Seguridad – Especificaciones y Configuraciones	Spanish
CE114404	Safety 24 Vdc 4 DO Transistor Module – Technical Characteristic	English
CT114404	Módulo 24 Vdc 4 SD Transistor de Segurança – Características Técnicas	Portuguese
CS114404	Módulo 24 Vdc 4 SD Transistor de Seguridad – Especificaciones y Configuraciones	Spanish
MU214605	Nexto Series CPUs User Manual	English
MU214100	Manual de Utilização UCPs Série Nexto	Portuguese

Table 6: Safety Related documents