

Operating instructions for safety control unit mod. NC11



These operating instructions are only valid in conjunction with the operating instructions for the relevant sensors and magnet (1SMA_Nxxxcodedsensor_ITA_ENG).

Correct Use

The coded Magnetic Safety switches are a series of technical safety devices for monitoring moveable separating safety guards. They ensure that dangerous work on machines can only be carried out if the safety guards are closed.
A stop command is triggered if a safety guard is opened while the machine is running. Before safety switches are used, a risk assessment must be performed on the machine in accordance with:

- **EN ISO 13849-1:2015**, Safety of machinery
Safety-related parts of control systems:
Part 1: General principles for design;
- **EN ISO 14119:2013**, interlocking devices associated with guards;
- **EN 60204-1:2018**, electrical equipment of machines;
- **EN 60947-5-1:2017**
Electromechanical control circuit devices
- **EN 60947-5-3:2013**, Requirements for proximity devices with defined behaviour under fault conditions (PDDDB)

SAFETY PRECAUTIONS

The safety switch fulfills a personal protection function. Incorrect installation or manipulation, use of spare magnets to activate sensors with safety guards open can lead to severe injuries to personnel.

Safety switches must **not** be bypassed (bridging of contacts), turned away, removed or otherwise rendered ineffective.

The switching operation may only be triggered by coded magnets specially provided for this purpose which are permanently connected to the safety guard.

A complete safety-oriented system generally consists of several signalling devices, sensors, control units and concepts for safe shut-off operations. The manufacturer of a machine or installation is responsible for correct and safe overall function.

Functioning

The safety system consists of a control unit, sensors and activation magnets and is only functional in particular combinations (see combination options)!

The sensors connected to the control unit contains reed contacts which are activated by the coded magnets. The safety control unit converts this information and transfers the safety guard state to the control system via a safety output.

When the protective door is being opened or closed, the control unit is checked to ensure that it is functional. In this way internal errors from the sensors to the control unit output can be detected.
If an error is detected, the control unit goes into a blocked state. The safety outputs remain in the open state.
The control unit status is displayed visually by means of LED displays.

A maximum of 2 sensors may be connected to the control unit.

Assembly

Installation must be performed by authorized personnel only.
The NC11 control unit must be assembled in a suitable operating area (switch cabinet, protective housing, at least IP 54).
The control unit is installed by clipping it to a standard 35 mm top-hat rail in accordance with EN 50022.

Electrical Connection

Electrical connection must be performed by authorized personnel only.
All the electrical inputs must either be isolated from the mains supply by a movable safety transformer in accordance with EN IEC 61558-2-6 with limited output voltage in the event of a defect or by another equivalent movable mechanism. The supply have to be connected in a permanently way and using a cable with a maximum lenght of 10 m; the sensors have to be connected to the unit using a cable with a maximumum lenght of 30 m.
Terminals 1 and 2 are reverse polarity protected for connection of the power supply for all outputs (safety and door signal output).
External contact fuses (4 A quick-action fuse) for relay outputs must be fitted.
All the output contacts must have an adequate protective circuit for capacitive and inductive loads.
If a standard power supply is used, all the inductive and capacitive loads (e.g. relay contactors) connected to the power supply must be connected to appropriate interference suppressors.
If sensors are not connected to the plug-in terminals provided in the control units, the bridges supplied must be inserted in accordance with the connection plan.

Service and Inspection

For category 1 No servicing is required. In order to ensure lasting, trouble-free operation, **regular inspection (once a turn** or not later than every **8 hours**) of the following is required:

- correct switching function
- secure mounting of components
- loose connections.

For category 2 is necessary a **regular inspection** of the system to control the correct switching function **once a shift** or not later than every **8 hours**. This test has to be performed by opening every single safety door.
In case of a door open condition:
- The safety output **MUST BE OFF**
- The led on the control unit related of the sensor on the door **MUST BE OFF**.

In the event of damage or wear and tear, the damaged system component must be replaced.
If the protective doors are not frequently used, the system should be subjected to a function test as part of the inspection schedule.

Liability coverage is void under the following circumstances:

- if instructions are not followed
- non-compliance with safety regulations
- installation and electrical connection not performed by authorized personnel
- non-implementation of functional checks.

Setup

If the control unit does not appear to function when operating voltage is applied (green PWR LED does not light up), the unit must be returned unopened to the manufacturer.
Check whether the safety outputs are being switched (see LED display) by opening and closing the protective door.

LED displays

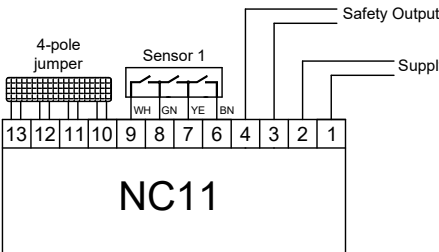
Function	LED	Colour	State
Operating voltage	PWR	green	on
Sensor 1 Magnet in activation area	S1	green	on
Magnet not in activation area	S1	green	off
Sensor 2 Magnet in activation area	S2	green	on
Magnet not in activation area	S2	green	off

If the magnets are in the response area (or one sensor and one 4-pole jumper) safety output 3/4 is switched through. LEDs S1 and S2 light up. If the 4-pole jumper is used, the relevant LED S1 and / or S2 lights up and stays on.

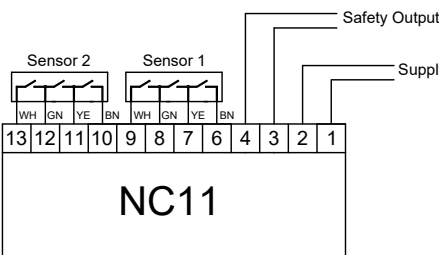
Sensors and Magnets installation

- Install Sensor and Magnets so that:
- They are accessible for inspection work and the installation of spare parts.
 - When the safety guard is closed, the active read head and actuator area are exactly aligned (see "Sensors and Magnets alignment" of the sensor manual 1SMA_Nxxxcodedsensor_ITA_ENG)
 - The magnet is located in the sensor's response area when the safety guard is closed.
 - A guide and an extra stop must be fitted to the moveable part of the safety guard.
 - A stopping mechanism must be fitted to the protective doors for closed position.
 - If the Sensor and Magnets are fitted flush, the switching distance is reduced depending on the installation depth and the safety guard material.
 - If the Sensors and Magnets are fitted on ferromagnetic material, the activation distance is reduced.
 - Round magnets are torque-resistant. In order to ensure that the magnet cannot be rotated when secured to the protective doors, a 2 mm hole should be drilled for the safety lug during installation.

NC11 with 1 sensor



NC11 with 2 sensor

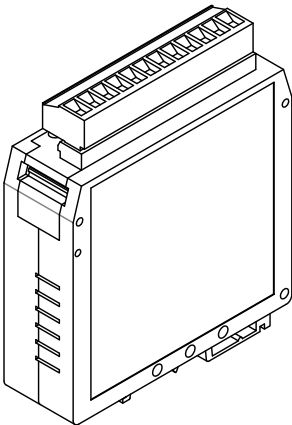
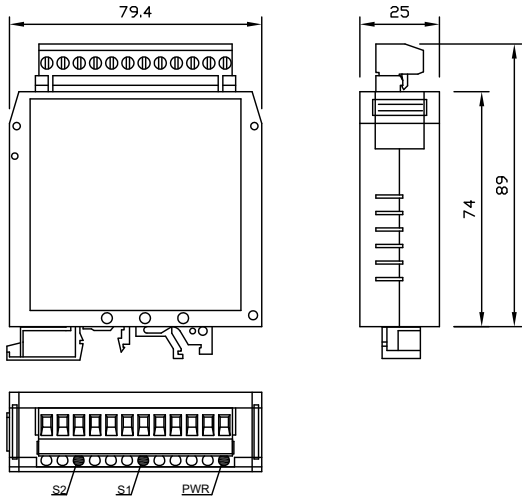


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ORIGINAL INSTRUCTIONS

NC11 Overall Dimensions



NC11 Combination Options Table

Shape	Sensor	Safety Category	Circuit Diagram	Activation Magnet	Activation Distance Son [mm]*	Deactivation Distance Soff [mm]*	Reset Distance [mm]*
	N510 FC N510 LC	1		M140	< 6	> 14	-
	N510 FD N510 LD			M148	< 18	> 30	-
	N520 FE N520 LE			M125	< 6	> 14	-
	N180 FB			M110 M11A	< 7	> 13	-
	N250 FB N250 LB			M110 M11A	< 7	> 13	-
	N300 FB N300 LB			M113	< 7	> 13	-
	N55x FE			M15x	> 2 *** < 6	> 18	-

* Activation, deactivation and reset distances are influenced by ferromagnetic materials. all the data applies to the frontal direction of approach and a center offset of 0,0 mm.
***Sensor activation is guaranteed between this two distances.
All the distances have a tolerance of ±1 mm.

UL CERTIFICATION REQUIREMENTS

This Device is intended for Din Rail mounting in an overall Industrial Control Panel Enclosure and have been evaluated according to the requirements of UL508 and C22.2 no. 14 and have not been investigated with respect to EMC, FMEA or for use in safety related circuits.

This device is intended to be used with a Class 2 power source or Class 2 transformer in accordance with UL1310 or UL1585.

As an alternative a LV/C (Limited Voltage / Current) power source with one of the following properties can be used:

a) This device shall be used with a suitable isolating source such that the maximum open circuit voltage potential available to the product is not more than 24 Vac/dc and the current is limited to a value not exceeding 8 amperes measured after 1 minute of operation.

b) This device shall be used with a suitable isolating source in conjunction with a fuse in accordance with UL248. The fuse shall be rated max. 4 A and be installed in the 24 Vac/dc power supply to the device in order to limit the available current.

c) Terminal tightening torque of 4.5 Lb per In.

A device that is intended to be supplied from a Limited voltage /current circuit shall be provided with installation instructions that specify the use of a suitable isolating transformer or power supply and rating of the secondary overcurrent protective device (max. 4 A) to be installed in the field. The open peak voltage is limited to max. 30 V with a max. power of 100 VA according table 32.1 (UL508).

RATINGS

- Read Heads: Input: 24 V ac/dc, Class 2 Output: Max 30 V ac/dc, Class 2
- Accessories: 24 V ac/dc, Class 2
- Actuators: Non-electric

Technical Data

Parameter	Value	Units
Housing Material	Poliammide PA66	
Dimensions	89 x 79,4 x 25	mm
Weight	115	g
Ambient temperature	0 ... +50	°C
Storage temperature	-25 ... +70	°C
Degree of protection (IEC 60529)	Terminals: IP20 / Housing: IP40	
Degree of contamination	2	
Assembly	35 mm standard top-hat rail (EN50022)	
Max number of sensors	2	
Connection type	Plug-in screw terminals	
Cable insulation removal for correct insertion into the terminal	6 Max	mm
Supply Voltage	24 ±10%	V AC/DC
Internal fuse on the supply	750 mA PTC	
Switching voltage to the output (max)	250	V AC
Typ. current consuption	45	mA
Switching current (Imax @ 24 V)	4	A
Switching current (Imin @ 12 V)	4	mA
Switching power to the output (max)	1000	VA
External fuse on the output	4 A quick-action	
Safety outputs	1	
Usage category (safety output)	AC-1: 4A, 250V / AC-15: 1A, 250V AC-3: 4A, 24V / AC-15: 1A, 24V DC-3: 4A, 24V	
Safety category and PL EN ISO 13849-1:2015		
nop (n. of operation / years)	65700	26280
MTTFd (AC-1: I laod = 4A)	39	100
PFHd	2,93x10 ⁻⁶	1,14x10 ⁻⁶
B10d	AC-1 (4A) = 4x10 ⁵ ; AC-15 (1A) = 1,4x10 ⁵	N. cycles
TM	20	years
Output open response time	20	ms
Rated insulation voltage	250	V
Rated impulse withstand voltage	6	kV
Mechanical switching cycle relays	10x10 ⁵	N. cycles
Vibration and shock resistance	EN 60947-5-1:2017	
EMC compliance	EN 60947-5-1:2017, EN 60947-5-3:2013 IEC 61326-3-1:2017	
Sensors coding level according to EN ISO 14119:2013	Type 4, low level	
Approval	TÜV n° Z10 17 01 48304 011	

** Safety category 2 (EN ISO 13849-1) only with **regular inspection** of the system that control the correct switching function **once a shift** or not later than every **8 hours**.
This test has to be performed by opening every single safety door. In case of a door open condition:
- The safety output **MUST BE OFF**
- The led on the control unit related of the sensor on the door **MUST BE OFF**.