

These operating instructions are valid only in conjunction with the manuals of the relevant sensors used, which can be downloaded from the main manuals section at the following link <https://www.stemsrl.it/it/downloads/>.

Refer to the table below for the type of STEM sensors combined with the control unit.

Sensor code	Type	Operating instructions
Nxxx Gx, Nxxx Lx	Reed coded	Coded sensors manual
Axxx 2M, Dxxx 2M, Exxx 2M	Reed not coded	Not coded sensors manual
NxxH G1, NxxH G2	Hall coded	Safety Hall sensors manual
N5xx RF G01	RFID + Hall coded	RFID sensors manual

## Correct Use

Safety sensors are a series of safety devices suitable for monitoring the status of removable safety guards on board machines. They ensure that dangerous work on machines can only be performed if the safety guards are closed. A stop command is activated only if a safety guard is opened while the machine is running.

## Protective Separations

This safety control unit implements Protective Separations between the relay contacts and the control circuit. This is achieved by using durable materials and appropriate construction rules in accordance with EN 60664-1:2018. All relays have double and reinforced insulation in accordance with IEC 60664-1 with:

Rated insulation voltage: 250 V AC

Contamination level: 2

Overvoltage category: II

## SAFETY PRECAUTIONS

Safety sensors perform a personal protection function. Incorrect installation or manipulation can cause serious injury to people.

Safety sensors must not be bypassed (short-circuiting the contacts), moved, removed or otherwise rendered ineffective.

The switching of coded sensors may only be controlled by magnets provided exclusively for this purpose which are permanently connected to the safety guard. When using non-coded sensors, it is recommended to implement the risk reduction measures provided for in ISO 14119:2024 in point 8.3 a) by making the position of the sensors and actuator magnets inaccessible and hidden.

A complete safety system generally consists of many signaling devices, sensors, control units. The manufacturer of the machine, or the installer, is responsible for correct and safe operation.

The auxiliary output NC 31-32 of this control unit must not be used as a safety output.

The NC66 is not suitable for operation in the presence of ionizing and non-ionizing radiation (X-rays, lasers, microwaves, ultraviolet rays) (EN 60204-1:2018, §4.4.7).

## Operation

The safety system consists of a control unit, sensors and actuators and is only functional in specific configurations.

The NC66 is able to control the status of two or more separate NO+NC inputs (magnetic safety sensors, emergency buttons, mechanical safety switches, safety interlocks for movable guards): the output is activated by pressing and releasing the START (reset) button only if the NO input is closed and the NC input is open.

Switching only one of the two inputs determines a safety situation, placing the safety outputs in the open state and preventing them from closing again even after a new switching of the input and pressing the START button. If an error is detected, the control unit goes into a locked state and the safety outputs remain open. The status of the control unit is displayed via LEDs.

When a sensor is in its activation area, the corresponding LED (Sx) and output signal (Yx) are on (VYx=24Vdc).

After the safety outputs have been opened, it will only be reactivated if the input channels have both been deactivated (NC closed and NO open) and subsequently activated (NC open and NO closed).

The START (Reset) button, if used, must be connected to terminals X1-X2; the safety outputs close when the button is released (if all safety doors are properly closed).

In case of using a monitored feedback loop, safety outputs 13-14 and 23-24 close only if the feedback loop is closed when the unit is requested to be activated.

The feedback loop contacts must be connected in series with the Start button (if used), otherwise they must be connected to terminals X1-X3 (see connection diagram). If the Start button is not used and in case of an unmonitored feedback loop, a 2-pole jumper must be connected to terminals X1-X3.

The NC66 module can also work with mechanical NO+NC switches or emergency stop buttons; in these cases, automatic resetting by short-circuiting terminals X1 - X3 is not permitted (EN ISO 13850:2015, §4.1.4, EN 60204-1:2018, §9.3.1, §9.2.3.4.2).

## Mounting

Installation must be carried out by authorized personnel only. The control unit must be mounted in a suitable operating area (switch cabinet, protective housing, at least IP 54). The control unit is installed by snapping it onto a standard 35 mm DIN rail.

## Electrical connections

Electrical connections must be made by authorised personnel only. All electrical inputs must be isolated from the mains supply either by a separately wound transformer in accordance with EN IEC 61558-2-6 with limited output voltage in the event of a fault, or by an equivalent removable mechanism or by a power supply electrically isolated from the mains supply.

The power supply must be permanently connected using a maximum cable length of 10 m; sensors must be connected to the unit with cables of a maximum length of 30 m.

Relay outputs have a maximum current of 3 A; the power supply connected to these outputs must be protected against overcurrent by devices appropriate to the loads to be protected. All output contacts must have an adequate protection circuit for inductive and capacitive loads.

All inductive and capacitive loads connected to the power supply must be connected to an appropriate interference suppressor.

The supplied jumpers must be inserted, in accordance with the connection diagram, according to the number of sensors connected.

## Service and Inspection

The correct operation of the control unit must be checked by the operator and/or the control circuit of the machine in which it is used at each installation, new wiring or modification of the sensor configuration and in any case periodically (at the beginning of each shift or at the latest within 8 hours) by checking the following:

- correct switching of each individual sensor checking:
  - a) that when the single sensor/guard is opened the safety outputs are opened
  - b) that when the same sensor/guard is closed the safety outputs are closed following any start command
- secure fixing of the components
- correct fixing of the connections.

The monitoring function of the device is carried out at each intervention of the device itself. If with all the guards closed and following a possible start command, the control unit does not activate its safety outputs, avoid turning the device off and on, then proceed to check for any open guards and carry out the checks indicated above in points a) and b).

In the event of a fault or wear, the damaged system must be replaced.

## Liability coverage is void under the following circumstances:

- if the instructions are not followed
- non-compliance with safety regulations
- installation and electrical connection not carried out by authorised personnel
- failure to carry out the operation checks.

## Setup

If the control unit does not appear to function when the supply voltage is applied (the green LED does not light up), the unit must be returned sealed to the manufacturer. Check whether the safety outputs switch (see LED table) by opening and closing the protective doors.

## LED Table

Function	LED	Color	State
Operating voltage	PWR	Green	on
Outputs 13-14 and 23-24: OPEN	K1 K2	Green Green	off off
Outputs 13-14 and 23-24: CLOSED	K1 K2	Green Green	on on
Sensors n. x (x= 1...6)			
Magnete <b>nell'</b> area di attivazione	Sx	Green	on
Magnete <b>non nell'</b> area di attivazione	Sx	Green	off

The green output LEDs K1 and K2 both light up when the inputs are activated and, following a possible start command, the safety outputs have closed.

## Installation of Sensors and Magnetic Units

Install Sensors and Magnetic Units so that:

- They are accessible for inspection work and for the installation of spare parts.
- When the safety guard is closed, the active regions of the sensor and the magnetic unit are aligned (see "Alignment between Sensors and Magnets" in the sensor manual).
- The magnetic unit is within the activation area of the sensor when the guard is closed.
- An extra guide and locking system is fitted to the moving part of the guard.
- A stop mechanism is fitted on the guard doors for the closed position.

If several Sensor-Magnetic Unit pairs are mounted close to each other, the switching distance is reduced depending on the distance between the pairs and the material of the safety guard.

If Sensors and Magnetic Units are mounted on ferromagnetic material, the activation distance is reduced.

The approach speed between the sensor and the magnet must not be too slow if the unit is configured with automatic start.

To ensure that the Round Magnetic Units cannot rotate once fixed to the protective doors, a 2 mm hole must be drilled during installation for the anti-rotation pin that each magnet is equipped with.

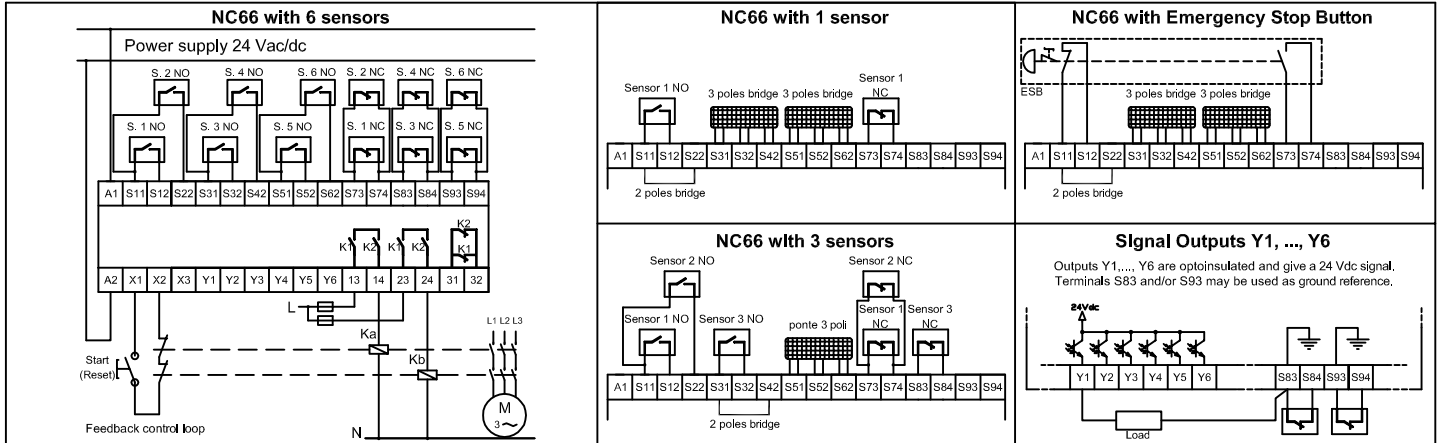
# Operating instructions for safety control unit mod. NC66

Original instructions



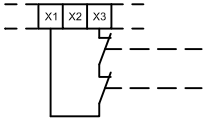
Connection diagram (the illustrated input contact configurations refer to open guards or ESBs not pressed)

If less than 6 sensors are connected, the NO inputs must be short-circuited



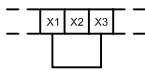
## NOTE 1

If START button is not used, feedback loop must be connected to X1-X3 terminals (X2 not connected).

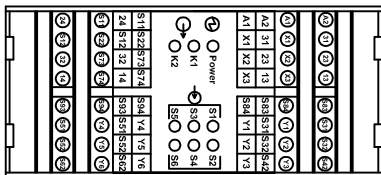
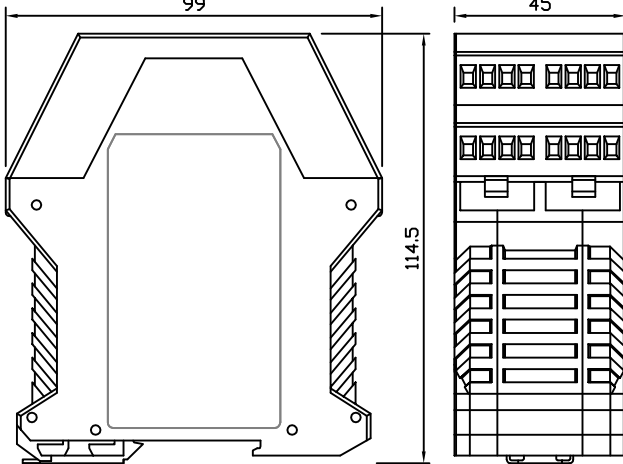


## NOTE 2

If START button is not used, and in case of unmonitored feedback loop, a 2 poles bridge must be connected to X1-X3 terminals (X2 not connected).



## Dimensions



## Technical Data

Parameter	Value	Unit
Housing Material	PA	
Dimensions	114,5 x 99 x 45	mm
Weight	300	g
Working Environmental Conditions	Temperature: -5 ... +55 Relative Humidity: 4% ... 100%	°C
Air Pressure: 86 ... 106		kPa
Storage Environmental Conditions	Temperature: -25 ... +70 Relative Humidity: 5% ... 95%	°C
Air Pressure: 86 ... 106		kPa
Degree of protection (IEC 60529)	Terminals: IP20 / Housing: IP40	
Degree of contamination	2	
Supply Voltage	24 ±10% (AC 50 + 60 Hz)	V ac/dc
Internal fuse on the supply	750 mA PTC fuse (resettable)	
Current consumption	@24Vdc: 10 min, 110 max; @24Vac: 30 min, 150 max	mA
Switching voltage (Rated operational voltage, U <sub>e</sub> )	240 (max) (SAFETY outputs)	V AC
Switching Current (I <sub>e</sub> )	3 (AC-1) (SAFETY outputs)	A
Min. Switching Current @ 10 V	10	mA
Switching power to the output (max)	720 (max)	VA
External fuse on the output	4 A gG (according to IEC EN 60269-1)	
Safety Outputs	13 - 14, 23 - 24	
Auxiliary Outputs	31-32 NC; Y1,Y2,Y3,Y4,Y5,Y6, signal (24Vdc/50 mA)	
Usage category / Electrical Life (SAFETY outputs)	AC-15: 0,9A, 230/240 V / 3,5x10 <sup>5</sup> cycles DC-13: 1,5A, 24 V / 1x10 <sup>5</sup> cycles	
NC Auxiliary output parameters	max: 1,5 A @ 24 Vdc	
Rated insulation voltage (U <sub>i</sub> )	250	V AC
Rated impulse withstand voltage (U <sub>imp</sub> )	4	kV
Contamination level	2	
Overvoltage category	II	
Output open response time	20	ms
Stop Category	0 (EN 60204-1; EN ISO 13850)	

## 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:

- 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.
- 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.
- Terminal tightening torque of 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

Safety category (EN ISO 13849-1)	4 with one sensor	3 with more than one sensor		
PL	e	d	e	
nop (n. of operations / year) AC-15 ; I = 0,9 A	29500	65000	29500	nop/ year
nop (n. of operations / year) DC-13 I = 0,1 A I = 1 A I = 1,5 A	97000 75000 18000	261000 128000 31500	97000 75000 18000	nop/ year
MTTFd	100	56	100	years
PFHd	2,47x10 <sup>-9</sup>	1,03x10 <sup>-7</sup>	4,29x10 <sup>-9</sup>	
TM	20 ( For MTTFd = 100)			years
Connection type	Screw terminals			
Cable insulation removal for correct insertion into the terminal	6			mm
Vibration resistance	EN 60068-2-6, EN 60947-5-1, EN 60947-5-3			
Mechanical Switching Life	10 <sup>7</sup> (min)			cycles
Electrical Switching Life @ I <sub>e</sub>	10 <sup>5</sup> (min)			cycles
EMC compliance	IEC 61326-3-1, EN 60947-5-1, EN 60947-5-3			
In accordance with	EN 60204-1, IEC 60664-1, EN ISO 13849-1, EN ISO 13849-2, EN ISO 13850, EN 60947-5-1			
Approval	TÜV IT 9948 10 MAC 0005			