Description

The safety sensors described below are equipped with a double coding magnetic and RFID type, therefore they can be classified as a type 4 interlock with a high level of coding according to EN ISO 14119. These instructions are only valid in conjunction with the operating instructions for the relevant NCxx control units.
If the sensors are **not** used with the relevant NCxx control units, they must be interfaced with a safety control unit or a safety PLC and the complete system must be approved for this function. The responsibility for using these sensors as safety sensors lies with the machine manufacturer.

Correct Use

The **N55xRF, N51xRF** sensors are a series of devices suitable for monitoring the status of removable safety guards of the machines. They ensure that hazardous work on machines can only be performed if the safety guards are closed.
A stop command is only activated if a safety guard is opened while the machine is running.
Before using the **N55xRF, N51xRF** sensors, a risk assessment must be carried out on the machine in accordance with:
- EN ISO 13849-1, Safety of machinery Safety-related parts of systems - Part 1: General principles for design.
- EN ISO 14119, interlocking devices associated with guards.
- EN 60204-1, electrical equipment of machines.
- EN 60947-5-3, Low voltage equipment.
  Part 5-3: Control circuit devices and switching elements - Requirements for proximity devices with defined fault behavior (PDDB).

SAFETY PRECAUTIONS

No responsibility is accepted for the safe use operation of sensors or actuators without the relevant NCxx control units.

Safe operation is only ensured when the complete system with the safety control units is used

If sensors and actuators are used as safety devices without the corresponding control units, the responsibility lies with the machine manufacturer.

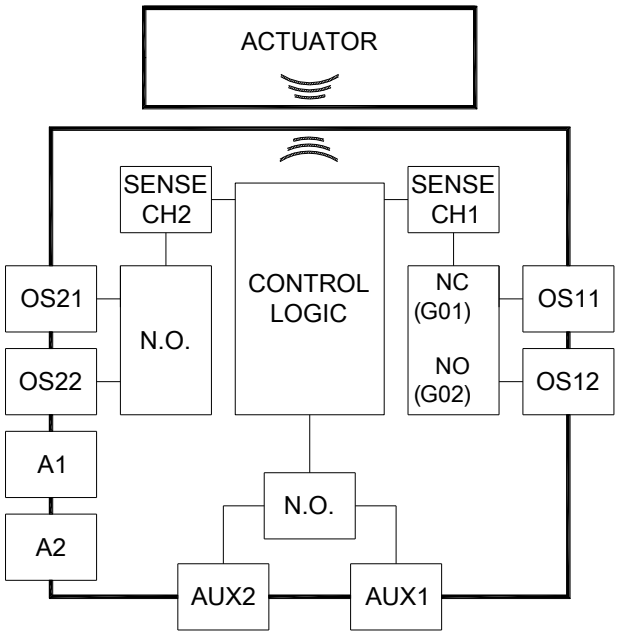
Safety sensors perform a personal protection function. Incorrect installations or manipulations can cause serious harm to people.

Coded sensors must not be bypassed (by short-circuiting contacts), moved, removed, or otherwise rendered ineffective. Switching can only be controlled by coded actuators supplied exclusively for this purpose which are permanently connected to the safety protection.

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

Operation

The safety system consists of a control unit, sensors and actuators and works only in particular configurations (see table options for STEM control unit sensors)
The devices connected to the control unit contain magnetic sensors and an RF transceiver that are activated by the actuators.
When the actuator approaches the sensor, a flashing red LED signals the recognition of the unique code contained in the actuator; Bringing the sensor closer, if the magnetic coding is correct, the redundant outputs of the sensor that constitute the inputs of the safety control units are activated, also the signal LED will become green.



The safety status is defined as the state in which the sensor is far from the actuator; in this state the signal LED is red and the sensor outputs are both open in the case of NO-NO configuration (version G02) or one open and the other closed in the case of NO-NC (version G01).
When the actuator is near the sensor its outputs reverse their state becoming respectively both closed in the case of NO-NO sensor (version G02) or one closed and the other open in the case of NO-NC configuration (version G01).
The sensor is also equipped with an auxiliary output type NO that is closed when both channels have been activated, so when the actuator is near the sensor.
At the Power-ON the sensor signals in sequence a green-blue-red flashing then the signal can be:

- Blue if the sensor has not been paired with any actuator
- Green if the actuator is near the sensor
- Red if the actuator is far from the sensor
- Flashing red if the actuator is in an intermediate position where the tag is recognized but the magnetic coding is not yet recognized.

LED STATUS AND OUTPUTS

STATUS DESCRIPIONS	LED	OS11-OS12	OS21-OS22	AUX
No actuator paired	Blue on	OFF	OFF	OFF
Sensor is in Learning mode	Flashing Blue	OFF	OFF	OFF
Registered actuator code	1 Flash green	OFF	OFF	OFF
Unrecognized actuator	Red on	OFF	OFF	OFF
Actuator recognized, but not yet activated	Flashing red	OFF	OFF	OFF
Recognized actuator channel 1 activated	Flashing red	ON	OFF	OFF
Recognized actuator channel 2 activated	Flashing red	OFF	ON	OFF
Recognized actuator channel 1 and channel 2 activated	Green on	ON	ON	ON

Programming process

The sensor can recognize up to 4 different actuators through a learning process. This process can start by the user within the first minute after the sensor is powered on.
Learning process:

1. Power on the sensor.
2. After the sturt up flashing sequence (Green, Blue, and Red), the sensor will begin blinking in blue, indicating it has entered learning mode.
3. Approach each actuator one by one to the sensor. Up to 4 different actuators can be programmed by simply bringing them into proximity with the sensor.
4. If the pairing is successful, the sensor will blink in Green momentarily, then resume flashing blue, indicating readiness to learn additional actuators.
5. The sensor will exit learning mode after either memorizing 4 tags or when one minute has elapsed since start-up.

Note:

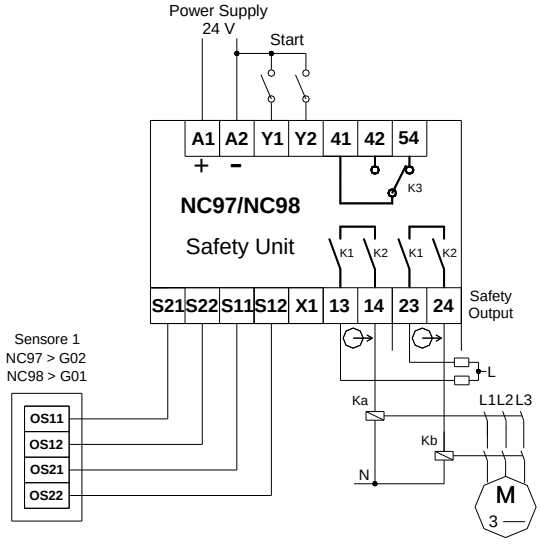
- It is recommended to approach the actuators perfectly aligned and directly in front of the sensor for optimal results.
- The sensor will not enter the learning mode if 4 actuators already have been registered in the memory.
- The programming option is available only in the sensors with the product code ending with “R” (refer to the last page of this document).

Electrical connections

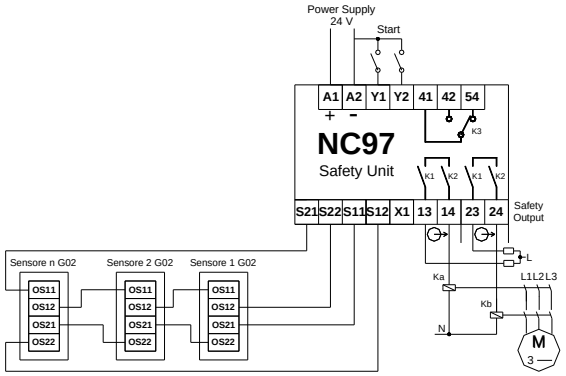
Electrical connections must be made only by authorized personnel.
The connection cable of the sensors must not be stretched. The sensors must be connected to the control unit according to the suggested schemes (see also operating instructions for the control units).

CONNECTONS

COLOR	TYPE	FUNCTION
Blu	Power supply	Power supply reference (0)
Bown	Power supply	Power supply + (Vsup)
Purple - Orange	Solid state Output	OS11-OS12 (output Channel 1)
White - Black	Solid state Output	OS21-OS22 (output Channel 1)
Pink - Gray	Solid state Output	AUX1-AUX2 (Auxiliary output for signaling)

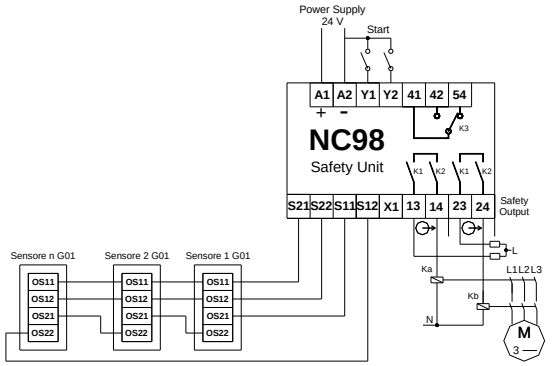


Connection diagram of a single sensor to the NC97/NC98 control unit or equivalent models



Connection diagram to the control unit NC97 or equivalent model in case of use of multiple sensors with option G02 (NO-NO):

- Channels 1 (Purple-Orange, NO) in series
- Channels 2 (Black-White, NO) in series



Connection diagram to the control unit NC98 or equivalent model in case of use of multiple sensors with option G01 (NO-NC):

- Channels 1 (Purple-Orange, NC) in parallel
- Channels 2 (Black-White, NO) in series

Assembly

Installation must only be carried out by authorized personnel.
Prevent dismantling or displacement of actuators (actuators) by the use of non-removable fastening (gluing, one-way screws).
Sensors and actuators should not be used as a mechanical stop.
Sensors and actuators should not be used in an environment with strong magnetic fields.
Sensors and actuators must be attached to safety guards.
Sensors and actuators can be installed in any position. Remember to align sensors and actuators (see "Alignment between Sensors and Actuators").
Small misalignments are allowed to ensure correct operation even in case of wear that can cause mechanical clearance.
Install Sensors and Actuators so that:
- 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 magnet are aligned (see "Alignment between Sensors and Actuators").
- the actuator is within the sensor activation area when the guard is closed.
- A stop mechanism must be inserted on the protective doors for the closed position.

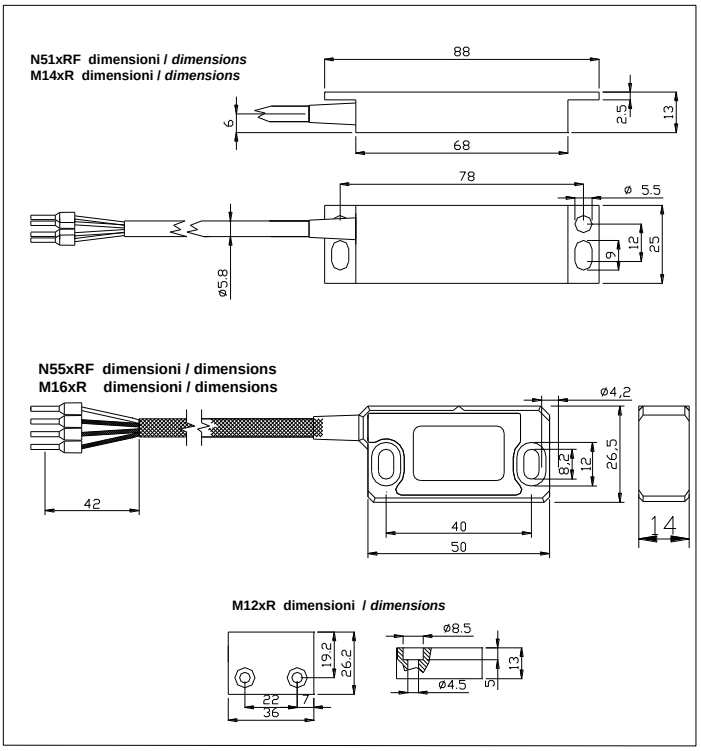
If sensor and actuators are assembled "in battery", the switching distance is reduced depending on the distance between the sensor-actuator pairs and depending on the protection material.
If sensors and actuators are mounted on a magnetic iron material, the activation distance is reduced.

Maintenance and controls

Remove any iron filings from sensors and actuators at regular time intervals.
Use only solvent-free cleaners to clean sensors and actuators.

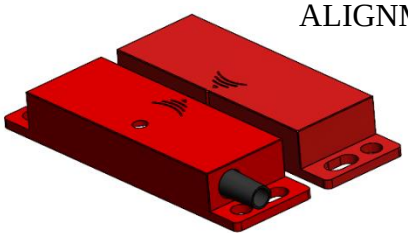
Additional safety measures (EN ISO 14119:2013, Table 3)
It is mandatory to apply one of the following safety measures:
1) assembly of the sensors and magnets out of the operator's reach 2) physical obstruction or shielding of sensors and magnets 3) install sensors and magnets in hidden position
4) check periodically (at the beginning of each working shift or at latest within the 8 hour period) the correct operation of the sensors by verifying the following:
- Correct switching of each sensor by checking:
a) that at the opening of the sensor/guard, the safety output of the control unit open
b) that when the same sensor/guard is closed, the safety output close as following eventually, the start command.
- safe fixing of components
- correct fastening of the connections.
If one of points 1, 2, 3 is applied, it is still necessary to perform the check as described in point 4.
By selecting the factory-programmed sensor version with unique, high-level coding (final P-code), the above requirements can be ignored.
The device monitoring is performed at each intervention of the device by the control unit connected to the sensors.
If with all the protections closed and following a possible start command, the control unit does not activate its safety output, avoid turning the device off and on, then proceed to check any open guards and perform the checks indicated above in points a) and b).
In case of failure or wear, the damaged system must be replaced.
Warranty coverage is voided in the following circumstances:
- if the instructions are not followed
- non-compliance with safety regulations
- installation and electrical connection not performed by authorized personnel
- failure to carry out operational checks
- product tampering

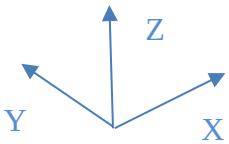
Mechanical dimensions

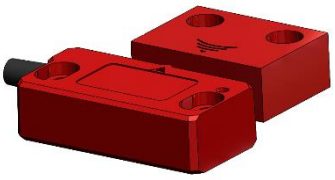


SENSOR-STEM CONTROL UNIT		
SENSOR	OUTPUT TYPE	CONTROL UNIT
N51xRFG01xx N55xRFG01xx	NO-NC	NC62, NC66, NC98, NC9801, NC20, NC21
N51xRFG02xx N55xRFG02xx	NO-NO	NC96, NC85, NC86 NC97, NC9701

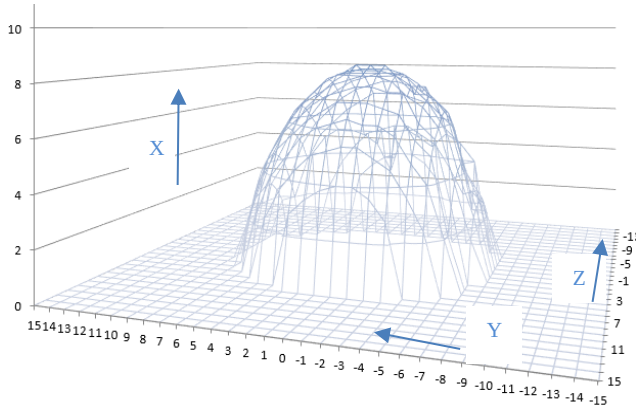
ALIGNMENT BETWEEN SENSORS AND ACTUATORS



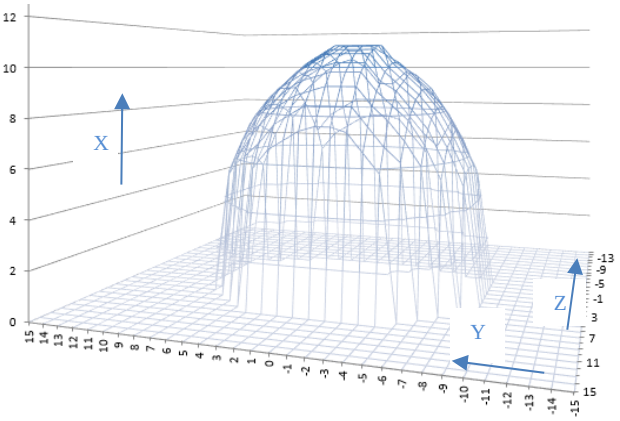




TYPICAL ACTIVATION AREA (mm)



TYPICAL DEACTIVATION CURVE (mm)



SENSOR TECHNICAL DATA		
Parameter	**Value**	**Unit**
GENERAL FEATURES		
Housing Material	PPS reinforced with fiberglass	
Operative temperature	-25 +85	°C
IP grade protection	IP 67 (IEC 60529)	
Connection	Cable with sleevs	
Operating voltage (U_B)	10-30	V dc
Maximum Current consumption without load (I_o)	15	mA
Rated insulation voltage (U_i)	35	V
Rated impulsive withstand voltage (U_{imp})	1500	V
Pollution degree	3	
Internal PTC Fuse	0,1	A
Rated conditional short-circuit current	0,1	A
External rapid fuse	0,5	A
OUTPUT FEATUTRES		
Voltage Vmax	60	V AC/DC
Power Pmax	300	mW
Current Imax (I_e)	500	mA
Minimum operational current (I_m)	<1	mA
Off State current (I_r)	<0,5	mA
Usage category Attention: use a free-wheeling diode in the case of inductive loads.	DC12, DC13 AC12 Ue=24Vdc, Ie=15mA	
Max commutation frequency	500	Hz
Voltage drop (U_d)	0.3	V
ACTIVATION PARAMETER		
Assured activation distance (S_{ao})	6	mm
Assured release distance (S_{ar})	12,5	mm
Repetition accuracy	<10%	
RELABILITY PARAMETR		
MTTF	270	years
MTTFd	500	years
MT	20	years
Diagnostic coverage (DC)	Delegated to the control unit	
Activation time	< 10	ms
Risk time	Delegated to the control unit	
CONFORMITY		
Vibration resistance	EN60947-5-3	
Shock resistance	EN60947-5-3	
Electromagnetic compatibility	EN60947-5-3, EN61326-3-1, ETSI EN301 489-1. ETSI EN301 489-3, ETSI EN300 330-V2.1.1	
Product conformity	EN60947-5-3, EN14119 Type 4 high level coding	
Certification	TÜV IT 094816MAC0077B TÜV IT 094816MAC0076B TR_722315174	

CODED ACTUATOR TECHNICAL DATA		
Parameter	**Value**	**Unit**
Housing Material	PPS reinforced with fiberglass	
Operative temperature	-25 ... +80 °C	
IP grade protection	IP 67 (IEC 60529)	
Vibration resistance	EN60947-5-3	
Shock resistance	EN60947-5-3	
Transponder frequency	125	Khz

ORDERING CODES

N5xxRF xxxxxxxxx

Esempio di codice d'ordine sensore / Sensor ordering code example

N51 0 RF G01 OL 0 196 P

Serie corpo
N51, N55
Body series
N51, N55

Colore Corpo
0=Rosso, 1=nero
Body colour
0=Red, 1=black

Opzione RFID
RFID option

Tipo di uscita
G01=NO-NC, G02=NO-NO
Output type
G01=NO-NC, G02=NO-NO

Tipologia di cavo:
OL = Cavo 8 poli, guaina esterna nera;
Cable type:
OL = 8 pole cable, external black

Caratteristiche speciali:
0 = Cavo con puntalini, x = Eventuali altre connessioni;
Special Features:
0= Cable with end-sleeves; x = Any other connection;

Lunghezza cavo in cm o cavo con connettore costampato
Length of cable *in cm or cable with connector*

Riconoscimento attuatore
P=preprogrammato in fabbrica (alto livello di codifica), R=riprogrammabile (basso livello di codifica)
Actuator check
P=factory programmed (High coding level), R=Riprogrammabile (low level coding)

M1xxRx xxxxxxx

M14 0 R0 xxxxxxx

Serie corpo
M12, M14, M16
Body series
M12, M14,M16

Colore Corpo
0=Rosso, 1=nero
Body colour
0=Red, 1=black

R0= codifica univoca,
R1= codifica comune a tutti gli attuatori
R0= unique code,
R1= same code for each actuator

Opzioni Future
Future Options