Operating instructions for N51HGx and N52HGx sensors

Description

The safety sensors described below are magnetically coded and can be classified as a type 4 interlock with low coding level according to EN ISO 14119. These instructions are only valid in conjunction with the operating instructions for the relevant NCxx control units.

If they are not used with the relevant NCxx control units, the sensors must be interfaced with a safety control unit or PLC and the entire system must be approved for this function. The responsibility for using these sensors as safety sensors lies with the machine manufacturer.

Correct Use

The N51HGx and N52HGx sensors are devices suitable for monitoring the status of removable safety protections on the machine. They ensure that dangerous work on machines can only be carried out if the safety guards are closed.
A stop command is activated only if a safety guard is opened while the machine is running.
Before using the N51HGx and N52HGx sensors, a risk assessment must be performed on the machine in accordance with:
- EN ISO 13849-1, Safety of machinery - Safety-related parts of control systems – Part 1: General principles for design.
- EN ISO 14119, Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
- EN 60204-1, Safety of machinery - Electrical equipment of machines Part 1: General requirements.
- EN 60947-5-3, Low-voltage switchgear and controlgear – Part 5-3: Control circuit devices and switching elements – Requirements for proximity devices with defined behaviour under fault conditions (PDDB)

PRECAUTIONS

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

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

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

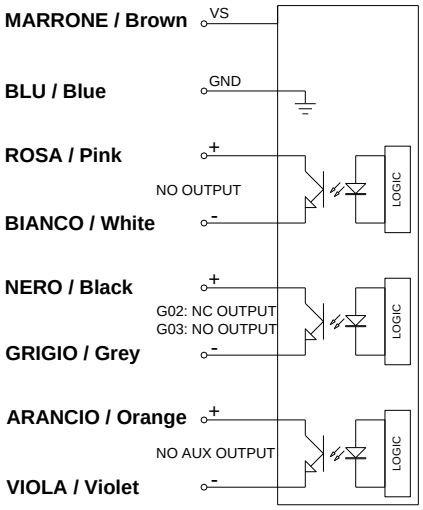
Safety sensors perform a personal protection function.
Incorrect installations or manipulations can cause serious damage to people.

Coded sensors must not be bypassed (bridging of contacts), moved, removed, or otherwise rendered ineffective. The 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 manufacturer of the machine, or the installer, is responsible for correct and safe overall operation.

Operation

The safety system consists of an evaluation unit, sensors and actuators and works only in particular configurations (see STEM control unit sensor combination options table)
The devices connected to the control unit contain Hall effect magnetic sensors which are activated by the actuators.
When the actuator approaches the sensor at a distance less than or equal to the guaranteed intervention distance (Sao), the two outputs switch, activating the inputs of the safety control unit and the green signaling LED lights up.



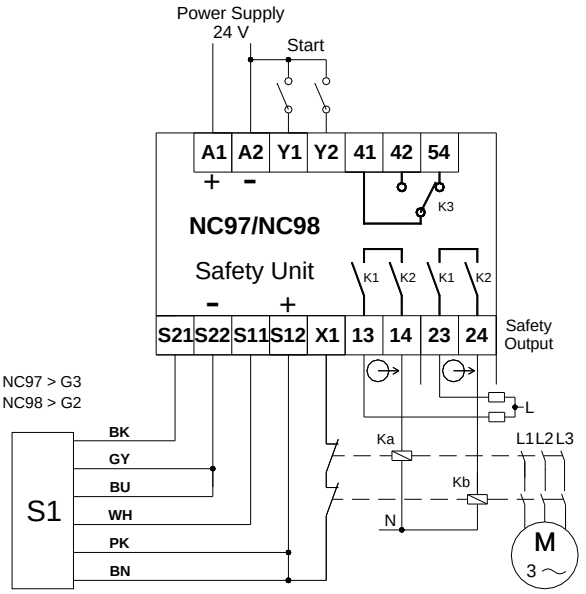
The safe state is defined as the state in which the sensor is away from its activation actuator; in this state the signaling LED is off, the sensor outputs are one open and the other closed in the case of NO-NC configuration (G2 version) or both open in the case of NO-NO configuration (G3 version); the auxiliary output is open.
When the actuator is close to the sensor, its outputs invert their state becoming respectively one closed and the other open in the case of NO-NC configuration (G2 version) or both closed in the case of NO-NO sensor (G3 version) ; the auxiliary output closes.

Electrical connection

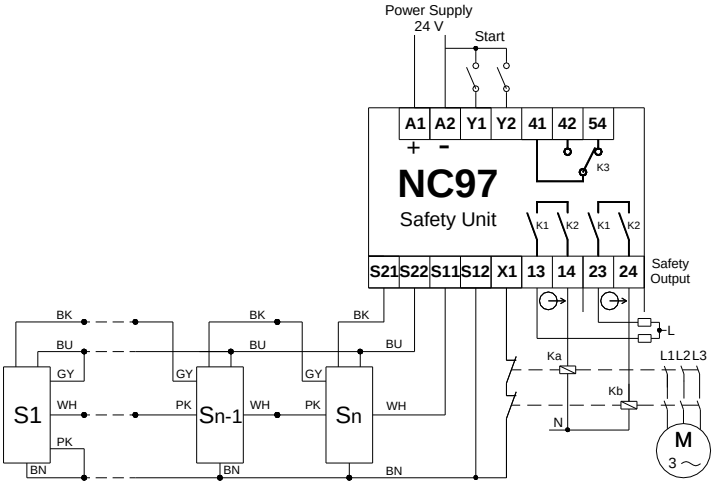
Connections must be made only by authorized personnel.
The sensors cable must not be extended. The sensors must be connected to the control unit according to the suggested diagrams (see also the operating instructions for the control units).

CONNECTIONS

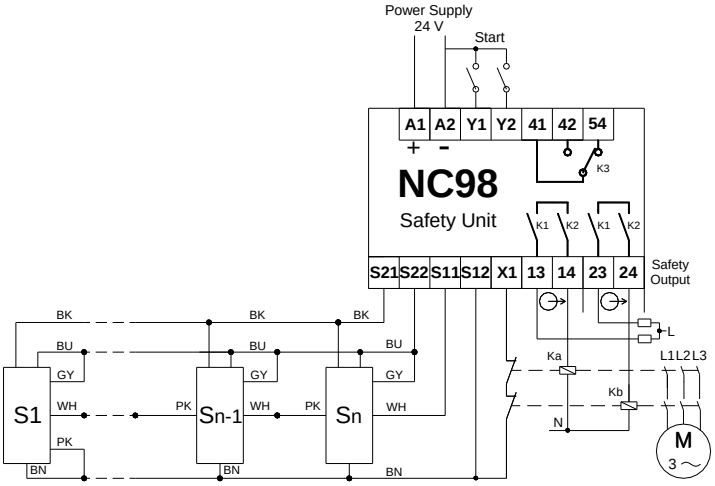
COLOR	TYPE	FUNCTION
Brown	Power supply	Positive Power (Vs)
Blue	Power supply	Negative Power (GND)
Pink - White	Opto-isolated output	Channel 1 Output (NO)
Grey - Black	Opto-isolated output	Channel 2 Output (G2 = NC; G3 = NO)
Orange - Violet	Opto-isolated output	Auxiliary output (NO)



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



Connection diagram to the NC97 control unit or equivalent model in the case of using multiple sensors with option G03 (NO-NO):
- Channels 1 (Pink-White, NO) in series
- Channels 2 (Black-Grey, NO) in series



Connection diagram to the NC98 control unit or equivalent model in the case of using multiple sensors with option G02 (NO-NC):
- Channels 1 (Pink-White, NO) in series
- Channels 2 (Black-Grey, NC) in parallel

Mounting

Installation must be carried out exclusively by authorized personnel.
Prevent removal or displacement of actuators (actuators) by use of non-removable fastening (gluing, one-way screws).
Sensors and actuators must 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 positively mounted to safety guards.
Sensors and actuators can be installed in any position. Remember to align the sensors and actuators (see "Alignment between Sensors and Actuators").
Small misalignments are allowed to guarantee correct functioning even in case of wear which can cause mechanical slack.
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 the magnet are aligned (see "Alignment between Sensors and Actuators");
- the actuator is within the sensor activation area when the protection is closed;
- an extra guide and locking system are inserted into the mobile part of the protection;
- a stop mechanism is fitted on the protective doors for the closed position.
If sensors and actuators are fitted flush, the switching distance is reduced in line with the installation depth and the safety guard material. f If the read head and actuator are fitted on ferromagnetic material, the read distance is reduced.

Service and inspection

Remove any iron swarf from the sensors and actuators at regular 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 security measures:
1) mount sensors and magnets out of reach of the operator
2) physical obstruction or shielding of sensors and magnets
3) mount sensors and magnets in a hidden position
4) periodically check (at the beginning of each shift or at the latest within 8 hours) the correct functioning of the sensors by checking the following:
   - correct switching of each sensor by checking:
     a) that when the single sensor/guard opens, the safety outputs of the control unit open
     b) that when the same sensor/guard closes, the safety outputs of the control unit close following of any start command
   - secure fixing of components
   - correct fixing of the connections.

If one of points 1, 2, 3 is applied, it is still necessary to carry out the check as described in point 4.
The monitoring function of the device is carried out at each intervention of the device itself by the connected control units.
If with all protections 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 point a) and b).
In the event of failure or wear, the damaged system must be replaced.

The warranty coverage as well as the manufacturer's liability ceases in the following circumstances:
- if the instructions are not followed
- non-compliance with safety regulations
- installation and electrical connection not carried out by authorized personnel
- failure to perform functional checks
- tampering with the product

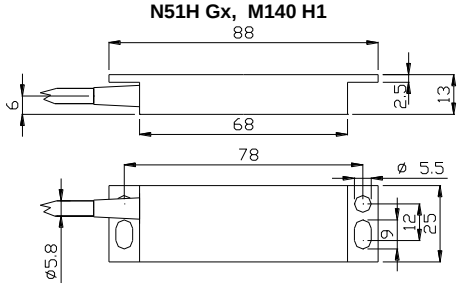
SENSOR TECHNICAL DATA		
Parameter	**Value**	**Unit**
CARATTERISTICHE GENERALI		
Housing material	Glass fiber reinforced PPS	
Operating ambient temperature	-5 ÷ +55	°C
Degree of protection (IEC 60529)	IP 67	
Connections	Cable with ferrules	
Supply voltage	20-35	V DC
Max current with no load	35	mA
Isolation voltage (U_i)	35	V
Rated withstand voltage (U_{imp})	1500	V
Pollution degree	3	
Fast external fuse on the power supply	100	mA
FEATURES SAFETY AND AUXILIARY OUTPUTS		
Rated operating voltage (U_e)	24	V DC
Isolation voltage (U_i)	35	V
Rated withstand voltage (U_{imp})	1500	V
Maximum output current (I_e)	15	mA
Minimum operating current (I_m)	<1	mA
OFF state currrent (I_r)	<0,5	mA
Fast external fuse in series with the outputs	50	mA
Usage category Attention: use freewheeling diode in case of inductive load	DC12, DC13: Ue=24Vdc, Ie=15mA	
Max. switching frequency	500	Hz
Voltage drop (U_d)	0,7	V
ACTIVATION PARAMETERS N51HGx with M140 H1		
Assured switch-on distance (S_{ao})	10	mm
Assured switch-off distance (S_{ar})	20	mm
Repetition accuracy	<10%	
ACTIVATION PARAMETERS N52HGx with M120 H1		
Assured switch-on distance (S_{ao})	6	mm
Assured switch-off distance (S_{ar})	13	mm
Repetition accuracy	<10%	
RELIABILITY PARAMETERS		
$MTTF_d$	1478	years
TM	20	years
Diagnostic coverage (DC)	Refer to the control unit used	
Switch-off time	< 10	ms
Risk time	Refer to the control unit used	
CONFORMITA'		
Resistance to vibrations and shocks	EN60947-5-3	
Electromagnetic compatibility	EN60947-5-3, EN61326-3-1	
Product compliance	EN60947-5-3, EN14119 Tipo 4 Low level code	
System test certificate	Refer to the certificate of the control unit used	

ACTUATORS TECHNICAL DATA		
Parameter	**Value**	**Unit**
Housing material	Glass fiber reinforced PPS	
Operating ambient temperature	-5 ÷ +55	°C
Degree of protection (IEC 60529)	IP 67	
Resistance to vibrations and	EN60947-5-3	

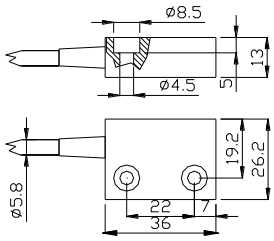
COMBINATIONS OF SENSORS-ACTUATORS-STEM CONTROL UNITS			
Sensor	**Actuator**	**Output Type**	**Control units**
N51HG2	M140 H1	NO-NC	NC20, NC21, NC62, NC66, NC98, NC9801
N52HG2	M120 H1		
N51HG3	M140 H1	NO-NO	NC96, NC85, NC86 NC97, NC9701
N52HG3	M120 H1		

MECHANICAL DIENSIONS (mm)

N51H Gx, M140 H1



N52H Gx, M120 H1



ORDERING CODES

N5xH Gx xx x xxx xxx

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

N51H G1 OL P 196 N

Serie corpo:
N51H, N52H
Body series:
N51H, N52H

Tipo di uscita:
G2=NO-NC, G3=NO-NO
Output type:
G2=NO-NC, G3=NO-NO

Tipologia di cavo e presenza uscita AUX:
EE = 6 poli, NO AUX; OL = 8 poli, AUX
Cable type and AUX output presence:
EE = 6 poles, NO AUX; OL = 8 poles, AUX

Terminazioni cavi:
0 = Cavo con puntalini, x = Eventuali altre connessioni;
Cable terminations:
0= Cable with end-sleeves; x = Any other connection;

Lunghezza cavo in cm
Cable length in cm

Caratteristiche speciali ed eventali personalizzazioni:
Es. colore corpo: - = Rosso, N = Nero
Special features and possible customizations:
Ex. body colour: - = Red, N = Black

M1x x H1 xxxxxx

Esempio di codice d'ordine attuatore / Actuator ordering code example

M14 0 H1 xxxxxxx

Serie corpo:
M12, M14
Body series:
M12, M14

Colore Corpo:
0=Rosso, 1=Nero
Body colour:
0=Red, 1=Black

H1 = attuatore codificato per sensori Hall
H1 = coded actuator for Hall sensors

Opzioni Future
Future Options