

Operating instructions for safety control unit mod. NC96 - Original instructions -



Description

The NC96 control unit has been designed for use in safety systems in accordance with EN81-20, EN81-50, EN 60204-1, EN ISO 13849-1, EN ISO 13850, EN ISO 13856-1, EN ISO 13856-2, EN ISO 13856-3.

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 Hx, Nxxx FP, Nxxx FH	Reed codificato	Coded sensor manual
Axxx 2L, Dxxx 2L, Exxx 2L	Reed not coded	Not coded sensors manual
NxxH G3	Hall coded	Safety Hall sensors manual
N5xx RF G02	RFID + Hall coded	RFID sensors manual

SAFETY PRECAUTIONS

Safety devices with two separate NO contacts perform a personal protection function; they must not be bypassed (short-circuiting the contacts), moved, removed or otherwise rendered ineffective. Incorrect installation or manipulation can cause serious injury to people. The manufacturer or installer of the machine is responsible for correct and safe operation.

The auxiliary NC output 31/32 is optically isolated and provides a status signal of the device, therefore it must not be used in any way as a safety output.

The NC96 is not suitable for operation in the presence of ionizing and non-ionizing radiation (X-rays, microwaves, lasers, ultraviolet rays) (EN 60204-1:2018, §4.4.7).

The NC96 control unit must be installed in a suitable area of use (switch cabinet, protective housing).

In the elevator sector (EN 81-20, EN 81-50) it is necessary to insert the control unit in an IP54 box if the safety outputs (13-14, 23-24) in the final application have a potential difference between them or between the other connections greater than 160V.

Operating

- Devices with two separate NO contacts

The NC96 safety control unit is able to monitor the status of two contacts (magnetic Reed sensors, emergency buttons, mechanical safety switches, safety interlocks for movable guards): the output is activated by pressing the START (reset) button only if the two contacts are closed. The opening of one input contact determines a safety situation, placing the safety outputs in the open state and preventing them from closing even after the contact has closed and the START (reset) button has been pressed.

WARNING: the start command does not meet the requirements of §5.2.2.3 of the EN ISO 13849-1:2023 standard as it acts on the rising edge of the signal.

If the NC96 is used to control emergency buttons, following the intervention of the device, its reset must not result in a new start of the machine (EN 60204-1:2018, §9.2.3.4.2, EN ISO 13850:2015, §4.1.4).

When the NC96 is used to control interlock sensors of movable guards, the re-closing or reactivation of a protection must not start a dangerous operation of the machine (EN 60204-1:2018, §9.3.1).

By short-circuiting terminals Y1-Y2, the device is automatically reset; the behavior of the machine when the device is reset - i.e. the non-automatic restart of the dangerous elements of the machine - depends on the way the machine control circuit is implemented according to the risk assessment carried out by the user.

In automatic start configuration, a synchronization time (ts=0.5s) between the closing of the two input contacts must be respected; for an automatic start without synchronization time, see the connection diagram (lift applications).

If the emergency stop command has only one NC contact, connect it between the positive terminal (L+) of the supply voltage and terminal A1, bridging S11-S12 and S21-S22 (cat. 4 EN ISO 13849-1).

Safety category 4 is guaranteed only if (see connection drawing):

- two relays are used to interrupt the load, each of which is connected to an output of the control unit.
- the contacts of the relays controlled by the control unit are inserted in the feedback control loop.

- Pressure-sensitive safety devices

The NC96 control unit may be used to control pressure-sensitive safety devices only with automatic reset according to EN ISO 13856-1, EN ISO 13856-2 and EN ISO 13856-3.

In this case, no START (reset) button must be connected to the Y1 and Y2 contacts; only the feedback contacts of external relays or contactors may be connected.

To configure the system with manual start (reset), the NC95 control unit must be used (approved for use exclusively with safety mats).

The NC96 system + pressure-sensitive device achieves safety category 3 according to EN ISO 13849-1.

Safety is ensured by the use of guided contacts, redundancy and the contact interconnection scheme.

It is the user's responsibility to select suitable components for safety applications, for example guided contact relays.

- Operation according to EN 81-20

The safety module guarantees the opening of the contacts within 20 ms from the opening of the sensors S11-S12 or S21-S22, therefore it can be used as a detector in A3 systems compliant with point 5.6.7.7 EN 81-20.

Electrical connections

Electrical connections must only be made by authorized personnel in accordance with EN 60204-1.

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 or pressure sensitive safety device must be connected to the unit with cables of maximum length 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.

Mounting

Installation should be carried out by authorized personnel only.

The control unit is installed by fixing it to a standard 35 mm omega DIN rail.

Service and Inspections

The correct operation of the NC96 control unit must be checked by the operator and/or the control circuit of the machine in which it is used at each installation or new wiring and in any case periodically (at the start of each shift or at the latest within 8 hours) by checking the following:

- correct switching of each individual sensor by checking:
 - a) that when the individual sensor/guard is opened or when the sensitive safety device is pressed, the safety outputs (13-14 / 23-24) open
 - b) that when the same sensor/guard is closed or when the sensitive device is released, the safety outputs (13-14 / 23-24) close following any start command
- secure fixing of the components
- correct fixing of the connections.

The monitoring function of the control unit is carried out at each intervention of the control unit itself.

If with all guards closed or with the pressure sensitive device not pressed, following a possible start command the control unit does not activate its safety outputs, do not switch the control unit off and on, then 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.

The warranty coverage is void in 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 operate when the supply voltage is applied (the green PWR LED does not light up), the unit must be returned sealed to the manufacturer. Check whether the safety outputs switch (see LED table) by activating the inputs and pressing the START (reset) button.

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.

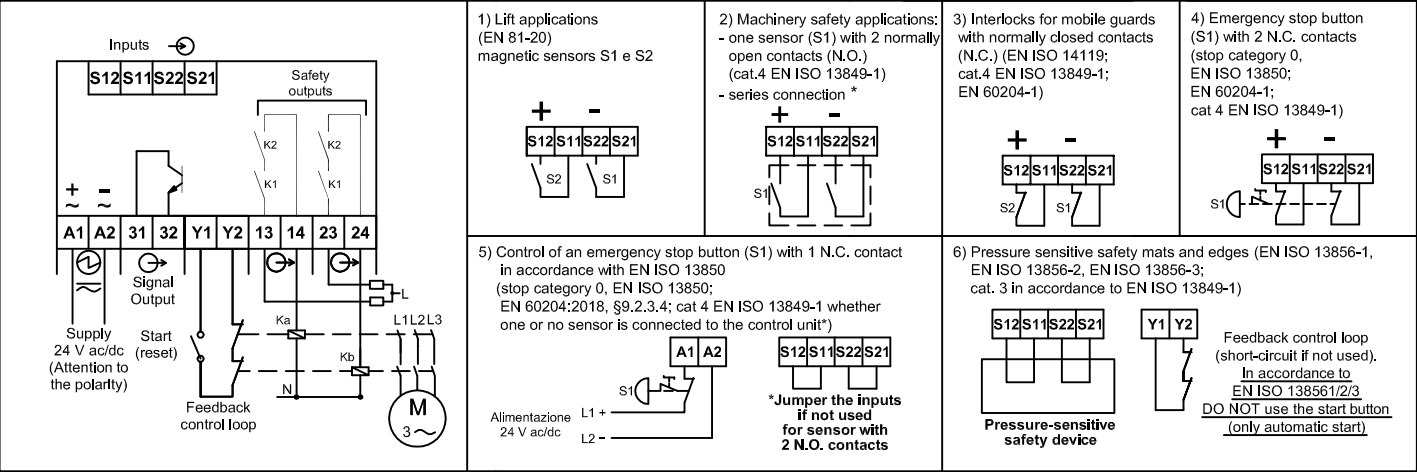
The approach speed between the sensor and the magnet must not be too slow if the unit is configured with automatic start.

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.

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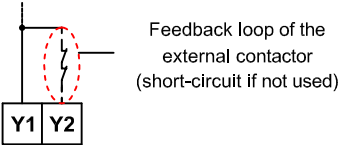


Connection diagram (the illustrated input contact configurations refer to open guards or ESB not pressed)



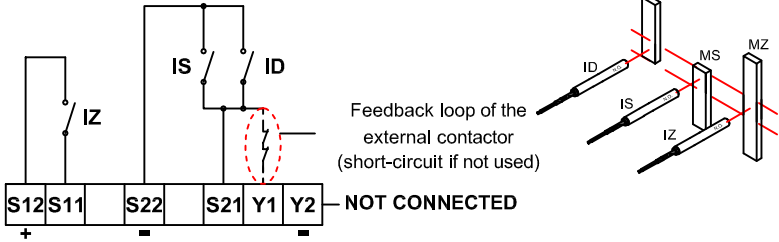
Automatic start - 1 -

Automatic start for use in machinery safety applications (EN ISO 13849-1). In this onfiguration the maximum synchronization time between the closing of the two inputs contacts is 0,5 s.

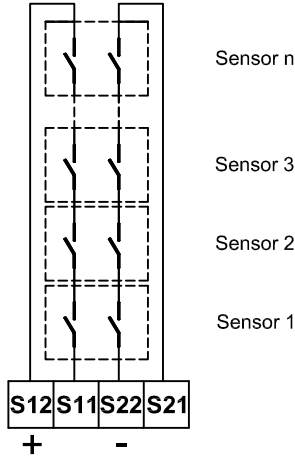


Automatic start - 2 -

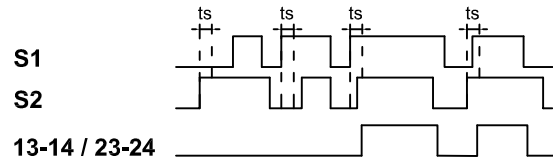
Automatic start for use as lift safety unit (EN 81-20, EN 81-50) Reed switch sensors ID, IS and IZ. In this configuration the inputs synchronization time among the closing of IZ and one between IS and ID, it is endless, but a correct closing sequence has to be respected: the first contact to be closed is IZ, then IS or ID.



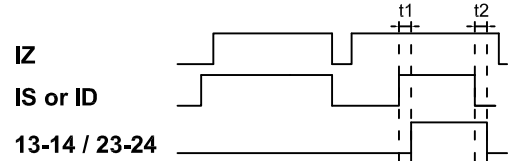
* Machinery safety applications: series connection of sensors (up to 30) with 2 normally open contacts (N.O.) (cat.3 EN ISO 13849-1)



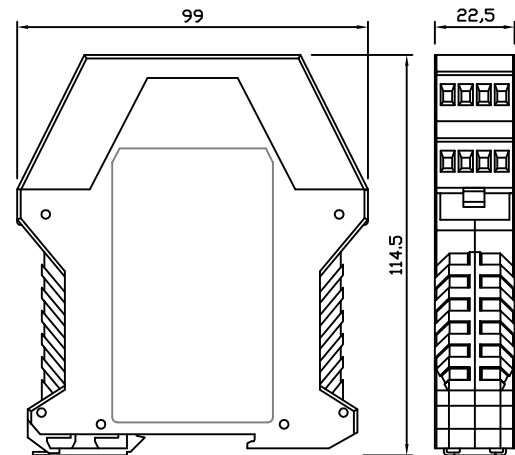
Automatic reset timing diagram - 1 - (Y1-Y2 closed)



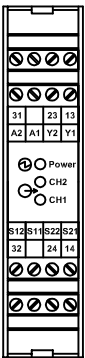
Automatic reset timing diagram - 2 - (for elevator use)



Dimensions



Front view



LED Table

Function	LED	Color	State
Power supply	PWR	Green	on
Outputs 13-14 e 23-24 : OPEN	CH1	Green	off
Output 32-32 : CLOSED	CH2	Green	off
Outputs 13-14 e 23-24 : CLOSED	CH1	Green	on
Output 32-32 : OPEN	CH2	Green	on

TECHNICAL DATA					
Parameter	Value				Unit
Housing material	PA				
Dimensions	114,5 x 99 x 22,5				mm
Weight	160				g
Operating conditions	Temperature: -5 ... +55				°C
	Relative humidity: 4% ... 100%				
	Pressure: 86 ... 106				kPa
Housing conditions	Temperature: -25 ... +70				°C
	Relative humidity: 5% ... 95%				
	Pressure: 86 ... 106				kPa
Degree of protection (IEC 60529)	IP20				
Degree of contamination (see note 1)	3 (if condition NOTE1 is satisfied)		2 (if condition NOTE1 is not satisfied)		
Overvoltage Category	II				
Assembly	35 mm DIN standard rail				
Connection type	Screw terminals				
Supply voltage	24 -15% / +10% (AC 50 + 60 Hz)				V ac/dc
Internal fuse on the supply	630 mA fast fuse				
Current consuption	@24Vdc: 25 min, 70 max; @24Vac: 110 min, 220 max				mA
Safety Outputs switching voltage	240 (max)				V AC
Switching current AC-1 / Electrical life	3 A (safety outputs) / >10 ⁵ cycles				
Minimum switching current @ 10 V	10				mA
Safety output switching power	720 (max)				VA
External fuse at the output	4 A gG (according to IEC EN 60269-1)				
Safety outputs terminals	13 -14, 23 - 24				
Auxiliary output terminals	31 - 32 NC (optoisolated)				
Usage category / Electrical Life (SAFETY outputs)	AC-15: 1,4 A / 240 V (inductive load, cos Φ=0,3) / 10 ⁵ cycles DC-13: 1A / 24 V / 10 ⁵ cycles				
Auxiliary NC output parameters	max: 60 mA @ 24 Vdc				
Output response time (t1)	20				ms
OFF state response time (t2)	20				ms
Synchronization time (ts) (automatic start - 1 -)	500				ms
Max input sensor resistance	200				ohm
Safety category and PL (EN ISO 13849-1:2015)	Cat. 4 (1 safety sensor)		Cat. 3 (more then 1 sensor or pressure sensitive device)		
	PL - e	PL - e	PL - d	PL - e	PL - e
nop (number of operations / year)	61320	17520	61320	30000	17520
MTTFd	30	100	30	62	100
PFHd	2,47x10 ⁻⁸	9,54x10 ⁻⁸	2,65x10 ⁻⁷	8,84x10 ⁻⁸	4,29x10 ⁻⁸
TM	20				years
Stop category (EN ISO 13850:2015)	0				
Vibration resistance	EN 60068-2-6, EN 60947-5-3 EN 81-50				
Mechanical life	10 ⁷				Cycles
EMC compliance	EN 61000-6-2, EN 61000-6-3, EN 60947-5-3, IEC 61326-3-1, EN 12015, EN 12016				
In accordance with	EN 81-20, EN 81-50,, EN 60204-1, EN ISO 13849-1, EN ISO 13849-2, EN ISO 13850, EN ISO 13856-1, EN ISO 13856-2, EN ISO 13856-3				
Approvals	TÜV IT 0948 10 MAC 0016, EDES 008				

NOTE 1

-The safety outputs (13-14,23-24) in the final application have a voltage difference between them or between the other connections lower than 160V

UL CERTIFICATION REQUIREMENTS				
Power Source (input)				
Input Terminals	Voltage		Max. Current	
A1-A2	24Vac/dc		220mA / 110mA	
Auxiliary Outputs (SAFETY)				
Output Terminals	Contacts Type	General Use Or Resistive	Pilot Duty	
13-14 23-24	NO	3A/240Vac Res	1.4A/240Vac	1A/24Vdc
Signalling Outputs (SIGNAL)				
Output Terminals	Contacts Type		Nom. Ratings	
31-32	NC		60mA/24Vdc	
Environmental Ratngs Max. Surrounding Air Temperature: 55°C Pollution Degree: 2 Environmental designation Open type equipment		Installation Notes Use with min. 60°C copper (CU) conductor only Terminal tightening torque: 5-7 LbIn (0.56-0.79 Nm)		