

Operating instructions for safety control unit mod. NC85 - Original instructions -



Description

The NC85 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 61496-1.

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 output Y1/Y2 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 NC85 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 NC85 CANNOT be disposed of as general waste.

Operation

The NC85 safety control unit is able to control the status of two contacts (Reed magnetic sensors or PNP/NPN static output, emergency button, mechanical safety switches, interlocks for movable guards, output contacts of safety photoelectric barriers): the output is activated by pressing the START (reset) button only if two contacts are closed. The opening of one input contact (S1 and/or S2) 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 NC85 is used to control emergency buttons, after the device has been activated, its reset must not lead to a new start of the machine (EN 60204-1:2018, §9.2.3.4.2, EN ISO 13850:2015, §4.1.4).

If the NC85 is used to control interlock sensors of movable guards, the reclosing or reactivation of a guard must not start a dangerous operation of the machine (EN 60204-1:2018, §9.3.1).

If the START button (automatic reset) is not used, follow the instructions in the relevant connection diagram on the following page; the behaviour of the machine when the device is reset - i.e. the non-automatic restart of the dangerous elements of the machine - depends on the method of creating the machine control circuit according to the risk assessment carried out by the user.

The input channels work on opposite potentials (S11/S31 →- ; S21/41 →+).

An input (X1-X2) is available for the feedback of any external contactors or relays (see Ka and Kb on the connection drawing); if the feedback control is not carried out, it is necessary to short-circuit the X1-X2 terminals.

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 loop.

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

It is the user's responsibility to choose suitable components for safety applications, for example relays with guided contacts.

Mounting

Installation must be carried out by authorised personnel only.

The NC85 control unit must be installed in a suitable area of use (switch cabinet, protective housing). The control unit is installed by fixing it to a standard 35 mm omega DIN rail.

Electrical connections

Electrical connections must be carried out by authorised personnel only following the indications of EN ISO 13849-1 and EN ISO 13849-2.

All electrical inputs must be isolated from the mains supply either by a transformer with separate windings in accordance with IEC EN 61558-2-6 with output voltage limited in the event of a fault, or by an equivalent removable mechanism.

The relay outputs have a maximum current of 3 A; the power supply connected to these outputs must be protected against overcurrents 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.

Service and Inspection

The correct operation of the NC85 control unit must be checked by the operator and/or the control circuit of the machine in which it is used at each switch-off and switch-on cycle, installation, new wiring, reactivation of the detection device (ESPE EN 61496-1:2021, §4.2.2.5), reset following a start or restart command 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 by checking:
 - a) that upon opening of the single sensor, guard or upon activation of the detection function (ESPE-> interrupted barrier beams) the safety outputs (13-14 / 23-24) open
 - b) that upon closing of the same sensor, guard or upon deactivation of the detection function (ESPE-> uninterrupted barrier beams) 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 the protections closed, following a possible start command the control unit does not activate its safety outputs, do not switch the control unit off and on, therefore 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 the 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 work 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 S1, S2 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.

Operation according to EN 81-20:2014

The safety module guarantees the opening of the contacts within 15 ms from the opening of the sensors S1 or S2, therefore it can be used as a detector in A3 systems compliant with point 5.6.7.7 EN 81-20:2014.

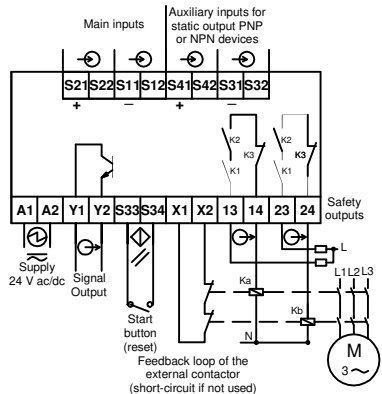
LED table

Function	LED	Color (ON)	Status
Supply voltage	Power	green	on
Outputs 13/14, 23/24 and Y1/Y2: OPEN	OUT	-	off
Outputs 13/14, 23/24 and Y1/Y2: CLOSED	OUT	green	on
Inputs S1, S2, START: OPEN	S1, S2, START	-	off
Inputs S1, S2, START: CLOSED	S1, S2, START	green	on

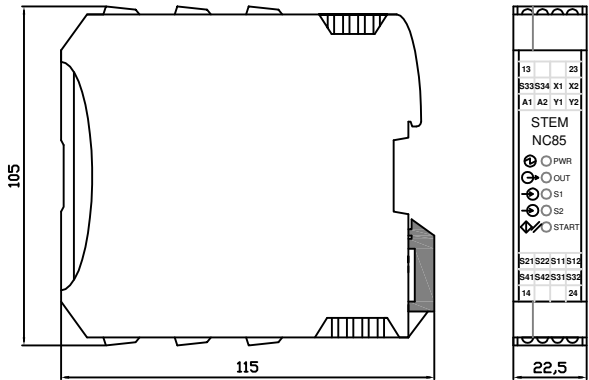
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Connections



Dimensions



Inputs (the input contact configurations shown refer to open guards or ESB not pressed)

1) Lift applications (EN81-20,EN81-50):
Reed contact sensors S1 e S2

2) Lift applications (EN81-20, EN81-50):
NPN static output devices S1 and S2

3) Lift applications (EN81-20,EN81-50):
PNP static output devices S1 and S2

4) Machine safety applications (cat.4 EN ISO 13849-1):
sensor (S1) with 2 normally open (N.O.) contacts

* Series connection

5) Mobile guard interlock sensors with normally closed (N.C.) contacts (EN 14119; cat.4 EN ISO 13849-1; EN 60204-1:2018, §9.3)

6) Control of an emergency stop button in accordance with EN ISO 13850 (stop category 0, EN ISO 13850; EN 60204:2018, §9.2.3.4)

with 2 N.C. contacts (S1) (cat 4 EN ISO 13849-1)

with 1 N.C. contact (S2) (cat 4 EN ISO 13849-1 whether one or no sensor is connected to the control unit*)

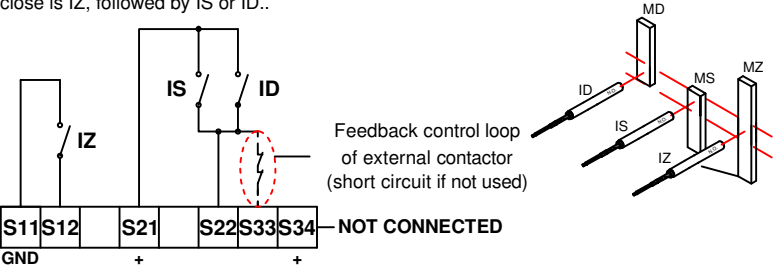
7) Safety light curtains:

2 static outputs NPN or PNP (Tipo 4, EN 61496-1)

2 N.O. outputs (B1) (Tipo 4, EN 61496-1)

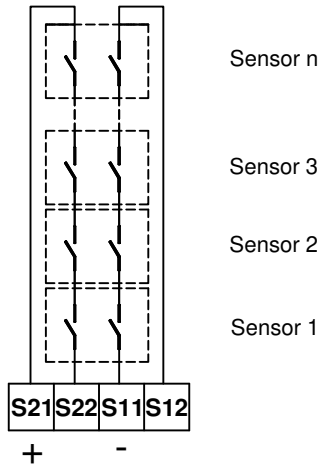
1 N.O. output (B2) (Tipo 2, EN 61496-1)

Use with automatic start - 1 -
Automatic start for use in the elevator field (EN 81-20, EN 81-50):
Reed sensors ID, IS and IZ.
With this configuration the synchronization time between the closing of IZ and one between IS and ID is infinite, but a correct closing sequence must be respected: the first sensor that must close is IZ, followed by IS or ID..



Use with automatic start - 2 -
Automatic start with synchronization time between inputs (ts) equal to 600 ms:
short-circuit S33 and S34.

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



Manual reset timing diagram

Automatic reset timing diagram - 1 - (ONLY for lift applications)

Automatic reset timing diagram - 2 - (S33-S34 closed)

Technical data

Parameter	Value	Unit				
Housing Material	PA 6.6					
Dimensions / Weight	115 x 105 x 22,5 / 180	mm / g				
Operating conditions	Temperature: 0 ... +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	3					
Overvoltage Category	II					
Assembly	DIN standard 35 mm guide					
Connection type	Screw terminals					
Supply voltage	24 +15%, - 15% (AC 50 ÷ 60 Hz)	V ac/dc				
Internal fuse on the supply	750 mA resettable PTC					
Current consupcion	DC: OUT=off: 50 OUT=on: 100; AC: OUT=off: 50 OUT=on: 100	mA				
Max. switching frequency	1	Hz				
Input synch. time ts (automatic start 2)	600	ms				
Output response time (t1)	Typical 120, max 160	ms				
OFF state response time (t2)	15	ms				
Safety outputs terminals	13-14 e 23-24 (normally open)					
Safety Output switching voltage	250	V AC				
Safety output switching current	3 (MAX)	A				
Safety output switching power	750	VA				
Safety outputs minimum load	10 mA / 5V					
Auxiliary outputs terminals	Y1-Y2 (collector-emitter optoinsulated)					
Auxiliary Output voltage	55 (MAX)	Vdc				
Auxiliary output current	60 (MAX)	mA				
Auxiliary output power	0,15 (MAX)	W				
Input cables maximum length (l _{max})	$l_{max} = R_{lim} / (R_i / km)$ R _{lim} = total max resistance of the input cables R _i / km= cable resistance / km	km				
Usage category: safety outputs parameters	AC-1: 3A @ 250V; AC-15: 0,9A @ 250V DC-13: 1,8A @ 24V / 0,13A @ 120V / 0,06A @ 240V					
Vibration resistance	in accordance with EN81-50, EN 60947-5-3, EN 61496-1 : stationary use class 3M4 (IEC TR60721-4-3)					
Electrical operation life	2,5 x 10 ⁵ (250 Vac, 3 A cosφ=1)	cycles				
Mechanical operation 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, EN 61496-1					
Stop Category	0 according to EN 60204-1 and EN ISO 13850					
Safety Category and PL (EN ISO 13849-1)	Cat. 4 (1 safety switch) PL - e PL - e					N° cycles/ year
nop (numero operazioni / anno)	61320	17520	61320	30000	17520	
MTTFd	30	100	30	62	100	years
PFHd	2,47x10 ⁻⁸	9,54x10 ⁻⁸	2,65x10 ⁻⁷	8,84x10 ⁻⁸	4,29x10 ⁻⁸	
TM	20					years
In accordance with	EN 81-20, EN 81-50, EN 60204-1, EN ISO 13849-1, EN ISO 13849-2, EN ISO 13850, EN 61496-1					
Approvals	TÜV IT 0948 10 MAC 0010 B, TÜV EDES 003					

Usage category parameters						
	AC-1		AC-15		DC-13	
	MAX	MIN	MAX	MIN	MAX	MIN
Voltage (V)	250	5	250	5	240	5
Current (A)	3	0,01	0,9	0,01	0,06	0,01
Lifetime (cycles@ I _{max})	2,5x10 ⁵		7x10 ⁴		3x10 ⁵	