

## Description

The NCMAT01 safety relay has been designed to control pressure sensitive safety mats and edges in according to EN ISO 13856-1:2013, EN ISO 13856-2:2013, EN 60204-1:2006+A1:2009, EN ISO 13849-1:2015, EN ISO 13850:2015.

This module is based upon the use of guided-contact safety relays.

## Safety Precautions

The pressure sensitive safety mats and edges fulfill a personal protection function.

Incorrect installation or manipulation can lead to severe injuries to personnel.

The pressure sensitive safety mats and edges must not be bypassed (bridging the contacts), moved, removed or otherwise made ineffective.

The manufacturer or the technician that install the machinery is responsible for correct and safe overall function.

Auxiliary output 31-32-33 must not be used as a safety output.

The NCMAT01 is not proper for the operation in presence of ionizing and not ionizing radiations (rays X, microwaves, laser, ultraviolet rays)

(EN 60204-1:2006, §4.4.7).

## Functioning

The NCMAT01 module is used to control 2-wire pressure sensitive safety mats and edges terminated with 8.2 Kohm resistor: the safety outputs are closed by pushing and releasing the reset button (X1-Y1) only if the safety device is connected to the input (X1-X2) and nobody is on the safety mat (edge) area. At the pressure of the safety device, the unit opens the safety outputs 13-14 and 23-24.

The reset (manual and monitored) is possible if the mat (edge) is not pressed according to EN ISO 13856-1:2013 (Annex A) and EN ISO 13856-2:2013 (Annex A).

Automatic reset at the release of the safety device is possible by shorting X1-Y2 terminals.

The opening of X1-X2 input leads to a safety situation by putting the safety outputs in open state and by preventing the closing after the pressure of the reset button.

It is possible to connect non-terminated 4-wire devices using the X3-X4 input

The system NCMAT01 + pressure sensitive safety mat or edge reaches the safety category 3 according to EN ISO 13849-1:2015 only if two relays (Ka, Kb; see connection diagram) are used to interrupt the load, each connected to an input of the safety unit.

In order to check the functionality of the Ka, Kb relays, it is possible to connect the NC auxiliary contacts of these contactors in series to the reset circuit.

It is possible to connect an emergency stop button in series to the safety mat or edge.

Safety is ensured by using guided contacts, by the redundancy and by the interconnection schematic of the contacts.

The responsibility to choose the adequate components for safety applications, for example guided contacts safety relays, falls to the user.

## Assembly

Installation must be performed by authorized personnel only.

The NCMAT01 control unit must be assembled in a suitable operating area (switch cabinet, protective housing, at least IP 54).

The unit is installed by clipping it to a standard 35 mm top-hat rail.

## LED display

Function	LED	Color	Status
Power supply	POWER	Green	on
Outputs 13-14 e 23-24 : OPEN	K1	Green	off
Output 31-32 : CLOSED			
Output 31-33 : OPEN	K2	Green	off
Outputs 13-14 e 23-24 : CLOSED			
Output 31-32 : OPEN	K1	Green	on
Output 31-33 : CLOSED			
	K2	Green	on

## Electrical Connection

Electrical connection must be performed by authorized personnel only according to EN 60664-1:2006.

All the electrical inputs must either be isolated from the mains supply by a separate coils safety transformer in accordance with EN IEC 61558-2-6 with limited output voltage in the event of a defect or by another equivalent movable mechanism. The power supply have to be connected in a permanently way and using a cable with a maximum length of 10 m; the safety mat has to be connected to the unit using a cable with a maximum length of 30 m.

The outputs of the relays have a maximum current of 3 A; the power supply connected to the outputs must be protected from overcurrents by devices adequate to the loads that have to be protected. All the output contacts must have an adequate protective circuit for capacitive and inductive loads. If a common power supply is used, all the inductive and capacitive loads (e.g. relay contactors) connected to the power supply must be connected to appropriate interference suppressors.

## Service and Inspection

The correct functioning of the NCMAT01 safety unit must be controlled by the operator and/or by the control circuit of the machine in which it is used periodically (at the beginning of every shift), by checking:

- correct switching function
- secure mounting of components
- correct connection fixing.

The monitoring function of the unit is done at every switching.

In the event of damage or wear and tear, the damaged system component must be replaced.

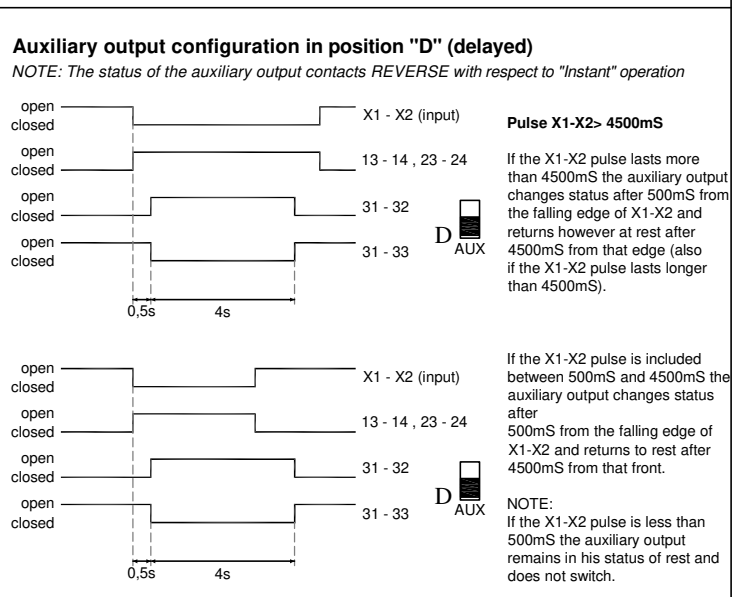
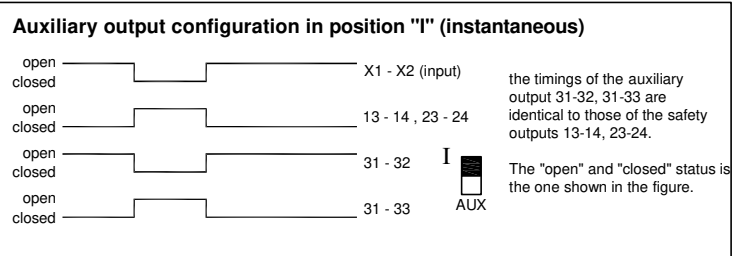
## Liability coverage is void under the following circumstances:

- if instructions are not followed
- non-compliance with safety regulations
- installation and electrical connection not performed by authorized personnel
- non-implementation of functional checks.

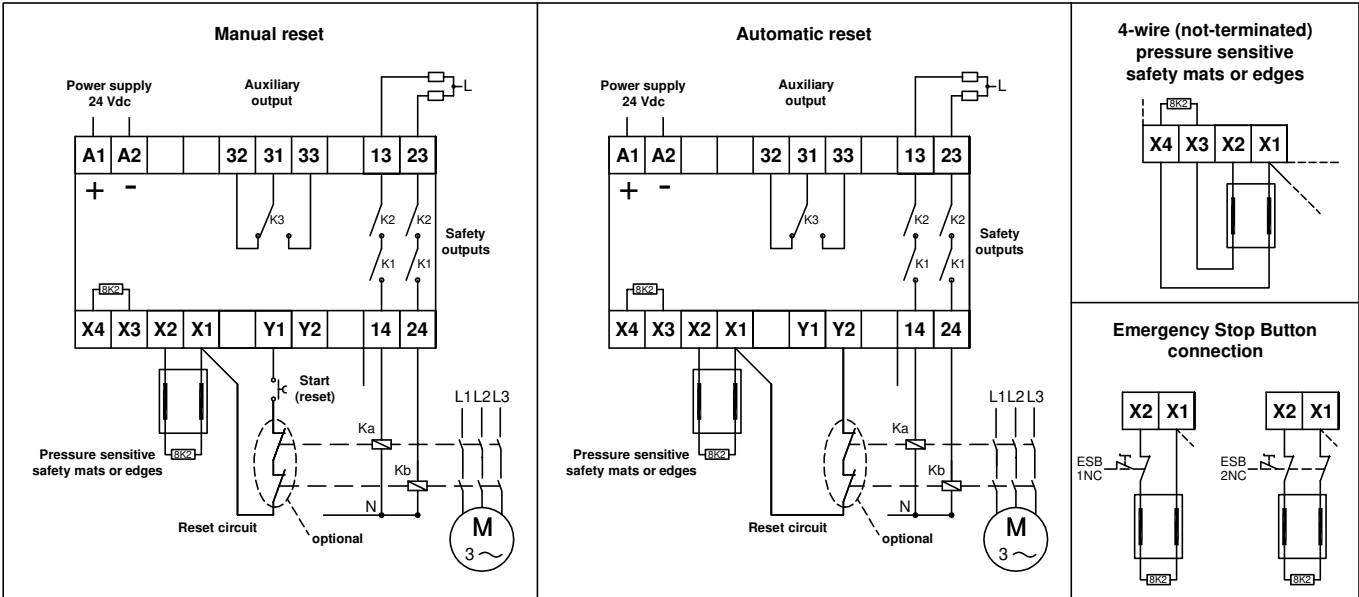
## Setup

If the control unit does not appear to function when operating voltage is applied (green "Power" LED does not light up), the unit must be returned unopened to the manufacturer.

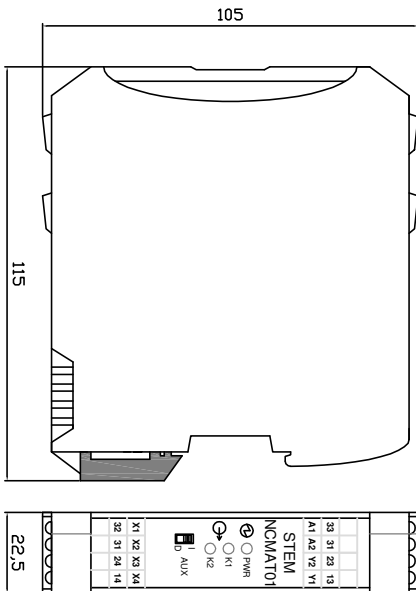
Check whether the safety outputs are being switched (see LED display) by activating the two inputs and START.



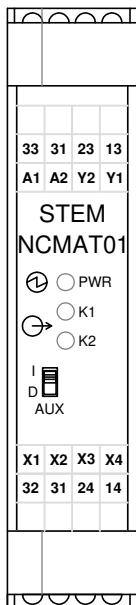
Connections



Dimensions (mm)



Frontale view



Technical data

Parameter	Value
Housing material	PA 6.6
Dimensions	115 x 105 x 22,5 mm
Weight	165 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	2
Overvoltage category	II
Assembly	35 mm DIN standard rail
Connection type	Screw terminals
Supply voltage	24 Vdc (-15% / +10%)
Internal fuse on the supply	300 mA PTC
Current consumption	@24Vdc: 25 mA min, 70 mA max
Termination resistance of the 2-wire device	Standard = 8.2 kOhm Upper threshold > 12 kOhm Lower threshold < 5 kOhm
Safety Outputs switching voltage	250 Vac, 30 Vdc
Switching current AC-1 / Electrical life	3 A (ac/dc, resistive load) (safety outputs) / 10 <sup>5</sup> cycles
Minimum switching current @ 10 V	10 mA
Safety output switching power	750 VA, 90W
External fuse at the output	4 A gG (according to IEC EN 60269-1)
Safety outputs terminals	13 - 14, 23 - 24
Usage category / Electrical Life (SAFETY outputs)	AC-15: 1,4 A / 250 Vac (cosΦ=0,3)/10 <sup>5</sup> cycles DC-13: 1A / 24 Vdc / 10 <sup>5</sup> cycles
Auxiliary output terminals	31 (Common) - 32 (NC) - 33 (NO)
Auxiliary output parameters (resistive load)	DC: 220V / 2A / 60W; AC: 250V / 3A / 125 VA
OFF state response time	20 ms
Safety category and PL (EN ISO 13849-1:2015)	Cat.3 PL - d   PL - e   PL - e
nop (n. operations / year) (safety outputs load: AC-15: 1,4 A / 250 Vac) (N.op. / year)	62000   28100   15800
MTTFd (anni)	30   62   100
PFHd	2,65x10 <sup>-7</sup>   8,84x10 <sup>-8</sup>   4,29x10 <sup>-8</sup>
TM	20 years (MTTFd = 100 years)
Vibration resistance	EN ISO 13856-1:2013, EN ISO 13856-2:2013
Mechanical life (N. of cycles)	10 <sup>7</sup>
Stop category (EN ISO 13850:2015)	0
EMC compliance	EN 61326-3-1:2011, EN 55011:2011
In accordance with	EN 60204-1:2006+A1:2009, EN ISO 13849-1:2015, EN ISO 13856-1:2013, EN ISO 13856-2:2013 EN ISO 13850:2015
Approvals	TÜV IT 0948 17 MAC 0108 B