NS series
RFID safety switches with lock
NS series RFID safety switches with lock

Description
These switches are used mainly on machines where the hazardous conditions persist even after the machine has been switched off. Mechanical parts such as pulleys, saw blades, etc., could continue to move after the machine is switched off. Thus, the switches can also be used if individual guards are only to be opened under certain conditions.

Versions with mode 1 and 3 (safety outputs active when guard closed and locked) are interlocks with guard locking acc. to ISO 14119; the product is labelled with the symbol shown.

Maximum safety with a single device
Pl e+ Sil 3
The NS series switches are constructed with redundant electronics. As a result, the maximum Pl e and Sil 3 safety levels can still be achieved through the use of a single device on a guard. This avoids expensive wiring in the field and allows faster installation. Inside the control cabinet, the two electronic safety outputs must be connected to a safety module with OSSD inputs or to a safety PLC.

Series connection of several switches
Pl e+ Sil 3
One of the most important features of the NS series is the possibility of connecting up to 32 sensors in series, while still maintaining the maximum safety levels Pl e laid down in EN 13849-1 and Sil 3 acc. to EN 62061.

This connection type is permissible in safety systems which have a safety module at the end of the chain that monitors the outputs of the last NS switch. The fact that the Pl e safety level can be maintained even with 32 sensors connected in series demonstrates the extremely secure structure of each single device.

Series connection with other devices
Pl e+ Sil 3
The NS series features two safety inputs and two safety outputs, which can be connected in series with other Pizzato Elettrica safety devices. This option allows the creation of safety chains containing various devices. For example, stainless steel safety hinges (Hx BeE1 series), RFID sensors (St series) and door lock sensors (Ng series) can be connected in series while still maintaining the maximum Pl e and Sil 3 safety levels.

RFID actuators with high coding level
The NS series is provided with an electronic system based on RFID technology to detect the actuator. This allows to provide each actuator with different coding and makes it impossible to tamper with a device by using another actuator of the same series. Millions of different coding combinations are possible for the actuators. They are therefore classified as high level coded actuators, according to En ISO 14119.

Holding force of the locked actuator
2100 N
The strong interlocking system guarantees a maximum actuator holding force of \( F_{\text{max}} = 2100 \text{ N} \).

Dustproof
The switch is provided with a through hole for inserting the actuator. Thanks to this unique feature, any dust that enters the actuator hole can always come out on the opposite side instead of remaining inside. Moreover, the lock pin is provided with a diaphragm seal, making the system suitable for critical environments with a high level of dust.

Integrated control devices
The NS series switches are also available in a version with a long housing, that has room for fitting 3 or 4 control devices, with the relevant contact blocks, on the same body of the safety device. This version has the same modular and orientation features as the NS switches. To meet requirements for a range of uses, a number of different colour and types of control devices can be adopted such as, for example: buttons, emergency stop buttons, indicator lights, selector switches.

The control devices can be illuminated and protrude only slightly out of the housing thanks to the recessed housing hole.

The result is a compact solution with direct access to control devices without needing to install them separately on the switch panel or in their own housing.
Six LEDs for immediate diagnosis

As the LEDs have been designed for quick immediate diagnosis, the status of each input and output is highlighted by one specific LED. This makes it possible to quickly identify the interruption points in the safety chain, which device is released, which guard is opened and any errors inside the device. All of this at a glance, without needing to decode complex flashing sequences.

Protection against tampering

Each actuator of the NS series is supplied with four protection caps. Not only do the caps prevent dirt from accumulating and simplify cleaning, they also block access to the fastening screws of the actuator. As a result, standard screws can be used instead of tamper-proof screws.

Jointed actuator for inaccurately closing guards

All NS series actuators are articulated, thereby allowing the actuator pin to be safely guided into the switch through the centring hole. As a result, the actuator and switch do not need to be precisely aligned during installation. In addition, the device can thereby be used on guards with a minimum actuation radius of 150 mm without the actuation pin needing to be angled.

Protection against tampering

Each actuator of the NS series is supplied with four protection caps. Not only do the caps prevent dirt from accumulating and simplify cleaning, they also block access to the fastening screws of the actuator. As a result, standard screws can be used instead of tamper-proof screws.

Function for protecting against recoil forces

If a guard is closed too quickly or with so much force that the recoil would cause it to open again, a special function in the NS switch prevents locking. This function prevents the immediate locking of the guard if the lock signal is applied. This protects the switch against recoil forces that occur during instantaneous locking, thus avoiding possible damage to the device.

Front and side mounting

Integrated in the housing of the NS series is a hole for inserting the actuator pin. Fixing holes are also provided in the robust body for front and side mounting. This makes it easier to mount the switch during lateral installation: the switch is directly mounted without needing to rotate the module that contains the hole for inserting the actuator pin. The fixing holes can be sealed with the protection caps provided for this purpose. Dirt deposits and tampering attempts are thereby prevented.

High protection degree

These devices are designed to be used in the toughest environmental conditions and they pass the IP67 immersion test acc. to EN 60529. They can therefore be used in all environments where maximum protection degree of the housing is required. Due to their special design, these devices are suitable for use in equipment subjected to cleaning with high pressure hot water jets. These devices meet the IP69K test requirements according to ISO 20653 (water jets with 100 bar and 80°C).

External device monitoring

On request, the switch can be supplied with EDM function (External Device Monitoring). In this case, the switch itself checks the proper function of the devices connected to the safety outputs. These devices (usually relays or safety contactors) must send a feedback signal to the EDM input, which checks that the received signal is consistent with the state of the safety outputs.

Holding force of the unlocked actuator

The inside of each switch features a device which holds the actuator in its closed position. Ideal for all those applications where several guards are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked guards in their position with a retaining force of approx. 20 N, stopping any vibrations or gusts of wind from opening them.

Key release device and escape release button

The key release device (auxiliary release) is used to permit unlocking of the actuator only by personnel in possession of the key. The device also functions with no power supply and, once actuated, prevents the guard from being locked.

The escape release button allows actuator release and immediate opening of the guard. Generally used in machines within which an operator could inadvertently become trapped, it faces towards the machine interior, to allow the operator to exit even in the event of a power failure. The button has two stable states and can be freely extended in length with suitable extensions (see accessories).

Both devices can be positioned on the four sides of the switch. As a result, it can be installed both towards the interior and towards the exterior of the machine.

Three safety output actuation modes

**MODE 1**
- mode 1: safety outputs active with inserted and locked actuator, for machines with inertia;
- mode 2: safety outputs active with inserted actuator, for machines without inertia;
- mode 3: a first safety output active with actuator inserted and locked and a second safety output active with actuator inserted, for special applications.

**MODE 2**
- mode 1: safety outputs active with inserted and locked actuator, for machines with inertia;
- mode 2: safety outputs active with inserted actuator, for machines without inertia;
- mode 3: a first safety output active with actuator inserted and locked and a second safety output active with actuator inserted, for special applications.

**MODE 3**
- mode 1: safety outputs active with inserted and locked actuator, for machines with inertia;
- mode 2: safety outputs active with inserted actuator, for machines without inertia;
- mode 3: a first safety output active with actuator inserted and locked and a second safety output active with actuator inserted, for special applications.
**Code structure**

**NS D4AZ1SMK-F41N001E36LP30**

<table>
<thead>
<tr>
<th>Release button length</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LP30 for max. 30 mm wall thickness</td>
<td></td>
</tr>
<tr>
<td>LP40 for max. 40 mm wall thickness</td>
<td></td>
</tr>
<tr>
<td>LP50 for max. 50 mm wall thickness</td>
<td></td>
</tr>
</tbody>
</table>

**Actuator extraction force**
- actuator extraction force 20 N (standard)
- E36 actuator freely removable
- E37 actuator extraction force 40 N

**Button configurations**
- N001 configuration 001
- N002 configuration 002
- N002 configuration 003
- ... other configurations on request

**Actuator**
- F40 low level coded actuator VN NS-F40 the switch recognises any type F40 actuator
- F41 high level coded actuator VN NS-F41 the switch recognises one single type F41 actuator

**Connection type**
- K integrated M12 connector (standard)
- 0.2 cable, length: 0.2 m, with M12 connector
- 2 cable, length: 2 m (standard)
- ... cable, length: 2 m
- 10 cable, length: 10 m

**Cable or connector type**
- A PVC cable 12x0.14 mm² (standard)
- B PVC cable 8x0.34 mm², for stand-alone connections
  - Note: without inputs IS1, IS2, I5 and without output O4
- E PUR cable, halogen-free, 8x0.34 mm², for stand-alone connections
  - Note: without inputs IS1, IS2, I6 and without output O4
- M M12 connector, 12-pole (standard)
- P M12 connector, 8-pole, for stand-alone connections
  - Note: without inputs IS1, IS2, I6 and without output O4
- Q M12 connector, 8-pole, for series connection with Y connectors
  - Note: without inputs IS2, I6, I8 and without output O3
- R two M12 connectors (12-pole + 12-pole)
  - Note: only for items with integrated control devices
- S M23 connector, 12-pole
  - Note: only for items with integrated control devices
- T M23 connector, 19-pole
  - Note: only for items with integrated control devices

For the complete list of possible combinations please contact our technical department.

**Code structure for actuator**

**VN NS-F40**

<table>
<thead>
<tr>
<th>Actuator</th>
</tr>
</thead>
<tbody>
<tr>
<td>F40 low level coded actuator the switch recognises any type F40 actuator</td>
</tr>
<tr>
<td>F41 high level coded actuator the switch recognises one single type F41 actuator</td>
</tr>
</tbody>
</table>

**Operating principle**
- D locked actuator with de-energised solenoid, mode 1
- E locked actuator with energised solenoid, mode 1
- G locked actuator with de-energised solenoid, mode 2
- H locked actuator with energised solenoid, mode 2
- L locked actuator with de-energised solenoid, mode 3
- M locked actuator with energised solenoid, mode 3

**Inputs and outputs**
- 2 safety inputs IS1, IS2
- 2 safety outputs OS1, OS2
- 1 signalling output O3: actuator inserted
- 1 signalling output O4: actuator locked
- 2 solenoid activation inputs IE1, IE2
- 1 reset input I3
- Note: Supplied only together with actuator

<table>
<thead>
<tr>
<th>Code structure for actuator</th>
</tr>
</thead>
<tbody>
<tr>
<td>VN NS-F40</td>
</tr>
</tbody>
</table>
Technical data

Housing made of glass fibre reinforced technopolymer, self-extinguishing and shock-proof
Versions with 12x0.14 mm² or 8x0.34 mm² integrated cable, length 2 m, other lengths from 0.5 to 10 m on request
Versions with integrated M12 stainless steel connector
Versions with 0.2 m cable and M12 connector, other lengths from 0.1...3 m on request
Protection degree:
IP67 acc. to EN 60529
IP69K acc. to ISO 20653
(Protect the cables from direct high-pressure and high-temperature jets)
Protection degree with control devices:
IP65 acc. to EN 60529

General data

Safety parameters | SIL | PL | Cat. | DC | PFIₚ | MTTFₚ |
--- | --- | --- | --- | --- | --- | --- |
Monitoring function: actuator locked - Mode 1 | 3 | e | 4 | High | 1.23E-09 | 2657 |
Monitoring function: actuator present - Mode 2 | 3 | e | 4 | High | 1.22E-09 | 1840 |
Monitoring function: locked actuator | 3 | d | 2 | High | 1.50E-06 | 2627 |
Monitoring function: locked actuator | 3 | d | 2 | High | 1.48E-06 | 2387 |
Single-channel control for locking function of the actuator | 3 | e | 4 | High | 3.94E-10 | 2254 |

Interlock, no contact, coded, with guard locking:
Level of coding acc. to EN 14119:
type 4 acc. to EN 14119
Low with F40 actuator
High with F41 actuator
Mission time:
20 years

Ambient temperature:
-20°C...+50°C

Max. actuation frequency:
600 operating cycles/hour

Mechanical endurance:
1 million operating cycles

Max. actuation speed:
0.5 m/s

Min. actuation speed:
1 mm/s

Maximum force before breakage F₁max:
2100 N acc. to EN 14119

Max. holding force F₂ₚ:
1615 N acc. to EN 14119

Maximum clearance of locked actuator:
4 mm

Released actuator extraction force:
-20 N

Power supply electrical data
Rated operating voltage Uₑ SELV:
24 Vdc ±10%

Rated insulation voltage Uₑ:
1.5 kV

Rated impulse withstand voltage Uₑₘₚ:
type gG fuse 2 A or equivalent device

Overvoltage category:
III

Overcurrent protection:
1 million operating cycles

Solenoid duty cycle:
100% ED (continuous operation)

Solenoid consumption:
9 V max.

Pollution degree:
3 acc. to EN 60947-1

Electrical data of inputs IS1/IS2/IS3/IE1/IE2/IS3/EDM

Rated operating voltage Uₑ:
24 Vdc

Rated current consumption Iₑ:
5 mA

Electrical data of OS1/OS2 safety outputs

Rated operating voltage Uₑ:
24 Vdc

Output type:
PNP type OSSD

Maximum current per output Iₑₚ:
0.25 A

Minimum current per output Iₑₚₚ:
0.5 mA

Thermal current Iₑₚₚₚ:
0.25 A

Utilization category:
DC13: Uₑₚ = 24 Vdc, Iₑₚ = 0.25 A

Short circuit detection:
Yes

Overcurrent protection:
Yes

Internal self-resettable protection fuse:
1.1 A

Duration of the deactivation impulses at the safety outputs:
< 300 μs

Permissible maximum capacitance between output and ground:
< 200 nF

Activation time of safety outputs OS1 and OS2 after deactivation of safety inputs IS1, IS2:
typically 7 ms, max. 15 ms
typically 7 ms, max. 12 ms
typically 120 ms, max. 200 ms

Maximum delay for EDM status change:
500 ms

Electrical data of O3/O4 signalling outputs

Rated operating voltage Uₑ:
24 Vdc

Output type:
PNP

Maximum current per output Iₑₚ:
0.1 A

Utilization category:
DC13: Uₑₚ = 24 Vdc, Iₑₚ = 0.1 A

Short circuit detection:
No

Overcurrent protection:
Yes

Internal self-resettable protection fuse:
1.1 A

RFID sensor data
Assured operating distance Sₐ:
2 mm

Assured release distance Sₐₚ:
6 mm (actuator not locked)
10 mm (actuator locked)

Rated operating distance Sₐₚ:
3 mm

Repeat accuracy:
≤ 10 % Sₐₚ
≤ 20 % Sₐ

Differential travel:
125 kHz

Max. switching frequency:
1 Hz
**Actuation mode of the OS1 and OS2 safety outputs**

<table>
<thead>
<tr>
<th>Mode 1</th>
<th>Mode 2</th>
<th>Mode 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Safety outputs OS1 and OS2 are active when the actuator is inserted and locked.</strong></td>
<td><strong>Safety outputs OS1 and OS2 are active when the actuator is inserted.</strong></td>
<td><strong>Safety output OS1 is active when the actuator is inserted and locked and IS1 is active. Safety output OS2 is active when the actuator is inserted and IS2 is active.</strong></td>
</tr>
</tbody>
</table>

In case of machines with or without inertia of the dangerous elements. Safety category of the safety outputs: PL e, SIL 3.

**Selection table for switches with high level coded actuators**

<table>
<thead>
<tr>
<th>Operating principle</th>
<th>Locked actuator with de-energised solenoid. With screwdriver release</th>
<th>Locked actuator with de-energised solenoid. With key release</th>
<th>Locked actuator with de-energised solenoid. With screwdriver release and escape release button</th>
<th>Locked actuator with de-energised solenoid. With escape release button</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode 1</td>
<td>NS D4AZ1SMK-F41</td>
<td>NS E4ZZ1SMK-F41</td>
<td>NS D4ST1SMK-F41</td>
<td>NS D4E1SMK-F41</td>
</tr>
<tr>
<td>Mode 2</td>
<td>NS G4AZ1SMK-F41</td>
<td>NS H4ZZ1SMK-F41</td>
<td>NS G4ST1SMK-F41</td>
<td>NS G4E1SMK-F41</td>
</tr>
<tr>
<td>Mode 3</td>
<td>NS L4AZ1SMK-F41</td>
<td>NS M4ZZ1SMK-F41</td>
<td>NS L4ST1SMK-F41</td>
<td>NS L4E1SMK-F41</td>
</tr>
</tbody>
</table>

**Selection table for switches**

<table>
<thead>
<tr>
<th>Operating principle</th>
<th>Locked actuator with de-energised solenoid. With screwdriver release</th>
<th>Locked actuator with de-energised solenoid. With key release</th>
<th>Locked actuator with de-energised solenoid. With screwdriver release and escape release button</th>
<th>Locked actuator with de-energised solenoid. With escape release button</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode 1</td>
<td>NS D4AZ1SMK</td>
<td>NS E4ZZ1SMK</td>
<td>NS D4ST1SMK</td>
<td>NS D4E1SMK</td>
</tr>
<tr>
<td>Mode 2</td>
<td>NS G4AZ1SMK</td>
<td>NS H4ZZ1SMK</td>
<td>NS G4ST1SMK</td>
<td>NS G4E1SMK</td>
</tr>
<tr>
<td>Mode 3</td>
<td>NS L4AZ1SMK</td>
<td>NS M4ZZ1SMK</td>
<td>NS L4ST1SMK</td>
<td>NS L4E1SMK</td>
</tr>
</tbody>
</table>

**Selection table for actuators**

The use of RFID technology in NS series devices makes them suitable for several applications. Pizzato Elettrica offers two different versions of actuators, in order to best suit customers’ specific needs. Type F40 actuators are all encoded with the same code. This implies that a device associated with an actuator type F40 can be activated by other actuators type F40. Type F41 actuators are always encoded with different codes. This implies that a device associated with an actuator type F41 can be activated only by a specific actuator. Another F41 type actuator will not be recognised by the device until a new association procedure is carried out (reprogramming). After reprogramming, the old actuator F41 will no longer be recognized. Reprogramming of the actuator can be performed repeatedly.

**Legend:**
- Interlock with lock monitoring acc. to EN ISO 14119
- Level of coding acc. to EN ISO 14119

<table>
<thead>
<tr>
<th>Level of coding acc. to EN ISO 14119</th>
<th>Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>VN NS-F40</td>
</tr>
<tr>
<td>high</td>
<td>VN NS-F41</td>
</tr>
</tbody>
</table>

**To order a product with lateral connection** replace character S with character D in the order codes shown above. Example: NS D4AZ1SMK → NS D4AZ1DMK

**To order a product with EDM input** replace number 4 with number 5 in the codes shown above. Example: NS D4AZ1SMK → NS D5AZ1SMK

**To order a product with lateral connection** replace character S with character D in the order codes shown above. Example: NS D4AZ1SMK → NS D4AZ1DMK

**To order a product with EDM input** replace number 4 with number 5 in the codes shown above. Example: NS D4AZ1SMK → NS D5AZ1SMK

**Legend:**
- Interlock with lock monitoring acc. to EN ISO 14119
**Complete safety system**

The use of complete and tested solutions guarantees the electrical compatibility between the NS series switches and the safety modules from Pizzato Elettrica, as well as high reliability. The switches have been tested with the modules listed in the adjacent table.

NS series switches can be used as individual devices provided that the safety outputs be evaluated by a Pizzato Elettrica safety module (see table for combinable safety modules).

Possibility of series connection of multiple switches for simplifying the wiring of the safety system, whereby only the outputs of the last switch are evaluated by a Pizzato Elettrica safety module (see table with compatible safety modules). Each NS series switch is provided with two signalling outputs which are activated when the guard is closed (O3) or locked (O4). Depending on the specific requirements of the system that has been realised, the signals of the signalling outputs can be evaluated by a PLC.

### Internal block diagram

The diagram on the side represents the 7 logic functions which interact inside the device. Function f0 is a basic function and includes the monitoring of the power supply as well as internal, cyclical tests. Function f1 monitors the status of the device inputs, whereas function f2 monitors the presence of the actuator within the detection areas of the switch.

Function f4 checks the actuator lock condition. Function f3 is intended to activate or deactivate the safety outputs and check for any faults or short circuits in the outputs.

In the EDM versions, the f5 function verifies the consistency of the EDM signal during safety output state changes.

The safety-related function, which combines the sub-functions mentioned above, activates the safety outputs according to the chosen operating mode:

- Both safety outputs OS1/OS2 for switches in mode 1 are activated only if both IS1/IS2 safety inputs are active and the actuator is inserted and locked;
- Both safety outputs OS1/OS2 for switches in mode 2 are activated only if both IS1/IS2 safety inputs are active and the actuator is inserted;
- The safety output OS1 for switches in mode 3 is activated only if the IS1 safety input is active and the actuator is inserted and locked, whereas the safety output OS2 is activated only if the IS2 safety input is active and the actuator is inserted.

The f6 function verifies the coherence of the enable/disable signals of the actuator lock command. The status of each function is displayed by the corresponding LED (PWR, IN, OUT, ACT, LOCK, EDM), in such a way that the general device status becomes immediately obvious to the operator.

### Switches and Safety Module Output Contacts

<table>
<thead>
<tr>
<th>Switches</th>
<th>Compatible Safety Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS ••••1•••</td>
<td>CS AR-06••••</td>
</tr>
<tr>
<td>NS ••••1•••</td>
<td>CS AR-06••••</td>
</tr>
<tr>
<td>NS ••••1•••</td>
<td>CS AR-06••••</td>
</tr>
<tr>
<td>NS ••••1•••</td>
<td>CS AT-1••••</td>
</tr>
<tr>
<td>CS MP•••••</td>
<td>page 277 of the General Catalogue Safety</td>
</tr>
<tr>
<td>CS MF•••••</td>
<td>page 305 of the General Catalogue Safety</td>
</tr>
</tbody>
</table>

All NS series switches can be connected, provided that compatibility is checked, to safety modules or safety PLCs with OSSD inputs.
Actuation sequence in mode 1

The switch is supplied with power (PWR LED on, green), the IS1 and IS2 inputs are enabled (IN LED on, green), the OS1 and OS2 safety outputs are disabled (OUT LED off). The actuator is outside of the actuation zone (LED ACT off).

When the actuator is brought inside the safe actuation area (dark grey area), the switch turns on the ACT LED (green). In this position, the O3 signalling output (door-closed) is activated. The actuator is not locked (LOCK LED off).

The IE1, IE2 inputs can be used to lock the actuator (LOCK LED on, green). The OS1 and OS2 safety outputs are enabled (OUT LED on, green). The O4 signalling output is activated at the same time. The safe actuation area is extended in order to allow greater play for the actuator.

The actuator leaves the actuation limit area, the device turns off the ACT LED and the O3 signalling output.

The IE1, IE2 inputs can be used to unlock the actuator (LOCK LED off). The switch disables the OS1 and OS2 safety outputs and turns off the OUT LED. The O4 signalling output is deactivated at the same time. The safe actuation area returns to the initial values.

Actuation sequence in mode 2 and mode 3

In contrast to the above mode 2 description, the safety outputs OS1 and OS2 are activated when the actuator is detected, and deactivated when the actuator is no longer detectable, in mode 3, the OS1 safety output is active with inserted and locked actuator and IS1 active, the OS2 safety output is active with inserted actuator and IS2 active.

Operating states

<table>
<thead>
<tr>
<th>PWR LED</th>
<th>IN LED</th>
<th>OUT LED</th>
<th>ACT LED</th>
<th>LOCK LED</th>
<th>EDM LED (a)</th>
<th>Device state</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OFF</td>
<td>Device switched off.</td>
</tr>
<tr>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>POWER ON</td>
<td>Internal tests upon activation.</td>
</tr>
<tr>
<td>●</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Safety inputs of the device not active.</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Activation of safety inputs.</td>
</tr>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Safety inputs incoherence.</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Incoherence of solenoid activation inputs IE1, IE2.</td>
</tr>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Auxiliary release activated.</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Actuator in safe area. O3 signalling output active.</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Actuator in safe area and locked; O3 and O4 outputs active.</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Mode 1 Activation of safety inputs IS1, IS2. Actuator in safe area and locked. O3, O4, OS1 and OS2 outputs active.</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Mode 2 Activation of safety inputs IS1, IS2. Actuator in safe area. O3, OS1 and OS2 outputs active.</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Mode 3 Actuator present, guard closed and locked, IS1 enabled, IS2 disabled, OS1 enabled, OS2 disabled</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Mode 3 Actuator present, guard closed and not locked, IS1 and IS2 enabled, OS1 disabled, OS2 enabled</td>
</tr>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>RUN</td>
<td>Rapid flashing: supply voltage too high.</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>ERROR</td>
<td>Error on safety outputs. Recommended action: check for any short circuits between the outputs, outputs and ground or outputs and power supply, then restart the device.</td>
</tr>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>ERROR</td>
<td>Actuator detection error. Check the physical integrity of the device and, in case of failure, please replace the entire device. If undamaged, realign the actuator with the switch and restart the device.</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>ERROR</td>
<td>Internal error. Recommended action: restart the device. If the failure persists, replace the device.</td>
</tr>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>ERROR</td>
<td>EDM signal active (external relay off)</td>
</tr>
<tr>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>ERROR</td>
<td>EDM signal not active (external relay on)</td>
</tr>
<tr>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>ERROR</td>
<td>Error in the EDM function</td>
</tr>
</tbody>
</table>

Legend:
○ = off
● = on
● = blinking
● = changing colours
● = indifferent
(a) Available for NS versions only

8 NS series switches

8
**NS series RFID safety switches with lock**

### External device monitoring (EDM)

The NS •5••1••• version, in addition to maintaining the operating and safety characteristics of the NS series, allows control of forcibly guided NC contacts of contactors or relays controlled by the safety outputs of the switch itself. As an alternative to the relays or contactors you can use Pizzato Elettrica expansion modules CS ME-03 (see page 267). This check is carried out via the EDM input (External Device Monitoring as defined in EN 61496-1) of the switch.

This version, with the IS safety inputs, can be used at the end of a series of NS switches, up to a maximum number of 32 devices, while maintaining the maximum PL e safety level and acc. to EN ISO 13849-1 and SIL 3 safety level acc. to EN 62061. This solution allows you to dispense with the safety module connected to the last device in the chain. If present, the EDM function must be used.

### Connection with safety modules

#### Connections with CS AR-08***** safety modules

- **Input configuration with monitored start**
  - 2 channels / Category 4 / up to SIL 3 / PL e

#### Connections with CS AR-05***** / CS AR-06***** safety modules

- **Input configuration with manual start (CS AR-05*****)
  or monitored start (CS AR-06*****)**
  - 2 channels / Category 4 / up to SIL 3 / PL e

#### Connections with CS AT0***** / CS AT1***** safety modules

- **Input configuration with monitored start**
  - 2 channels / Category 4 / up to SIL 3 / PL e

#### Connections with CS MF***** / CS MP***** safety modules

- **The connections vary according to the program of the module**
  - Category 4 / up to SIL 3 / PL e

Application example on page 275, General Catalogue Safety 2019-2020.
Series connection of several switches

<table>
<thead>
<tr>
<th>NS ••••••M•</th>
<th>NS ••••••P•</th>
<th>NS ••••••Q•</th>
<th>NS ••••••A•</th>
<th>NS ••••••B•</th>
</tr>
</thead>
<tbody>
<tr>
<td>Versions with connector</td>
<td>Versions with cable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M12 connector, 12-pole</td>
<td>M12 connector, 8-pole</td>
<td>M12 connector, 8-pole</td>
<td>Cable</td>
<td>Cable</td>
</tr>
<tr>
<td>NS •••••••••</td>
<td>NS •••••••••</td>
<td>NS •••••••••</td>
<td>12×0.14 mm²</td>
<td>8×0.34 mm²</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>White</td>
<td>Blue</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>8</td>
<td>Purple</td>
<td>Red</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>/</td>
<td>Red-Blue</td>
<td>Purple</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>/</td>
<td>Pink</td>
<td>Black</td>
</tr>
<tr>
<td>9</td>
<td>/</td>
<td>5(b)</td>
<td>Red</td>
<td>purple-white</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>/</td>
<td>Grey</td>
<td>Brown</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Brown</td>
<td>Brown</td>
</tr>
<tr>
<td>2</td>
<td>/</td>
<td>2</td>
<td>Blue</td>
<td>/</td>
</tr>
<tr>
<td>6</td>
<td>/</td>
<td>6</td>
<td>Yellow</td>
<td>/</td>
</tr>
<tr>
<td>11</td>
<td>/</td>
<td>/</td>
<td>Grey-Pink</td>
<td>/</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>4</td>
<td>Green</td>
<td>Red-White</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>7</td>
<td>Black</td>
<td>Black-White</td>
</tr>
<tr>
<td>Connection</td>
<td>A2</td>
<td>Supply input 0 V</td>
<td>IE1</td>
<td>Solenoid activation input</td>
</tr>
<tr>
<td></td>
<td>IE2</td>
<td>Solenoid activation input</td>
<td>O2</td>
<td>Signalling output, actuator inserted</td>
</tr>
<tr>
<td></td>
<td>O4</td>
<td>Signalling output, actuator inserted and locked</td>
<td>I3</td>
<td>Actuator programming input / reset</td>
</tr>
<tr>
<td></td>
<td>IS1</td>
<td>Safety input</td>
<td>IS2</td>
<td>Safety input</td>
</tr>
<tr>
<td></td>
<td>I5</td>
<td>EDM input (a)</td>
<td>OS1</td>
<td>Safety output</td>
</tr>
<tr>
<td></td>
<td>OS2</td>
<td>Safety output</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Available for NS ••••••••• version only
(b) Available for 8-pole connector, not available for the end of a chain with Y connectors.

Series connection

To simplify series connections of the devices, various M12 connectors are available that allow complete wiring.

This solution significantly reduces installation times while at the same time maintaining the maximum safety levels PL e and SIL 3 for the interlocking function.

For further information see page 326 of the General Catalogue Safety 2019-20
Switch with integrated control device unit for 3 devices

### NS SRK-N001

<table>
<thead>
<tr>
<th>Device 1</th>
<th>Device 2</th>
<th>Device 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Illuminated button, spring-return 1NO</td>
<td>Illuminated button, spring-return 1NO</td>
</tr>
<tr>
<td><strong>Colour</strong></td>
<td>white</td>
<td>blue</td>
</tr>
<tr>
<td><strong>LED</strong></td>
<td>B4 B3</td>
<td>B5 B3</td>
</tr>
<tr>
<td><strong>Diagram</strong></td>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

#### Internal connections

- **Connection**
  - A1: Supply input +24 Vdc
  - A2: Supply input 0 Vdc
  - IS1: Safety input
  - OS1: Safety output
  - IS2: Safety input
  - OS2: Safety output
  - IE1: Solenoid activation input for double channel mode
  - IE2: Solenoid activation input for double channel mode
  - O3: Signalling output, actuator inserted
  - O4: Signalling output, actuator inserted and locked
  - I3: Actuator programming input / reset
  - I5: EDM input (a)
  - I4: Solenoid activation input for single channel mode

(a) Available for NS •••••1•••-N••• version only

### NS SRK-N002

<table>
<thead>
<tr>
<th>Device 1</th>
<th>Device 2</th>
<th>Device 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Illuminated button, spring-return 1NO</td>
<td>Emergency-stop button with rotary release 2NC</td>
</tr>
<tr>
<td><strong>Colour</strong></td>
<td>white</td>
<td>red</td>
</tr>
<tr>
<td><strong>LED</strong></td>
<td>B4 B3</td>
<td>B9 B11</td>
</tr>
<tr>
<td><strong>Diagram</strong></td>
<td><img src="image3.png" alt="Diagram" /></td>
<td><img src="image4.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

### NS STK-N003

<table>
<thead>
<tr>
<th>Device 1</th>
<th>Device 2</th>
<th>Device 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Spring-return button 1NO</td>
<td>Emergency-stop button with rotary release 2NC</td>
</tr>
<tr>
<td><strong>Colour</strong></td>
<td>white</td>
<td>red</td>
</tr>
<tr>
<td><strong>LED</strong></td>
<td>B4 B3</td>
<td>B9 B11</td>
</tr>
<tr>
<td><strong>Diagram</strong></td>
<td><img src="image5.png" alt="Diagram" /></td>
<td><img src="image6.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

#### Connector

- **2x M12, 12-pole, axial**

---

**NS series RFID safety switches with lock**

**Connection**

- **Supply input +24 Vdc**
- **Supply input 0 Vdc**
- **Safety input**
- **Safety output**
- **Safety input**
- **Safety output**
- **Solenoid activation input for double channel mode**
- **Solenoid activation input for double channel mode**
- **Signalling output, actuator inserted**
- **Signalling output, actuator inserted and locked**
- **Actuator programming input / reset**
- **EDM input (a)**
- **Solenoid activation input for single channel mode**

(a) Available for NS •••••1•••-N••• version only
Switch with integrated control device unit for 4 devices

<table>
<thead>
<tr>
<th>NS *****SRK-N004</th>
<th>NS *****SRK-N005</th>
<th>NS *****SRK-N006</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong>Colour</strong></td>
<td><strong>Diagram</strong></td>
</tr>
<tr>
<td>Device 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illuminated button, spring-return 1NO</td>
<td>green</td>
<td></td>
</tr>
<tr>
<td>Device 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illuminated button, spring-return 1NO</td>
<td>red</td>
<td></td>
</tr>
<tr>
<td>Device 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illuminated button, spring-return 1NO</td>
<td>white</td>
<td></td>
</tr>
<tr>
<td>Device 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illuminated 2-position selector switch 1NO</td>
<td>black</td>
<td></td>
</tr>
<tr>
<td>Connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2x M12, 12-pole, axial</td>
<td>/</td>
<td>/</td>
</tr>
</tbody>
</table>

**Internal connections (versions with integrated control device unit for 4 devices)**

<table>
<thead>
<tr>
<th>Connection</th>
<th>NS *****SRK-N004</th>
<th>NS *****SRK-N005</th>
<th>NS *****STK-N006</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Supply input +24 Vdc</td>
<td>A1</td>
<td>A1</td>
</tr>
<tr>
<td>A2</td>
<td>Supply input 0 Vdc</td>
<td>A2</td>
<td>A2</td>
</tr>
<tr>
<td>IS1</td>
<td>Safety input</td>
<td>IS1</td>
<td>IS1</td>
</tr>
<tr>
<td>OS1</td>
<td>Safety output</td>
<td>OS1</td>
<td>OS1</td>
</tr>
<tr>
<td>IS2</td>
<td>Safety input</td>
<td>IS2</td>
<td>IS2</td>
</tr>
<tr>
<td>OS2</td>
<td>Safety output</td>
<td>OS2</td>
<td>OS2</td>
</tr>
<tr>
<td>IE1</td>
<td>Solenoid activation input for double channel mode</td>
<td>IE1</td>
<td>IE1</td>
</tr>
<tr>
<td>IE2</td>
<td>Solenoid activation input for double channel mode</td>
<td>IE2</td>
<td>IE2</td>
</tr>
<tr>
<td>O3</td>
<td>Signalling output, actuator inserted</td>
<td>O3</td>
<td>O3</td>
</tr>
<tr>
<td>O4</td>
<td>Signalling output, actuator inserted and locked</td>
<td>O4</td>
<td>O4</td>
</tr>
<tr>
<td>I3</td>
<td>Actuator programming input / reset</td>
<td>I3</td>
<td>I3</td>
</tr>
<tr>
<td>I5</td>
<td>EDM input (a)</td>
<td>I5</td>
<td>I5</td>
</tr>
</tbody>
</table>

(a) Available for NS *****SRK-N005 version only

**Electrical connector configurations**

- Two M12 connectors, 12-pole
- M23 connector, 19-pole
### Extensions for release button

<table>
<thead>
<tr>
<th>Article</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VN NG-LP30</td>
<td>Metal extension for release button. For max. wall thickness of 30 mm</td>
</tr>
<tr>
<td>VN NG-LP40</td>
<td>Metal extension for release button. For max. wall thickness of 40 mm</td>
</tr>
<tr>
<td>VN NG-LP50</td>
<td>Metal extension for release button. For max. wall thickness of 50 mm</td>
</tr>
<tr>
<td>VN NG-ERB</td>
<td>Red metal release button</td>
</tr>
</tbody>
</table>

- Metal extensions can be combined with one another to achieve the desired length.
- Do not exceed an overall length of 100 mm between the release button and the switch.
- Use medium-strength thread locker to secure the extensions.

All values in the drawings are in mm

X = see page 14,  
Y = 47.5 mm (versions with 3 buttons); Y = 31.7 mm (versions with 4 buttons)
### Available integrated devices

<table>
<thead>
<tr>
<th>Description, colour and options</th>
<th>Article</th>
<th>Combimable with contacts</th>
<th>Protrusion (x) mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illuminated button, spring-return</td>
<td>VN-NC-AC26005</td>
<td>1NO</td>
<td>3</td>
</tr>
<tr>
<td>White</td>
<td>VN-NC-AC26001</td>
<td>1NO</td>
<td>3</td>
</tr>
<tr>
<td>Red</td>
<td>VN-NC-AC26003</td>
<td>2NO</td>
<td>3</td>
</tr>
<tr>
<td>Green</td>
<td>VN-NC-AC26002</td>
<td>1NO+1NC</td>
<td>3</td>
</tr>
<tr>
<td>Yellow</td>
<td>VN-NC-AC26004</td>
<td>1NO+1NC</td>
<td>3</td>
</tr>
<tr>
<td>Button, not illuminated, spring-return</td>
<td>VN-NG-AC26007</td>
<td>1NO</td>
<td>3</td>
</tr>
<tr>
<td>Black</td>
<td>VN-NG-AC26008</td>
<td>1NO</td>
<td>3</td>
</tr>
<tr>
<td>Indicator light</td>
<td>VN-NG-AC26009</td>
<td>/</td>
<td>2.7</td>
</tr>
<tr>
<td>White</td>
<td>VN-NG-AC26010</td>
<td>/</td>
<td>2.7</td>
</tr>
<tr>
<td>Red</td>
<td>VN-NG-AC26011</td>
<td>/</td>
<td>2.7</td>
</tr>
<tr>
<td>Green</td>
<td>VN-NG-AC26013</td>
<td>/</td>
<td>2.7</td>
</tr>
<tr>
<td>Red, rotary button acc. to EN 13850</td>
<td>VN-NG-AC26052</td>
<td>2NC</td>
<td>26.4</td>
</tr>
<tr>
<td>Emergency stop button acc. to EN ISO 13850</td>
<td>VN-NG-AC26055</td>
<td>/</td>
<td>26.4</td>
</tr>
<tr>
<td>Illuminated selector switch with handle, with transparent lens for LED</td>
<td>VN-NG-AC26033</td>
<td>1NO</td>
<td>16.8</td>
</tr>
<tr>
<td>Black</td>
<td>VN-NG-AC26034</td>
<td>2NO</td>
<td>16.8</td>
</tr>
<tr>
<td>Black</td>
<td>VN-NG-AC26040</td>
<td>1NO+1NC</td>
<td>16.8</td>
</tr>
<tr>
<td>Key selector switch, 2 positions</td>
<td>VN-NG-AC26041</td>
<td>1NO</td>
<td>14 (a)</td>
</tr>
<tr>
<td>Black</td>
<td>VN-NG-AC26042</td>
<td>2NO</td>
<td>14 (a)</td>
</tr>
<tr>
<td>Black</td>
<td>VN-NG-AC26043</td>
<td>1NO+1NC</td>
<td>14 (a)</td>
</tr>
<tr>
<td>Closing cap</td>
<td>VN-NG-AC26090</td>
<td>/</td>
<td>0</td>
</tr>
<tr>
<td>Fixing key</td>
<td>VN-NG-AC26080</td>
<td>/</td>
<td>/</td>
</tr>
</tbody>
</table>

Legend:  
-  
- Maintained  
- spring-return  
- Key extraction position

Other devices and contacts on request. Please contact our technical office for the complete list of available products.

### Technical data of the integrated control devices

#### General data
- Protection degree: IP65 acc. to EN 60529
- Mechanical endurance:  
  - Spring-return button: 1 million operating cycles
  - Emergency stop button: 50,000 operating cycles
  - Selector switch: 300,000 operating cycles
  - Key selector switch: 50,000 operating cycles
  -剁26.4法100,000 operating cycles including removal of the key
- Safety parameter B10D: 100,000 (emergency stop button)

#### Actuating force
- Spring-return button: 4 N min 100 N max.
- Emergency stop button: 20 N min 100 N max.
- Selector switch: 0.1 Nm min 1.5 Nm max.
- Key selector switch: 0.1 Nm min 1.3 Nm max.

#### Contact blocks of the control devices
- Material of the contacts: silver contacts
- Contact type: Self-cleaning contacts with double interruption

#### Electrical data:
- Thermal current Ith: 1 A
- Rated insulation voltage Ue: 32 Vac/dc
- Rated impulse withstand voltage Uimp: 1.5 kV
- LED supply voltage: 24 Vdc ± 15%
- LED supply current: 12 mA per LED

#### Utilization category of the contact block:
- Direct current: DC13
- Ue (V): 24
- Ie (A): 0.55

#### In compliance with standards:
- IEC 60947-5-1, IEC 60947-5-5, EN ISO 13850

#### Installation for safety applications:
- Always connect the safety circuit to the NC contacts (normally closed contacts) as stated in standard EN 60947-1.

#### M12 connector electrical data:
- Max. operating voltage: 32 Vac/dc
- Max. operating current: 1.5 A max.

#### M23 connector electrical data:
- Max. operating voltage: 32 Vac/dc
- Max. operating current: 3 A max.

### Accessories

<table>
<thead>
<tr>
<th>Article</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VF KLB300</td>
<td>Set of two locking keys</td>
</tr>
</tbody>
</table>

Extra copy of the locking keys to be purchased if further keys are needed (standard supply: 2 units). The keys of all switches have the same code. Other codes on request.

### Lock out device

<table>
<thead>
<tr>
<th>Article</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LK S1D001</td>
<td>Lock out device, mounting on the right side of the switch</td>
</tr>
<tr>
<td>LK S1S001</td>
<td>Lock out device, mounting on the left side of the switch</td>
</tr>
</tbody>
</table>

Device made entirely of metal, to be fixed on the side of NS switches without any additional plate or support. The front slider mechanically closes the actuator entry hole and functions as a shield for the RFID receiver antenna on the switch; thus ensuring an additional level of protection against accidental closure of the guard and untimely machine restart. Allows insertion of up to 5 padlocks with a 3.5 mm arc diameter.