NS series safety switches with solenoid and RFID technology
**NS series safety switches with solenoid and RFID technology**

**Description**

These switches are mainly used 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 or could still be hot or under pressure. Thus, the switches can also be used if individual guards are only to be opened under certain conditions. Versions with mode 1 (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.

**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.

**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.

**Centring**

The switch is provided with a wide centring inlet for the actuator pin. This solution makes it easier to align the actuator and the opening hole on the head during installation. Moreover, this solution drastically reduces the probability of a collision between the switch and the actuator, making it possible to install the device even on inaccurately closing doors.

**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.

**Holding force of the locked actuator**

The strong interlocking system guarantees a maximum actuator holding force of $F_{\text{max}} = 2100$ N.

**Modularity**

The innovative design of the auxiliary releases makes possible a wide range of combinations of auxiliary releases with lock, escape release buttons or screwdriver releases with front and rear mounting. The electrical connection is also highly flexible: outputs are available with cables as well as with connectors, which can be oriented axially or laterally.

**Head and release devices with variable orientation, not detachable**

The upper part of the switch, which contains the release devices, can be rotated and is permanently connected to the lower part, which contains the outputs for the electrical connection. After loosening the fastening screws, the individual modules can be rotated in 90° steps. As a result, a single device can be used to realise various configurations without the installation technician needing to concern himself with the correct assembly of various parts. The fastening screws are provided with protective caps to prevent dirt build-up and thereby simplify cleaning.
NS series switches

MODE 1

MODE 2

MODE 3

For the device, it is possible to choose among 3 different actuation modes of the safety outputs: safety outputs active with actuator inserted and locked (mode 1) for machines with inertia; safety outputs active with actuator inserted (mode 2) for machines without inertia; a first safety output active with actuator inserted and locked and a second safety output active with actuator inserted (mode 3) for special applications.

Protection against tampering

Each actuator of the NS series is supplied with four protective 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.

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 door is opened and any errors inside the device. All of this at a glance, without needing to decode complex flashing sequences.

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 doors are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked doors in their position with a retaining force of 20 N~, stopping any vibrations or gusts of wind from opening them.

Function for protecting against recoil forces

If a door 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 door 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.

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 door. 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 accessoires). 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.

Actuator with flexible bolt for inaccurately closing doors

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 doors with a minimum actuation radius of 150 mm without the actuation pin needing to be angled.

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.

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 protective caps provided for this purpose. Dirt deposits and tampering attempts are thereby prevented.
NS series safety switches with solenoid and RFID technology

**Selection diagram**

- **D-ST**: Locked actuator with de-energised solenoid key release at front
- **D-SE**: Locked actuator with de-energised solenoid key release at front and escape release button at back
- **D-CE**: Locked actuator with de-energised solenoid release by means of screwdriver at front and escape release button at back
- **E-TE**: Locked actuator with energised solenoid without release at front and escape release button at back

**Release and Operating Principle**

**ACTUATORS**

- **VN NS-F40**: Low level coded actuator
- **VN NS-F41**: High level coded actuator

**Connections**

- **M12 connector, at bottom**
  - SMK: 12-pole
  - SPK: 8-pole, for stand-alone connection
  - SQK: 8-pole, for series connection with Y connectors
- **M12 connector, lateral, orientable**
  - DMK: 12-pole
  - DPK: 8-pole for stand-alone connection
  - DQK: 8-pole, for series connection with Y connectors
- **Cable, length: 0.2 m, with M12 connector, at bottom**
  - SM0.2: 12-pole
  - SP0.2: 8-pole, for stand-alone connection
  - SQ0.2: 8-pole, for series connection with Y connectors
- **Cable, length: 0.2 m, with M12 connector, lateral, orientable**
  - DM0.2: 12-pole
  - DP0.2: 8-pole for stand-alone connection
  - DQ0.2: 8-pole, for series connection with Y connectors
- **Cable, length: 0.2 m, with M12 connector, at bottom**
  - D0.2: 8-pole, for series connection with Y connectors
- **With PVC cable at bottom**
  - SA2: 12-pole, length: 2 m
  - SB2: 8-pole, length: 2 m, for stand-alone connections

**Product options**

- Sold separately as accessory
### Operating principle

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>locked actuator with de-energised solenoid. mode 1: OS safety outputs active with inserted and locked actuator</td>
</tr>
<tr>
<td>E</td>
<td>locked actuator with energised solenoid. mode 1: OS safety outputs active with inserted and locked actuator</td>
</tr>
<tr>
<td>G</td>
<td>locked actuator with de-energised solenoid. mode 2: OS safety outputs active with inserted actuator</td>
</tr>
<tr>
<td>H</td>
<td>locked actuator with energised solenoid. mode 2: OS safety outputs active with inserted actuator</td>
</tr>
<tr>
<td>L</td>
<td>locked actuator with de-energised solenoid. mode 3: first safety output active with inserted and locked actuator, second safety output active with inserted actuator</td>
</tr>
<tr>
<td>M</td>
<td>locked actuator with energised solenoid. mode 3: first safety output active with inserted and locked actuator, second safety output active with inserted actuator</td>
</tr>
</tbody>
</table>

### Inputs and outputs

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
</table>
| 3      | 2 safety inputs IS1, IS2  
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 |
| 4      | 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 programming / reset input I3 |
| 5      | 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 programming / reset input I3  
1 feedback input EDM I5  
Note: Not available with mode 3 |

### Code structure for actuator VN NS-F40

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

### Actuator extraction force

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F40</td>
<td>actuator extraction force 20 N (standard)</td>
</tr>
<tr>
<td>F41</td>
<td>actuator extraction force 40 N</td>
</tr>
</tbody>
</table>

### Release button length

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP30</td>
<td>for max. 15 mm wall thickness (standard)</td>
</tr>
<tr>
<td>LP40</td>
<td>for max. 30 mm wall thickness</td>
</tr>
<tr>
<td>LP50</td>
<td>for max. 50 mm wall thickness</td>
</tr>
</tbody>
</table>

### Code structure

<table>
<thead>
<tr>
<th>Attention! The feasibility of a code number does not mean the effective availability of a product. Please contact our sales office.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Codes:</td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>E</td>
</tr>
<tr>
<td>G</td>
</tr>
<tr>
<td>H</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>M</td>
</tr>
</tbody>
</table>

### Auxillary release at front and back

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
</table>
| AZ   | release by means of screwdriver at front  
only available for operating principle D, G and L |
| ST   | key release at front  
only available for operating principle D, G and L |
| SE   | key release at front and escape release button at back  
only available for operating principle D, G and L |
| CE   | release by means of screwdriver at front and escape release button at back  
only available for operating principle D, G and L |
| ZZ   | without release  
only available for operating principle E, H and M |
| TE   | Without release at front and escape release button at back  
only available for operating principle E, H and M |

### Cable or connector type

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>PVC cable 12x0.14 mm² (standard)</td>
</tr>
</tbody>
</table>
| B    | PVC cable 8x0.34 mm² for stand-alone connection  
Note: without inputs IS1, IS2, I5 and without output O4 |
| E    | PUR cable, halogen-free, 8x0.34 mm² for stand-alone connection  
Note: without inputs IS1, IS2, I5 and without output O4 |
| M    | M12 connector, 12-pole (standard) |
| P    | M12 connector, 8-pole, for stand-alone connections  
Note: without inputs IS1, IS2, I5 and without output O4 |
| Q    | M12 connector, 8-pole, for series connection with Y connectors  
Note: without inputs IS1, IS2, I5 and without output O4 |

### Output direction, connections

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>cable or connector, lateral</td>
</tr>
<tr>
<td>S</td>
<td>cable or connector, at bottom</td>
</tr>
</tbody>
</table>

### Connection type

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>integrated M12 connector (standard)</td>
</tr>
<tr>
<td>0.2</td>
<td>cable, length: 0.2 m, with M12 connector</td>
</tr>
<tr>
<td>2</td>
<td>cable, length: 2 m (standard)</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>cable, length: 10 m</td>
</tr>
</tbody>
</table>

### Actuator

- **F40**: low level coded actuator, the switch recognises any type F40 actuator
- **F41**: high level coded actuator, the switch recognises one single type F41 actuator
**Main features**

- Actuation without contact, using RFID technology
- Digitally coded actuator
- SIL 3 and PL e also with series connection of up to 32 devices
- Max. actuator holding force: 2100 N
- SIL 3 and PL e with a single device
- Protection degrees IP67 and IP69K
- Versions with key release and escape release button
- 6 signalling LEDs

**Quality marks:**

EC type examination certificate: MGA171075157020
UL approval: E131787
TÜV SÜD approval: Z10 17 10 75157 019
EAC approval: RU C-ITA 35.00454

**In compliance with standards:**


**Compliance with the requirements of:**


**Features approved by UL**

Utilization categories: 24 Vdc, 0.25 A.
Inputs supplied by 24 Vdc remote class 2 source or limited voltage and limited energy.
In compliance with standard: UL 508, CSA 22.2 No. 14

**Features approved by TÜV SÜD**

Protection degree: IP67, IP69K
Ambient temperature: -25°C...+50°C
PL category: PL e, cat. 4.
SIL 3: SIL CL 3
Complies with machinery directive 2006/42/EC.

Please contact our technical department for the list of approved products.

**Technical data**

**Housing made of glass fibre reinforced technopolymer, self-extinguishing and shock-proof**

- Versions with integrated cable 12x0.14mm² or 8x0.34mm², standard length 2 m, other lengths from 0.5 ... 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)

**General data**

- SIL level (SIL CL): up to SIL 3 acc. to EN 62061
- Performance Level (PL): up to PL e acc. to EN ISO 13849-1
- Safety category: up to cat. 4 acc. to EN ISO 13849-1
- Interlock, no contact, coded, with guard locking:
  - Level of coding acc. to EN ISO 14119:
  - Type 4 acc. to EN ISO 1119

**Utilization categories:** 24 Vdc, 0.25 A.

- Features approved by UL

**Power supply electrical data**

- Rated operating voltage Ue SELV:
  - Operating current at Ue voltage: 24 Vdc ±10%
- Rated insulation voltage U:
  - Impulse withstand voltage Uimp: 15 kV
- Rated impulse withstand voltage Uimp:
  - Rated operating voltage Ue SELV: 24 Vdc ±10%
- Rated operating voltage Ue:
  - Internal self‑resettable protection fuse: 1.1 A

**Electrical data of inputs IS1/IS2/I3/IE1/IE2/I5/EDM**

- Rated current consumption Ie1: 5 mA
- Rated current consumption Ie2: 0.25 A
- Rated current consumption Ie3: 0.1 A
- Rated operating voltage Ue2: 24 Vdc
- Rated operating voltage Ue3: 24 Vdc
- Maximum current per output Ie3: 0.1 A
- Rated impulse withstand voltage Uimp:
  - Rated operating voltage Ue2: 24 Vdc

**Electrical data of O3/O4 signalling outputs**

- Minimum current per output Ie3: 0.5 mA
- Maximum current per output Ie2: 0.25 A
- Thermal current Ith2: 0.25 A
- Utilization category:
  - Type 3 e 4: 1.22E‑09 2243
- Short circuit detection: Yes
- Maximum holding force FZh: 1615 N acc. to EN ISO 14119
- Maximum clearance of locked actuator: 4 mm

**Compliance with the requirements of:**

- Interlock, no contact, coded, with guard locking: type 4 acc. to EN ISO 14119
- Safety category: up to cat. 4 acc. to EN ISO 13849-1
- Performance Level (PL): up to PL e acc. to EN ISO 13849-1

**Protection degrees:** IP67, IP69K

- Ambient temperature: -20°C ... +50°C
- Maximum delay for EDM status change: 500 ms
- Activation time upon removal of the actuator: typically 120 ms, max. 200 ms
- Activation time upon unlocking the actuator: typically 7 ms, max. 12 ms
- After deactivation of safety inputs IS1, IS2: typically 7 ms, max. 15 ms
- Maximum current per output Ie2: 0.25 A
- Rated operating voltage Ue2: 24 Vdc
- Maximum current per output Ie3: 0.1 A
- Rated operating voltage Ue3: 24 Vdc
- Not available in mode 2
- Guard locking function (guard locked)
- Interlock monitoring function (guard closed)
- Interlock monitoring function (guard closed)

**RFID sensor data**

- Assured operating distance SaO: 2 mm
- Assured release distance SaR: 6 mm (actuator not locked)
- Assured release distance SaR: 10 mm (actuator locked)
- Minimum current per output Ie2: 0.25 A
- Rated operating distance S: 3 mm
- Repeat accuracy: ≤ 10 % sn
- Differential travel: ≤ 20 % sn
- Max. switching frequency: 1 Hz

**Technical data**

- Housing made of glass fibre reinforced technoplymer, self-extinguishing and shock-proof
- Versions with integrated cable 12x0.14mm² or 8x0.34mm², standard length 2 m, other lengths from 0.5 ... 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)
### Activation 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>

### 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 energised solenoid. With key release</th>
<th>Locked actuator with de-energised solenoid. With key release and escape release button</th>
<th>Locked actuator with de-energised solenoid. With screwdriver release and 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 D45E1SMK-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 G45E1SMK-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 L45E1SMK-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 energised solenoid. With key release</th>
<th>Locked actuator with de-energised solenoid. With key release and escape release button</th>
<th>Locked actuator with de-energised solenoid. With screwdriver release and escape release button</th>
</tr>
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<tbody>
<tr>
<td>Mode 1</td>
<td>NS D4AZ1SMK</td>
<td>NS E4ZZ1SMK</td>
<td>NS D4ST1SMK</td>
<td>NS D45E1SMK</td>
</tr>
<tr>
<td>Mode 2</td>
<td>NS G4AZ1SMK</td>
<td>NS H4ZZ1SMK</td>
<td>NS G4ST1SMK</td>
<td>NS G45E1SMK</td>
</tr>
<tr>
<td>Mode 3</td>
<td>NS L4AZ1SMK</td>
<td>NS M4ZZ1SMK</td>
<td>NS L4ST1SMK</td>
<td>NS L45E1SMK</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.

<table>
<thead>
<tr>
<th>Level of coding</th>
<th>Article</th>
</tr>
</thead>
<tbody>
<tr>
<td>acc. to EN ISO 14119</td>
<td>VN NS-F40</td>
</tr>
<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 D4AZ1DSMK

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

Legend: **P** 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.

<table>
<thead>
<tr>
<th>NS series switches</th>
<th>Safety module output contacts</th>
<th>Safety module</th>
<th>Instantaneous contacts</th>
<th>Delayed safety contacts</th>
<th>Signalling contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS AR-05••••</td>
<td>3NO / 1NC</td>
<td>CS MF••••••</td>
<td>page 255 - SAFETY CATALOGUE 2017/18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS AR-06••••</td>
<td>3NO / 1NC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS AR-06••••</td>
<td>2NO / 0NC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS AR-06••••</td>
<td>3NO / 2NO / /</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS AT-0•••••</td>
<td>2NO 2NO / /</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS AT-1•••••</td>
<td>2NO / /</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS MP••••••</td>
<td>3NO / 1NC</td>
<td></td>
<td></td>
<td></td>
<td></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.

**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.

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 of the CS MP series. Both the safety-relevant evaluation and the evaluation of the signalling outputs are performed by the CS MP series.

The examples listed above refer to applications with NS ••••1•••
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.

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

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</th>
<th>Device state</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ ○ ○ ○ ○ ○ ○ ○ OFF</td>
<td>Device switched off.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● POWER ON</td>
<td>Internal tests upon activation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>○ ○ ○ ● ● ● ● ○ RUN</td>
<td>Safety inputs of the device not active.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Activation of safety inputs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Safety inputs incoherence. Recommended action: check for presence and/or wiring of inputs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Incoherence of solenoid activation inputs IE1, IE2. Recommended action: check for presence and/or wiring of inputs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Auxiliary release activated. Deactivate the auxiliary release to lock the actuator.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Actuator in safe area. O3 signalling output active.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Actuator in safe area and locked. O3 and O4 outputs active.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Mode 1</td>
<td>Activation of safety inputs IS1, IS2. Actuator in safe area and locked. O3, O4, OS1 and OS2 outputs active.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Mode 2</td>
<td>Activation of safety inputs IS1, IS2. Actuator in safe area. O3, OS1 and OS2 outputs active.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Mode 3</td>
<td>Actuator present, guard closed and locked. IS1 enabled, IS2 disabled, OS1 enabled, OS2 disabled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Mode 4</td>
<td>Actuator present, guard closed and not locked. IS1 and IS2 enabled, OS1 disabled, OS2 enabled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>Rapid flashing: supply voltage too high. Slow flashing: temperature outside admissible range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● ERROR</td>
<td>Actuator detection error. Check the physical integrity of the device and, in case of failure, please replace the device.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● ERROR</td>
<td>Internal error. Recommended action: restart the device. If the failure persists, replace the device.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>EDM signal active (external relay off)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● RUN</td>
<td>EDM signal not active (external relay on)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>● ● ● ● ● ● ● ● ERROR</td>
<td>Error in the EDM+ function</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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 245 - SAFETY CATALOGUE 2017/18. This check is carried out via the EDM input (External Device Monitoring as defined in EN 61496-1) of the switch.

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.

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.

Legends:
- ○ = off
- ● = on
- ⬤ = flashing
- ◊ = alternating colours
- × = indifferent

(a) Available only in versions NS •5••1•••
**Series connection of several switches**

| Connector pin assignment | Internal cable wiring |
|---------------------------------------------------------------|
| **M12 connector, 12-pole** | **M12 connector, 8-pole stand-alone connection** | **M12 connector, 8-pole series connection with “Y” connectors** | **Cable 12x0.14 mm² external Ø 6 mm** | **Cable 8x0.34 mm² external Ø 7 mm** | **Connection** |
| 3 | 3 | 3 | White | Blue | A2 Supply input 0 V |
| 10 | 8 | 8 | Purple | Red | IE1 Solenoid activation input |
| 12 | 5 | / | Red-Blue | Purple | IE2 Solenoid activation input |
| 5 | 2 | / | Pink | Black | O3 Signalling output, actuator inserted |
| 9 | / | 5(b) | Red | / | O4 Signalling output, actuator inserted and locked |
| 8 | 6 | / | Grey | purple-white | O3 Actuator programming input / reset |
| 1 | 1 | 1 | Brown | Brown | A1 Supply input +24 Vdc |
| 2 | / | 2 | Blue | / | IS1 Safety input |
| 6 | / | 6 | Yellow | / | IS2 Safety input |
| 11 | / | / | Grey-Pink | / | IS2 Safety input (a) |
| 4 | 4 | 4 | Green | Red-White | OS1 Safety output |
| 7 | 7 | 7 | Black | Black-White | OS2 Safety output |

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

All values in the drawings are in mm

### Switch
- **NS AZ1SMK**
- **NS ZZ1SMK**

### Switch
- **NS ST1SMK**
- **NS SE1SMK**

### Switch
- **NS CE1SMK**
- **NS TE1SMK**

---

**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.

---

**Extensions for escape release button**

<table>
<thead>
<tr>
<th>Article</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VN NG-LP30</td>
<td>Metal extension for escape release button. For max. wall thickness of 30 mm</td>
</tr>
<tr>
<td>VN NG-LP40</td>
<td>Metal extension for escape release button. For max. wall thickness of 40 mm</td>
</tr>
<tr>
<td>VN NG-LP50</td>
<td>Metal extension for escape release button. For max. wall thickness of 50 mm</td>
</tr>
<tr>
<td>VN NG-ERB</td>
<td>Red metal escape 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 **70 mm** between the escape release button and the switch.
- Use medium-strength thread locker to secure the extensions.

---

**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 304 of the General Catalogue Safety 2017-2018.

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The 2D and 3D files are available at [www.pizzato.com](http://www.pizzato.com)