

### 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

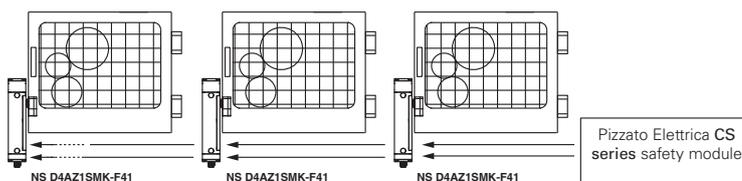
The NS series switches are constructed with redundant electronics. As a result, the maximum PL e and SIL 3 safety levels can still be achieved through the use of a single device on a guard. This avoids expensive wiring in the field and allows faster installation. Inside the control cabinet, the two electronic safety outputs must be connected to a module suitable for managing devices with solid state outputs, or to a safety PLC.

### Series connection of several switches

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.

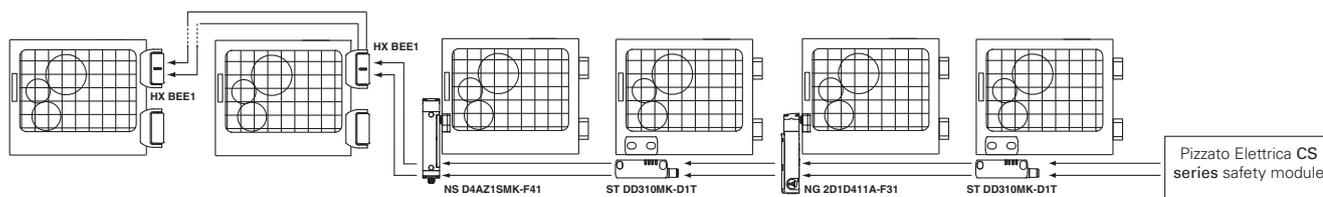
This connection type is permissible in safety systems which have a safety module at the end of the chain that monitors the outputs of the last NS switch.

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

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.



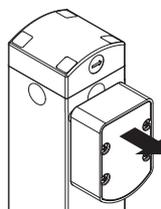
### RFID actuators with high coding level



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.

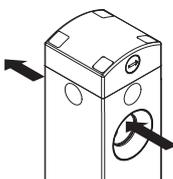
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### Holding force of the locked actuator



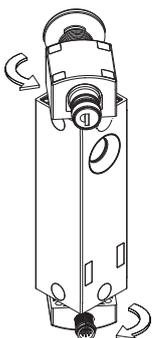
**2100 N** The strong interlocking system guarantees a maximum actuator holding force of  $F_{1max} = 2100 \text{ N}$ .

### 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.

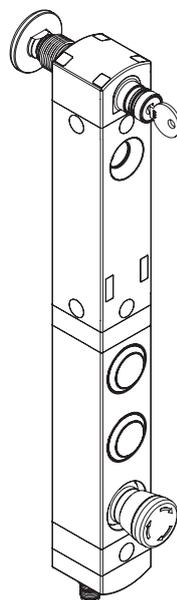
### Head and release devices with variable orientation, not detachable



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 protection caps to prevent dirt build-up and thereby simplify cleaning.

### 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.

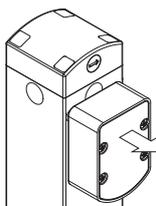


### Six LEDs for immediate diagnosis



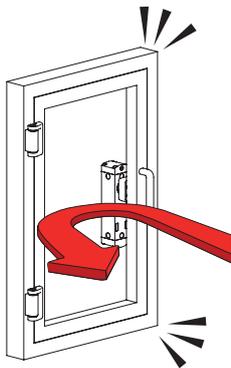
As the LEDs have been designed for quick immediate diagnosis, the status of each input and output is highlighted by one specific LED. This makes it possible to quickly identify the interruption points in the safety chain, which device is released, which guard is opened and any errors inside the device.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

### Holding force of the unlocked actuator



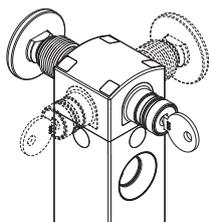
The inside of each switch features a device which holds the actuator in its closed position. Ideal for all those applications where several guards are unlocked simultaneously, but only one is actually opened. The device keeps all the unlocked guards in their position with a retaining force of approx.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

### 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.

### 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.

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### Three safety output actuation modes

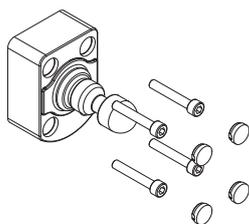
#### MODE 1 MODE 2 MODE 3

The device is available with 3 different actuation modes for safety outputs:

- 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;

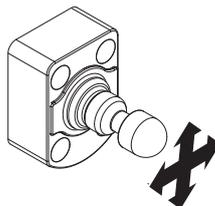
- mode 3: a first safety output active with actuator inserted and locked and a second safety output active with actuator inserted, for special applications.

### 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

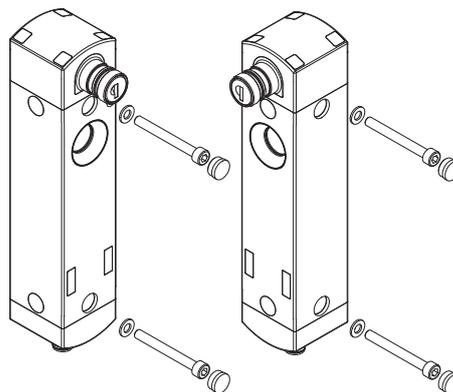


All NS series actuators are articulated, thereby allowing the actuator pin to be safely guided into the switch through the centring hole. As a result, the actuator and switch do not need to be precisely aligned during installation. In addition, the device can thereby be used on guards with a minimum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

### 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

# IP69K IP67

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).

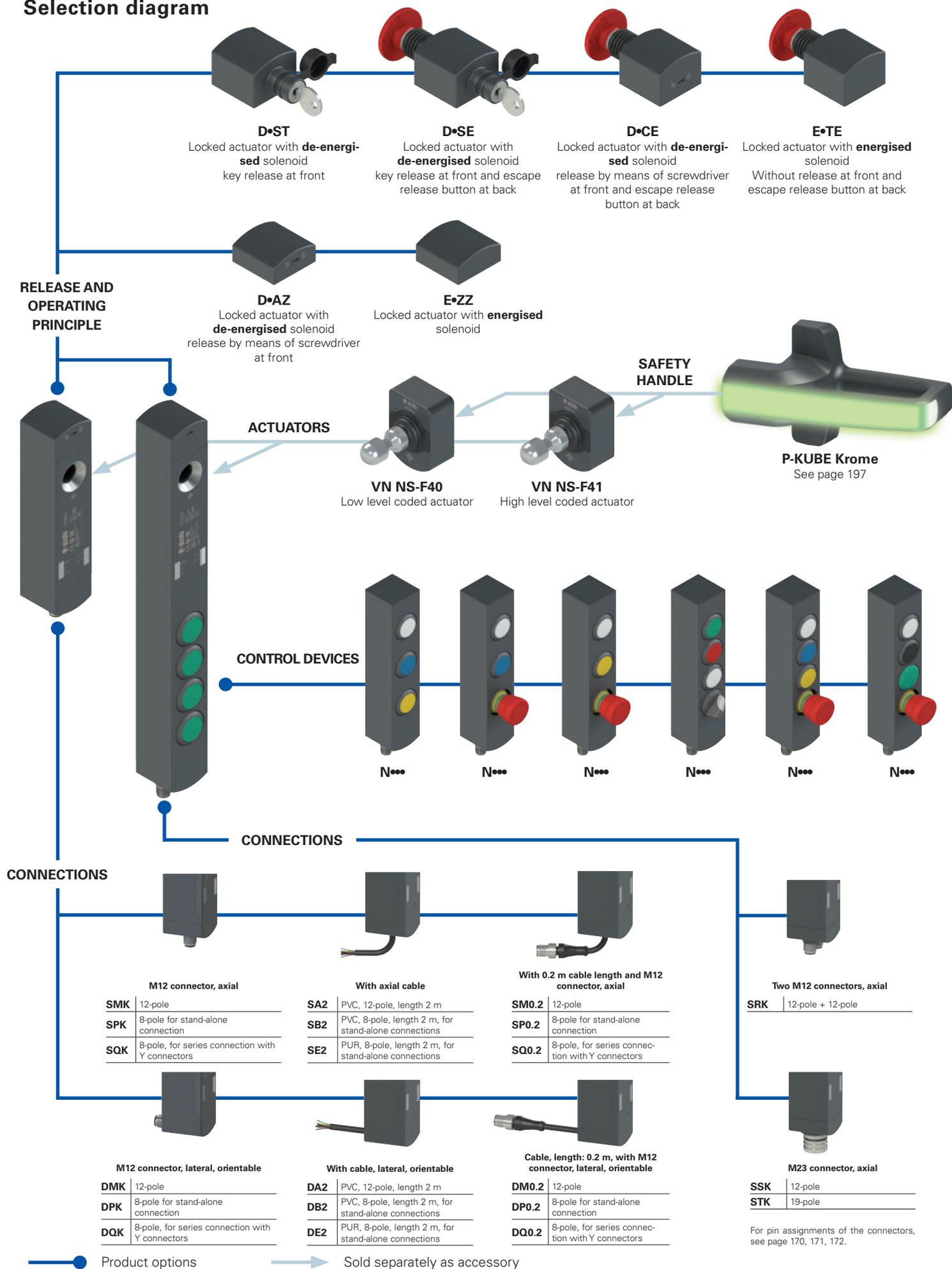
### External device monitoring

# EDM

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.

## Selection diagram





### Code structure

**Attention!** The feasibility of a code number does not mean the effective availability of a product. Please contact our sales office.

article options

# NS D4AZ1SMK-F41N001E36LP30VS01

#### Operating principle

<b>D</b>	locked actuator with de-energised solenoid, mode 1
<b>E</b>	locked actuator with energised solenoid, mode 1
<b>G</b>	locked actuator with de-energised solenoid, mode 2
<b>H</b>	locked actuator with energised solenoid, mode 2
<b>L</b>	locked actuator with de-energised solenoid, mode 3
<b>M</b>	locked actuator with energised solenoid, mode 3

#### Inputs and outputs

<b>3</b>	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
<b>4</b>	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
<b>5</b>	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

#### Auxiliary release at front and back

<b>AZ</b>	release by means of screwdriver at front <sup>(1)</sup>
<b>ST</b>	key release at front <sup>(1)</sup>
<b>SE</b>	key release at front and escape release button at back <sup>(1)</sup>
<b>CE</b>	release by means of screwdriver at front and escape release button at back <sup>(1)</sup>
<b>ZZ</b>	without release <sup>(2)</sup>
<b>TE</b>	Without release at front and escape release button at back <sup>(2)</sup>

<sup>(1)</sup> only available for operating principle D, G and L  
<sup>(2)</sup> only available for operating principle E, H and M

#### Output direction, connections

<b>D</b>	cable or connector, lateral
<b>S</b>	cable or connector, axial

### Code structure for actuator

## VN NS-F40

#### Actuator

<b>F40</b>	low level coded actuator the switch recognises any type F40 actuator
<b>F41</b>	high level coded actuator the switch recognises one single type F41 actuator

#### Software versions <sup>(1)</sup>

<b>VS01</b>	O4: fault signalling output
<b>VS02</b>	O3: inverted signalling output O4: inverted signalling output
<b>VS03</b>	O3: fault signalling output
<b>VS04</b>	O3: generates a voltage dip (0.2ms) when the device is blocked

<sup>(1)</sup> Available for non-safety inputs and outputs only.

#### Release button length

	for max. 15 mm wall thickness (standard)
<b>LP30</b>	for max. 30 mm wall thickness
<b>LP40</b>	for max. 40 mm wall thickness
<b>LP50</b>	for max. 50 mm wall thickness

#### Actuator extraction force

	actuator extraction force 20 N (standard)
<b>E36</b>	actuator freely removable
<b>E37</b>	actuator extraction force 40 N

#### Button configurations

<b>N001</b>	configuration 001
<b>N002</b>	configuration 002
<b>N002</b>	configuration 003
...	other configurations on request

#### Actuator

<b>F40</b>	low level coded actuator VN NS-F40 the switch recognises any type F40 actuator
<b>F41</b>	high level coded actuator VN NS-F41 the switch recognises one single type F41 actuator

#### Connection type

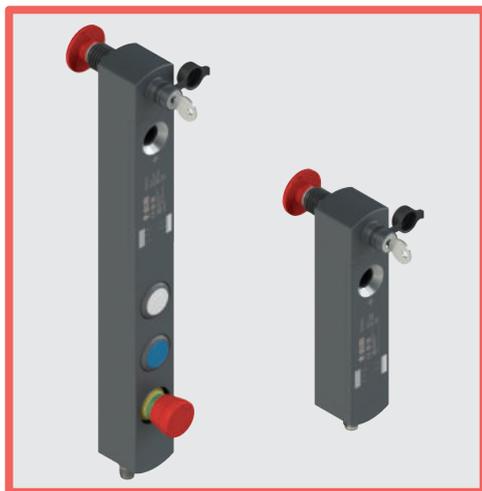
<b>K</b>	integrated connector (standard)
<b>0.2</b>	cable, length: 0.2 m, with M12 connector
<b>2</b>	cable, length: 2 m (standard)
...	.....
<b>10</b>	cable, length: 10 m

#### Cable or connector type

<b>A</b>	PVC cable 12x0.14 mm <sup>2</sup> (standard)
<b>B</b>	PVC cable 8x0.34 mm <sup>2</sup> , for stand-alone connections <sup>(1)</sup>
<b>E</b>	PUR cable, halogen-free, 8x0.34 mm <sup>2</sup> , for stand-alone connections <sup>(1)</sup>
<b>M</b>	M12 connector, 12-pole (standard)
<b>P</b>	M12 connector, 8-pole, for stand-alone connections <sup>(1)</sup>
<b>Q</b>	M12 connector, 8-pole, for series connection with Y connectors <sup>(2)</sup>
<b>R</b>	two M12 connectors (12-pole + 12-pole) <sup>(3)</sup>
<b>S</b>	M23 connector, 12-pole <sup>(3)</sup>
<b>T</b>	M23 connector, 19-pole <sup>(3)</sup>

<sup>(1)</sup> without inputs IS1, IS2, I5 and without output O4  
<sup>(2)</sup> without inputs IE2, I3, I5 and without output O3  
<sup>(3)</sup> only for items with integrated control devices

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



### 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 degree up to IP67 and IP69K
- 6 signalling LEDs

### Quality marks:



EC type examination certificate: M6A0751570029  
 UL approval: E131787  
 TÜV SÜD approval: Z10 075157 0025  
 EAC approval: RU C-IT.VT03.B.00035/19

### In compliance with standards:

EN ISO 14119, EN 60947-5-3, EN 60947-1, EN 60204-1, EN ISO 12100, EN 60529, EN 61000-6-2, EN 61000-6-3, EN 61508-1, EN 61508-2, EN 61508-3, EN ISO 13849-1, EN ISO 13849-2, EN 62061, EN 61326-1, EN 61326-3-1, EN IEC 63000, ETSI 301 489-1, ETSI 301 489-3, ETSI 300 330-2, UL 508, CSA 22.2 No.14

### Compliance with the requirements of:

Machinery Directive 2006/42/EC, EMC Directive 2014/30/EC, RED Directive 2014/53/EU, RoHS directive 2011/65/EU, FCC Part 15.

### Features approved by UL

Electrical ratings: 24 Vdc Class 2, 0,25 A (versions without control devices), 0,3 A (versions with control devices).  
 Input Supplied by 24 Vdc, Class 2 Source or limited voltage limited energy  
 Input NS side: 24 Vdc, 0,15 A. Input BN side: 24 Vdc, 0,048 A max. (maximum four leds).  
 Output NS side: 2 output 24 Vdc, 0,25 A plus 2 output 24 Vdc, 0,1 A. Output BN side: 24 Vac/dc Class 2 0,25 A Pilot Duty (maximum four actuators, with maximum six contacts, NO or NC or both) or 0,18 A Pilot Duty (maximum four actuators, with maximum eight contacts, NO or NC or both)  
 Environmental ratings: Types 1, 4X, 12, 13 (versions without control devices), Type 1 (versions with control devices).

### Features approved by TÜV SÜD

Protection degree: IP67, IP69K  
 Ambient temperature: -20°C...+50°C  
 PL, category: Cat 2 / 4, PL d / e  
 SIL: SIL 2/3, SIL CL 2/3  
 In compliance with standards: EN 60947-5-3:2013, EN 61508-1:2010 (SIL 2 / 3), EN 61508-2:2010 (SIL 2 / 3), EN 61508-3:2010 (SIL 2 / 3), EN ISO 14119:2013, EN 62061:2015/A2:2015 (SIL CL 2 / 3), EN ISO 13849-1:2015 (Cat. 2 / 4, PL d / e).  
 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 12x0.14 mm<sup>2</sup> or 8x0.34 mm<sup>2</sup> 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)  
 IP65 acc. to EN 60529

Protection degree with control devices:

### General data

Safety parameters	SIL	PL	Cat.	DC	PFH <sub>0</sub>	MTTF <sub>0</sub>
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: actuator locked - Mode 3	2	d	2	High	1.50E-09	2627
Monitoring function: actuator present - Mode 3	2	d	2	High	1.49E-09	3987
Dual-channel control for locking function of the actuator	3	e	4	High	2.04E-10	2254
Single-channel control for locking function of the actuator	2	d	2	High	2.04E-10	2254

Interlock, no contact, coded, with guard locking: type 4 acc. to EN ISO 14119  
 Level of coding acc. to EN ISO 14119: low with F40 actuator  
 High with F41 actuator

Mission time: 20 years  
 Ambient temperature: -20°C ... +50°C  
 Max. actuation frequency with actuator lock and release: 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  $F_{1max}$ : 2100 N acc. to EN ISO 14119  
 Max. holding force  $F_{Zh}$ : 1615 N acc. to EN ISO 14119  
 Maximum clearance of locked actuator: 4 mm  
 Released actuator extraction force: ~ 20 N

### Power supply electrical data

Rated operating voltage  $U_e$  SELV: 24 Vdc  $\pm$  10%  
 Operating current at  $U_e$  voltage: 40 mA min.; 0.4 A max. with activated solenoid; 1.2 A with activated solenoid and all outputs at maximum power

Rated insulation voltage  $U_i$ : 32 Vdc  
 Rated impulse withstand voltage  $U_{imp}$ : 1.5 kV  
 External protection fuse: type gG fuse 2 A or equivalent device III  
 Overvoltage category: III  
 Electrical endurance: 1 million operating cycles  
 Solenoid duty cycle: 100% ED (continuous operation)  
 Solenoid consumption: 9 W max.  
 Pollution degree: 3 acc. to EN 60947-1

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

Rated operating voltage  $U_{e1}$ : 24 Vdc  
 Rated current consumption  $I_{e1}$ : 5 mA

### Electrical data of OS1/OS2 safety outputs

Rated operating voltage  $U_{e2}$ : 24 Vdc  
 Output type: PNP type OSSD  
 Maximum current per output  $I_{e2}$ : 0.25 A  
 Minimum current per output  $I_{m2}$ : 0.5 mA  
 Thermal current  $I_{th2}$ : 0.25 A  
 Utilization category: DC13;  $U_{e2}$ =24 Vdc,  $I_{e2}$ =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  $\mu$ s  
 Permissible maximum capacitance between outputs: < 200 nF  
 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  
 Activation time upon unlocking the actuator: typically 7 ms, max. 12 ms  
 Activation time upon removal of the actuator: typically 120 ms, max. 200 ms  
 Maximum delay for EDM status change: 500 ms

### Electrical data of O3/O4 signalling outputs

Rated operating voltage  $U_{e3}$ : 24 Vdc  
 Output type: PNP  
 Maximum current per output  $I_{e3}$ : 0.1 A  
 Utilization category: DC13;  $U_{e3}$ =24 Vdc,  $I_{e3}$ =0.1 A  
 Short circuit detection: No  
 Overcurrent protection: Yes  
 Internal self-resettable protection fuse: 1.1 A

### RFID sensor data

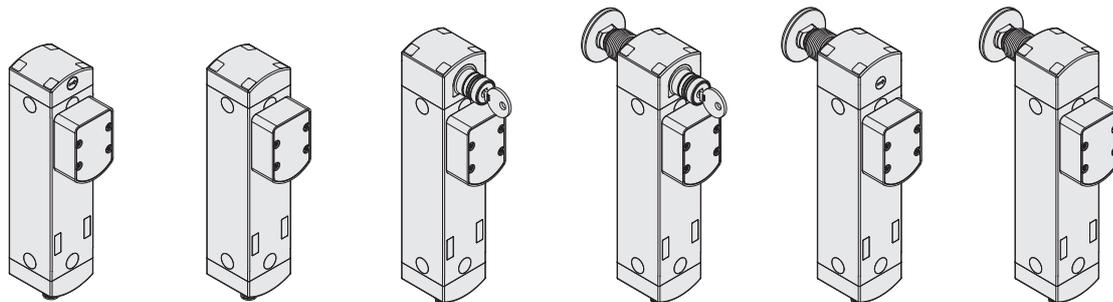
Assured operating distance  $S_{ao}$ : 2 mm  
 Assured release distance  $S_{ar}$ : 6 mm (actuator not locked)  
 10 mm (actuator locked)  
 Rated operating distance  $S_n$ : 3 mm  
 Repeat accuracy:  $\leq$  10 %  $s_n$   
 Differential travel:  $\leq$  20 %  $s_n$   
 RFID transponder frequency: 125 kHz  
 Max. switching frequency: 1 Hz



### Actuation mode of the OS1 and OS2 safety outputs

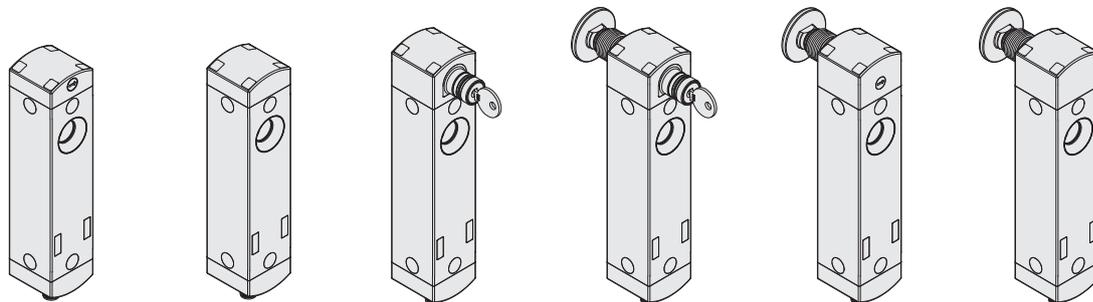
Mode 1	Mode 2	Mode 3
Safety outputs OS1 and OS2 are active when the actuator is inserted and locked.	Safety outputs OS1 and OS2 are active when the actuator is inserted.	Safety output OS1 is active when the actuator is inserted and locked and IS1 is active. Safety output OS2 is active when the actuator is inserted and IS2 is active.
In case of machines with or without inertia of the dangerous elements. Safety category of the safety outputs: PL e, SIL 3.	In case of machines without inertia of the dangerous elements. Safety category of the safety outputs: PL e, SIL 3.	In case of machines with or without inertia of the dangerous elements. Safety category of the safety outputs: PL d, SIL 2.

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



Operating principle	Locked actuator with de-energised solenoid. With screwdriver release	Locked actuator with energised solenoid	Locked actuator with de-energised solenoid. With key release	Locked actuator with de-energised solenoid. With key release and escape release button	Locked actuator with de-energised solenoid. With screwdriver release and escape release button	Locked actuator with energised solenoid. With escape release button
Mode 1	NS D4AZ1SMK-F41	NS E4ZZ1SMK-F41	NS D4ST1SMK-F41	NS D4SE1SMK-F41	NS D4CE1SMK-F41	NS E4TE1SMK-F41
Mode 2	NS G4AZ1SMK-F41	NS H4ZZ1SMK-F41	NS G4ST1SMK-F41	NS G4SE1SMK-F41	NS G4CE1SMK-F41	NS H4TE1SMK-F41
Mode 3	NS L4AZ1SMK-F41	NS M4ZZ1SMK-F41	NS L4ST1SMK-F41	NS L4SE1SMK-F41	NS L4CE1SMK-F41	NS M4TE1SMK-F41

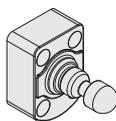
### Selection table for switches



Operating principle	Locked actuator with de-energised solenoid. With screwdriver release	Locked actuator with energised solenoid	Locked actuator with de-energised solenoid. With key release	Locked actuator with de-energised solenoid. With key release and escape release button	Locked actuator with de-energised solenoid. With screwdriver release and escape release button	Locked actuator with energised solenoid. With escape release button
Mode 1	NS D4AZ1SMK	NS E4ZZ1SMK	NS D4ST1SMK	NS D4SE1SMK	NS D4CE1SMK	NS E4TE1SMK
Mode 2	NS G4AZ1SMK	NS H4ZZ1SMK	NS G4ST1SMK	NS G4SE1SMK	NS G4CE1SMK	NS H4TE1SMK
Mode 3	NS L4AZ1SMK	NS M4ZZ1SMK	NS L4ST1SMK	NS L4SE1SMK	NS L4CE1SMK	NS M4TE1SMK

**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

### Selection table for actuators

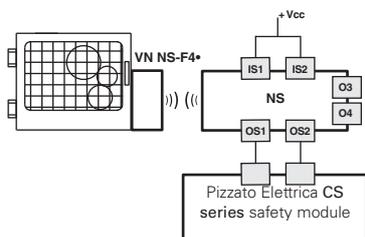


The use of RFID technology in NS series devices makes them suitable for several applications. Pizzato Elettrica offers two different versions of actuators, in order to best suit customers' specific needs. Type F40 actuators are all encoded with the same code. This implies that a device associated with 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.

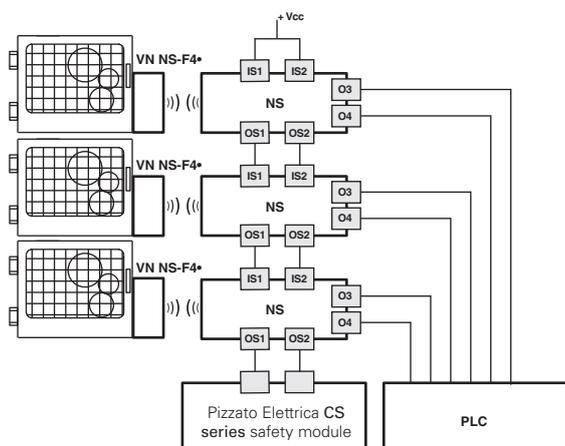
Level of coding acc. to EN ISO 14119	Article
low	VN NS-F40
high	VN NS-F41

## Complete safety system

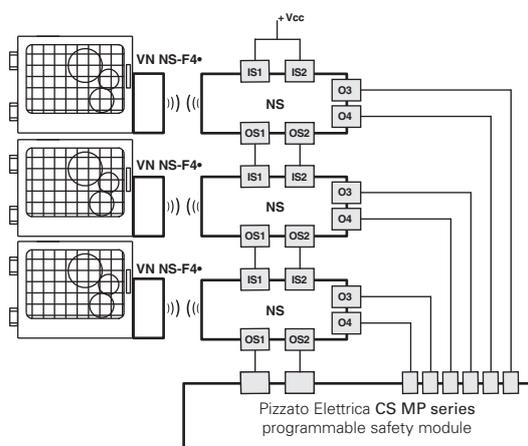
The use of complete and tested solutions guarantees the electrical compatibility between the NS series switches and the safety modules from Pizzato Elettrica, as well as high reliability. The switches have been tested with the modules listed in the adjacent table.



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).



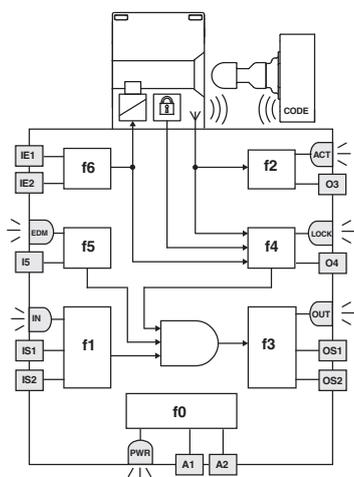
Possibility of series connection of multiple switches for simplifying the wiring of the safety system, whereby only the outputs of the last switch are evaluated by a Pizzato Elettrica safety module (see table with compatible safety modules). Each NS series switch is provided with two signalling outputs 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.



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●●●.

## Internal block diagram



LED	Function
<b>PWR</b>	Power supply / self-diagnosis
<b>IN</b>	status of safety inputs
<b>OUT</b>	status of safety outputs
<b>ACT</b>	actuator state
<b>LOCK</b>	actuator locked
<b>EDM</b>	state of EDM inputs (NS ●5●●1●●●)

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	Compatible safety modules	Safety module output contacts		
		Instantaneous safety contacts	Delayed safety contacts	Signalling contacts
NS ●●●●1●●●	CS AR-05●●●●	3NO	/	1NC
	CS AR-06●●●●	3NO	/	1NC
	CS AR-08●●●●	2NO	/	/
	CS AT-0●●●●●	2NO	2NO	1NC
	CS AT-1●●●●●	3NO	2NO	/
	CS MP●●●●●●	see page 309		
	CS MF●●●●●●	see page 341		

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 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.

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

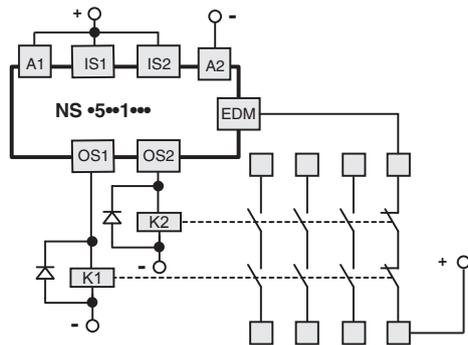
In contrast to the above mode 2 description, the safety outputs OS1 and OS2 are activated when the actuator is detected, and deactivated when the actuator is no longer detectable, in mode 3, the OS1 safety output is active with inserted and locked actuator and IS1 active, the OS2 safety output is active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

### Operating states

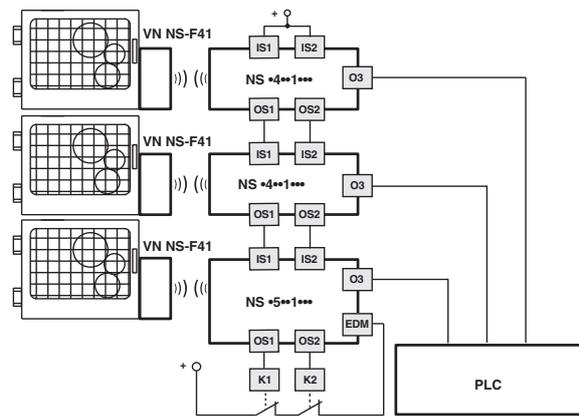
PWR LED	IN LED	OUT LED	ACT LED	LOCK LED	EDM LED (a)	Device state	Description
○	○	○	○	○	○	OFF	Device switched off.
●	●	●	●	●	●	POWER ON	Internal tests upon activation.
●	○	○	*	*	●	RUN	Safety inputs of the device not active.
●	●	*	*	*	*	RUN	Activation of safety inputs.
●	●	○	*	*	*	RUN	Safety inputs incoherence.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

Legend:  
 ○ = off  
 ● = on  
 ● = blinking  
 ● = changing colours  
 \* = indifferent  
 (a) Available for NS ●5●1●●● versions only

## 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 299). This check is carried out via the EDM input (External Device Monitoring as defined in EN 61496-1) of the switch.



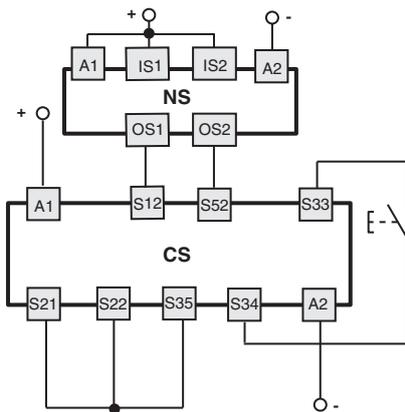
This version, with the IS safety inputs, **can be used at the end of a series** of NS switches, **up to a maximum number of 32 devices**, while maintaining the maximum PL e safety level and acc. to EN ISO 13849-1 and SIL 3 safety level acc. to EN 62061. This solution allows you to dispense with the safety 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

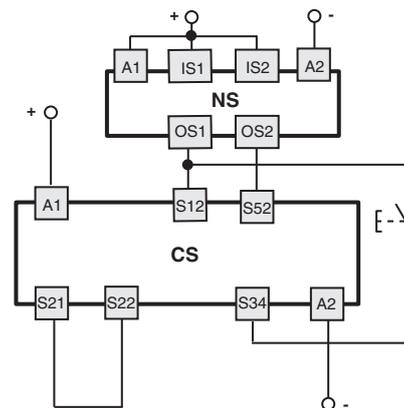
2 channels / Category 4 / up to SIL 3 / PL e



Connections with CS AR-05•••• / CS AR-06•••• safety modules

Input configuration with manual start (CS AR-05••••) or monitored start (CS AR-06••••)

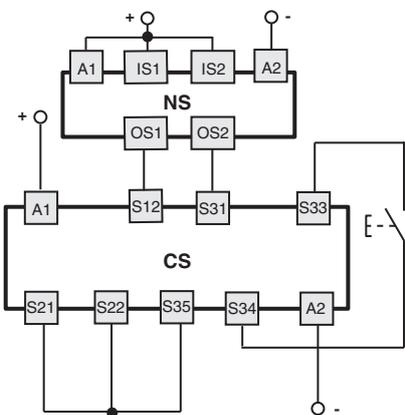
2 channels / Category 4 / up to SIL 3 / PL e



Connections with CS AT-0••••• / CS AT-1••••• safety modules

Input configuration with monitored start

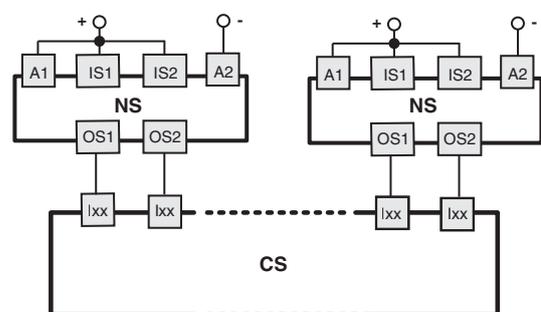
2 channels / Category 4 / up to SIL 3 / PL e



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



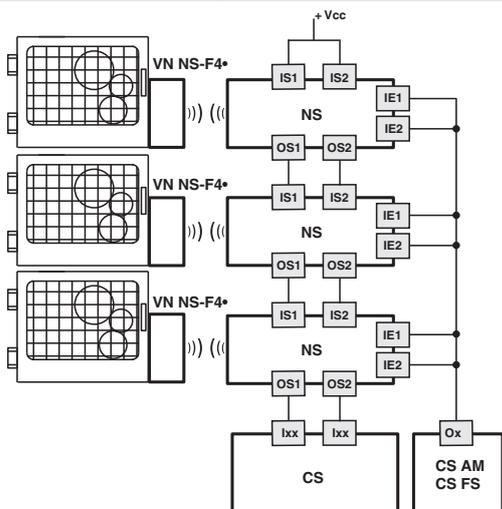
Application example on page 307.



### Series connection of several switches

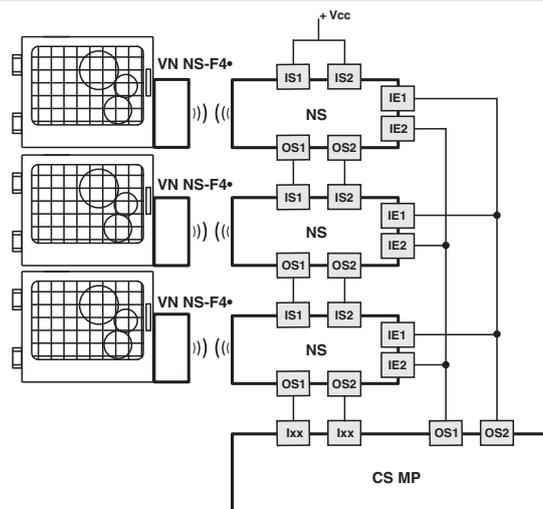
Monitoring function: actuator locked  
2 channels / Category 4 / up to SIL 3 / PL e

Single-channel control for locking function of the actuator  
1 channel / Category 2 / up to SIL 2 / PL d



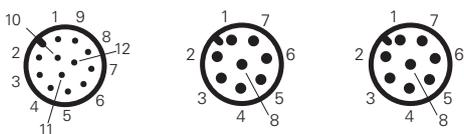
Monitoring function: actuator locked  
2 channels / Category 4 / up to SIL 3 / PL e

Dual-channel control for locking function of the actuator  
2 channels / Category 4 / up to SIL 3 / PL e



### Safety switch internal connections

Versions with connector			Versions with cable		Connection
NS *****M* M12 connector, 12-pole	NS *****P* M12 connector, 8-pole stand-alone connection	NS *****Q* M12 connector, 8-pole series connection with "Y" connectors	NS *****A* Cable 12x0.14 mm <sup>2</sup> outer diameter 6 mm	NS *****B*, NS *****C* Cable 8x0.34 mm <sup>2</sup> outer diameter 7 mm	
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	I3 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	/	I5 EDM input (a)
4	4	4	Green	Red-White	OS1 Safety output
7	7	7	Black	Black-White	OS2 Safety output



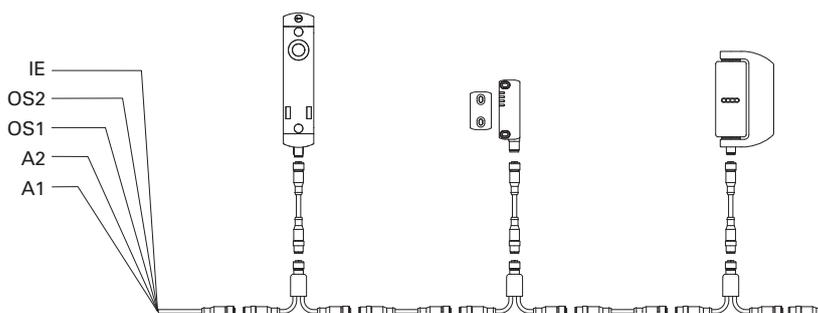
(a) Available for NS •5••1••• version only  
(b) Available for 8-pole connector, not available for the end of a chain with Y connectors.

### Series connection

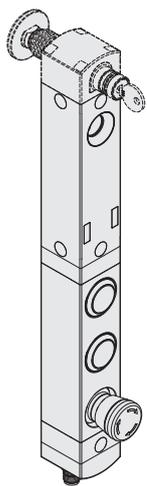
To simplify series connections of the devices, various M12 connectors are available that allow complete wiring.

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 366.



## Switch with integrated control device unit for 3 devices



NS .....SRK-N001			NS .....SRK-N002			NS .....STK-N003					
	Description	Colour	Diagram		Description	Colour	Diagram		Description	Colour	Diagram
Device 1	Illuminated button, spring-return 1NO	white		Device 1	Illuminated button, spring-return 1NO	white		Device 1	Illuminated button, spring-return 1NO	white	
Device 2	Illuminated button, spring-return 1NO	blue		Device 2	Illuminated button, spring-return 1NO	blue		Device 2	Spring-return button 1NO	black	
Device 3	Illuminated button, spring-return 1NO	yellow		Device 3	Emergency stop button with rotary release 2NC	red		Device 3	Emergency stop button with rotary release 2NC	red	
Connector	2x M12, 12-pole, axial	/		Connector	2x M12, 12-pole, axial	/		Connector	M23, 19-pole, axial	/	

## Internal connections (versions with integrated control device unit for 3 devices)

Connection		NS .....SRK-N001	NS .....SRK-N002	NS .....STK-N003	
Safety switch	A1	Supply input +24 Vdc	A1	A1	
	A2	Supply input 0 Vdc	A2	A3	
	IS1	Safety input	IS1	A2	
	OS1	Safety output	OS1	A4	
	IS2	Safety input	IS2	A6	
	OS2	Safety output	OS2	A7	
	IE1	Solenoid activation input for double channel mode <sup>(b)</sup>	IE1	A10	
	IE2	Solenoid activation input for double channel mode <sup>(b)</sup>	IE2	A12	
	O3	Signalling output, actuator inserted	O3	A5	
	O4	Signalling output, actuator inserted and locked	O4	A9	
	I3	Actuator programming input / reset	I3	A8	
	I5	EDM input <sup>(a)</sup>	I5	A11	
	I4	Solenoid activation input for single channel mode <sup>(c)</sup>			I4

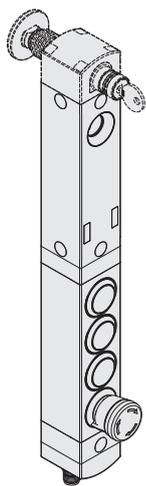
  

Terminal	NS .....SRK-N001	NS .....SRK-N002	NS .....STK-N003
A1	A1	A1	6
A2	A3	A3	19
IS1	A2	A2	2
OS1	A4	A4	4
IS2	A6	A6	3
OS2	A7	A7	5
IE1	A10	A10	
IE2	A12	A12	
O3	A5	A5	8
O4	A9	A9	9
I3	A8	A8	7
I5	A11	A11	
B1	B1	B1	12
B4	B4	B4	17
B5	B5	B5	15
B7	B7	B7	
B8	B8	B8	
B9	B9	B9	10
B10	B10	B10	11
B11	B11	B11	13
B2	B2	B2	14
B6	B6	B6	18
B12	B12	B12	16
B3	B3	B3	

(a) Available for NS •5•1•••-N••• version only  
(b) For versions with double M12 connector, 12-pole  
(c) For versions with M23 connector, 19-pole



### Switch with integrated control device unit for 4 devices

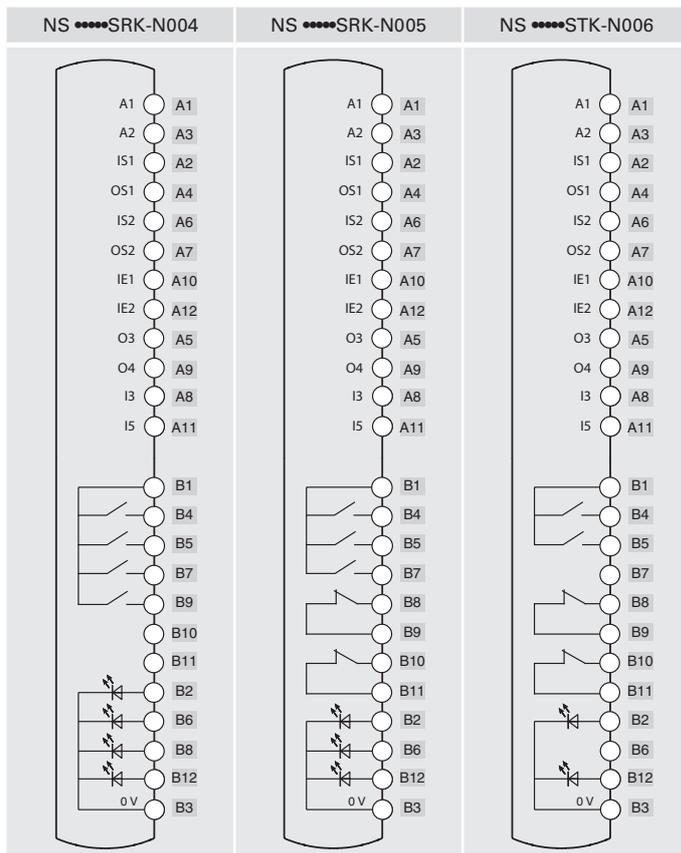


NS .....SRK-N004				NS .....SRK-N005				NS .....SRK-N006			
	Description	Colour	Diagram		Description	Colour	Diagram		Description	Colour	Diagram
Device 1	Illuminated button, spring-return 1NO	green		Device 1	Illuminated button, spring-return 1NO	white		Device 1	Illuminated button, spring-return 1NO	white	
Device 2	Illuminated button, spring-return 1NO	red		Device 2	Illuminated button, spring-return 1NO	blue		Device 2	Spring-return button 1NO	black	
Device 3	Illuminated button, spring-return 1NO	white		Device 3	Illuminated button, spring-return 1NO	yellow		Device 3	Indicator light	green	
Device 4	Illuminated 2-position selector switch 1NO	black		Device 4	Emergency stop button with rotary release 2NC	red		Device 4	Emergency stop button with rotary release 2NC	red	
Connector	2x M12, 12-pole, axial	/		Connector	2x M12, 12-pole, axial	/		Connector	2x M12, 12-pole, axial	/	

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

	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)

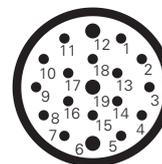
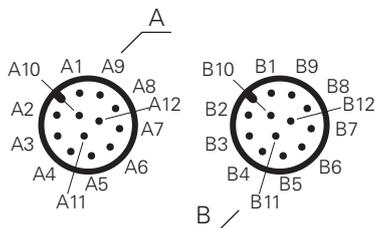
(a) Available for NS •5••1•••-N••• version only



### Electrical connector configurations

Two M12 connectors, 12-pole

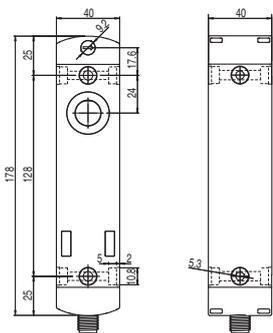
M23 connector, 19-pole



## Dimensional drawings

## Device

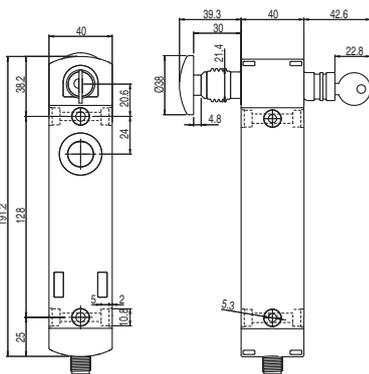
NS ••AZ••MK  
NS ••ZZ••MK



## Device

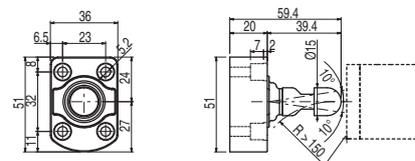
NS ••ST••MK  
NS ••SE••MK

NS ••CE••MK  
NS ••TE••MK



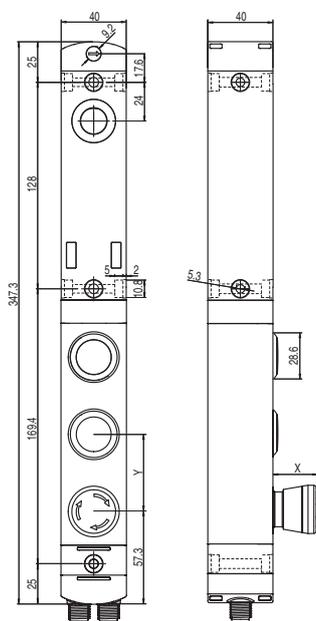
## Actuator

VN NS-F4•



## Device

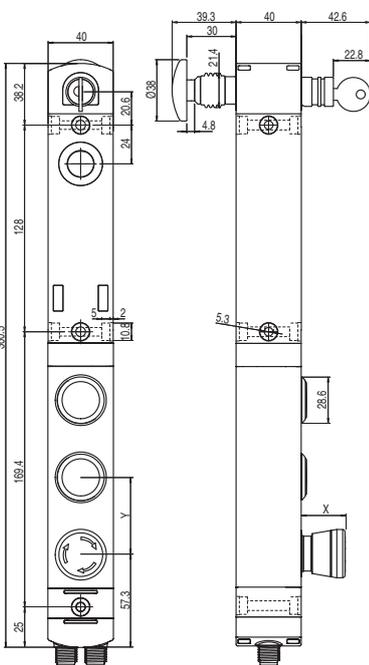
NS ••AZ•S•K-N•••  
NS ••ZZ•S•K-N•••



## Device

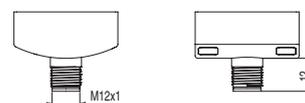
NS ••ST•S•K-N•••  
NS ••SE•S•K-N•••

NS ••CE•S•K-N•••  
NS ••TE•S•K-N•••

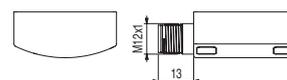


## Output type

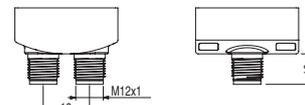
## M12 connector, axial



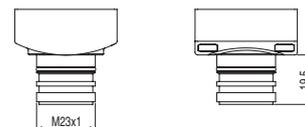
## M12 connector, lateral



## Two M12 connectors, axial



## M23 connector, axial

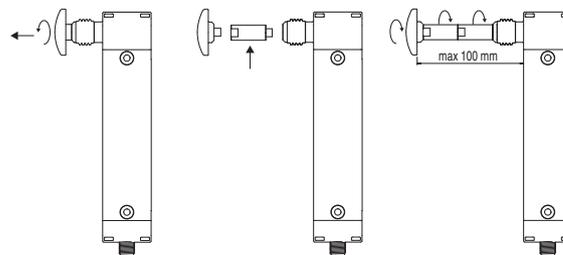


X = see page 174,

Y = 47.5 mm (versions with 3 buttons); Y = 31.7 mm (versions with 4 buttons)

## Extensions for release button

Article	Description	Drawing
VN NG-LP30	Metal extension for release button. For max. wall thickness of 30 mm	
VN NG-LP40	Metal extension for release button. For max. wall thickness of 40 mm	
VN NG-LP50	Metal extension for release button. For max. wall thickness of 50 mm	
VN NG-LP60	Metal extension for release button. For max. wall thickness of 60 mm	
VN NG-ERB	Red metal release button	



- 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

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



## Available integrated devices

	Description, colour and options	Article	Combinable with contacts	Protrusion (x) mm
	<b>Illuminated button, spring-return</b>			
	White	VN NG-AC26005		3
	Red	VN NG-AC26001	1NO	
	Green	VN NG-AC26003	2NO	
	Yellow	VN NG-AC26002	1NO+1NC	
Blue	VN NG-AC26004			
	<b>Button, not illuminated, spring-return</b>			
	Black	VN NG-AC26007	1NO 2NO 1NO+1NC	3
	<b>Indicator light</b>			
	White	VN NG-AC26064	/	2.7
	Red	VN NG-AC26060		
	Green	VN NG-AC26062		
	<b>Emergency stop button acc. to. EN ISO 13850</b>			
	Red, rotary release	VN NG-AC26052	2NC	26.4
	Red, push-pull release			
	VN NG-AC26055			
	<b>Illuminated selector switch with handle, with transparent lens for LED</b>			
	Black	VN NG-AC26033	1NO	16.8
	Black	VN NG-AC26034	2NO	
Black		1NO+1NC		
	<b>Key selector switch, 2 positions</b>			
	Black	VN NG-AC26040	1NO	39 (a)
	Black	VN NG-AC26043	2NO 1NO+1NC	14 (b)
	<b>Closing cap</b>			
	Black	VN NG-AC26090	/	0
	<b>Fixing key</b>			
	Black	VN NG-AC26080	/	/

**Legend:** Maintained Spring-return Key extraction position  
(a) with key (b) without key

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
	30,000 operating cycles including removal of the key
Safety parameter B <sub>10D</sub> :	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 I <sub>th</sub> :	1 A
Rated insulation voltage U <sub>i</sub> :	32 Vac/dc
Rated impulse withstand voltage U <sub>imp</sub> :	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
U <sub>e</sub> (V) 24
I <sub>e</sub> (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 60947-5-1.

## Electrical data of M12 connector:

Max. operating voltage:	32 Vac/dc
Max. operating current:	1.5 A max.

## Electrical data of M23 connector:

Max. operating voltage:	32 Vac/dc
Max. operating current:	3 A max.

## Accessories

Article	Description
VF KLB300	Set of two locking keys
	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

Article	Description
LK S1D001	Lock out device, mounting on the right side of the switch
LK S1S001	Lock out device, mounting on the left side of the switch
	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.