

# Solenoid Locking Key Operated Safety Switches FS



Safety interlock switches with guard locking requiring an internal solenoid to be energised before the guard can be opened

- Alternative version available with de-energise to release
- Holds guard shut until dangerous condition has ceased
- Machine cannot start until guard is closed and locked
- Can be used in conjunction with externally mounted timers or standstill monitors to detect that hazardous movement has stopped
- Suitable for the protection of hinged, sliding and lift-off guards
- Choice of stainless steel keys: right angle, flat, flexible and adjustable flexible
- Can be operated only by one of the keys provided, not by screwdrivers, fingers, etc
- Positive break of NC safety contacts according to BS EN60947-5-1, VDE 0660 part 206 and IEC 337-1
- Available with a wide choice of contact block configurations
- Rotatable head gives 8 possible key entry positions
- IP66
- Conforms to BS EN60204-1 and BS EN1088
- UL and CUL approved



**24VAC/DC solenoid as standard**  
**Other solenoid voltages available soon**  
**Please contact IMO for details**

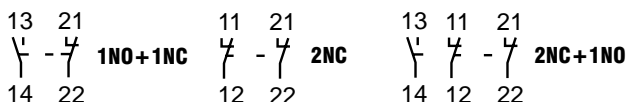
## Options and ordering codes

<b>FS</b>	<b>6</b>	<b>96-D</b>	<b>24</b>	-	<b>F</b>
Heavy duty plastic housing with 3 conduit entries			24 VAC/DC solenoid		
1NC safety contact + 1NO auxiliary contact	<b>6</b>				<b>F</b> Flat key
2NC safety contacts	<b>9</b>				<b>F1</b> 90° key
2NC safety contacts + 1NO auxiliary contact	<b>20</b>				<b>F2</b> Flexible key
3NC safety contacts	<b>21</b>				<b>F3</b> Adjustable flexible key
1NC safety contact + 2NO auxiliary contacts	<b>22</b>				
Locking by de-energising solenoid		<b>96-D</b>			
Locking by energising solenoid*		<b>96-E</b>			

\* The locking by energising the solenoid version should be used only in special cases after a strict risk analysis, as in the event of power failure to the solenoid, the guard can be opened immediately.

## Terminal connections

Contact arrangement with key inserted (guard closed).



- The safety circuit must be connected to the NC contacts.
- Terminal screws are M3.5 with rising cable clamps for ease of wiring.
- Terminal numbering in accordance with EN50013
- The maximum terminal screw torque is 0.8Nm (8kg cm).
- Fuse protection required against short-circuit in the safety circuit: 10A HRC quick-blow max.
- Plastic housing switches are double-insulated for electrical safety.
- Contact blocks are not removable due to interlocking with the positive break system.
- Three conduit entries PG13.5.



## Models conform to the following standards:

Low Voltage Directive 73/23/CEE, Directive 93/68/CEE, Machinery Directive 89/392/CEE, Directive 89/336/CEE

IEC 947-5-1, BS EN60947-5-1, CEI EN60947-5-1, IEC 204, BS EN60204, BS EN418, BS EN292 EN50081-1, EN50082-2, VDE 0113, IEC 337-1, BGGs-ET-19, VDE 0660, BS EN1088, EN954-1

Positive opening of the contacts in conformity with: VDE 0660-206, IEC 947-5-1, BS EN60947-5-1, CEI EN60947-5-1

**IP rating:** IP66

# Solenoid Locking Key Operated Safety Switches FS continued



## Specification

Rated thermal current I <sub>th</sub>	10A
Rated working contact voltage	500VAC/600VDC
Solenoid supply voltage	24VAC/DC
Solenoid inrush power	96VA for 0.1sec
Solenoid sealed power	4VA
Solenoid duty cycle	100%
Housing material	Heavy duty, impact resistant, self-extinguishing, glass-reinforced, thermoplastic resin
Mounting position	Any orientation
Mechanical life	>106 key operations
Maximum key operating speed	0.5m/sec
Minimum key operating speed	1mm/sec
Maximum solenoid operating frequency	1200 operations/hour
Conduit entries	3 x PG13.5
Key holding force	>1000N (100kg)
Protection degree	IP66
Ambient temperature	-20° to +60°C

## Function

The Solenoid Locking Key Operated Safety Switches are used on machinery where the hazard continues for generally longer times after the stop device of the machine has been operated, (longer than 20 seconds), or where the run down time varies, or where very frequent access to the dangerous areas is required, (e.g. the mechanical inertia of pulley wheels or circular saw blades or for temperature, pressure, etc.)

They are also used where the risk analysis shows that a higher integrity protection is required, or where unscheduled interruption of a machine process cycle could cause damage or further hazards.

The working principle assures that the electrical contacts can close only after the key is inserted and locked. Also, the key cannot be taken out if the contacts are still closed (guard locking).

When the key is unlocked and removed (guard open), the NC safety contacts are opened by the positive break mechanism.

These switches are available with two working principles:

### 1. Locking key by de-energising solenoid.

This version has a device to unlock the key during installation, or in the event of solenoid supply failure. This device should remain accessible after installation for use during power failures or during testing.

### 2. Locking key by energising solenoid.

This version should be used only in special cases after a strict risk analysis, as in the event of power failure to the solenoid, the guard can be opened immediately.

All models can be used in conjunction with externally mounted timers or standstill monitors to detect that hazardous movement has stopped.

Whichever system is used, it is essential that the key is unlocked only after the hazard has ceased.

After installation or inspection, it is advisable to seal the manual unlocking device screw by means of some drops of varnish.

## Power saving feature when using two or more switches

The FS0696 and FS0996 incorporate a device which can automatically 'stagger' the energisation of up to four models when they are simultaneously powered. This ensures that the power source does not have to supply the inrush VA of four switches at the same time, i.e. 384VA, but only the inrush of one switch plus the sealed VA of the remaining three, i.e. a total of 108 VA for every four switches. After the inrush, only 4VA per switch is required.

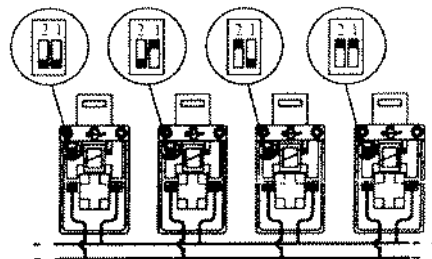
To program the switches, the power should be off, the terminal cover and the plastic protection cover inside should be removed, exposing the solenoid and two DIP switches.

The solenoid should not be moved and no dust, swarf or electrostatic discharge should come into contact with this area of the switch, even temporarily, as this could compromise its function.

The DIP switches should be set so that for every four FS0696 no two have the same DIP switch setting. For more than four FS0696 powered simultaneously, the DIP switch settings can repeat.

The solenoid and terminal covers should then be replaced.

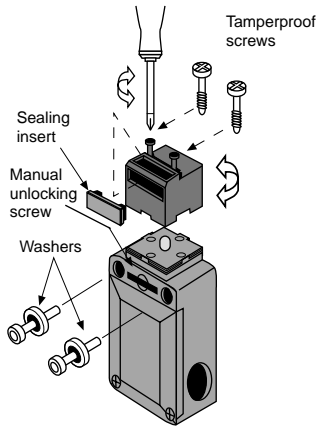
This feature enables a lower rating power supply to be used with a reduced cost and physical size.



# Solenoid Locking Key Operated Safety Switches FS continued

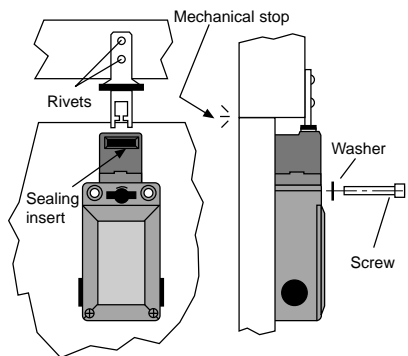


## Head options



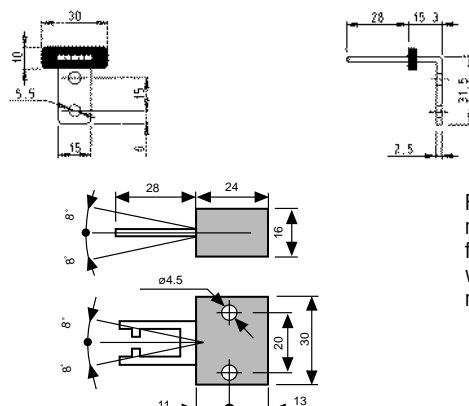
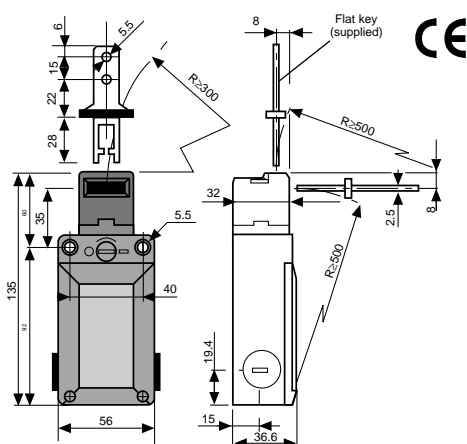
- Top and side entry points with sealing insert to cover the entry point not being used.
- The head is rotatable in 90° increments giving 8 possible key entry points: 4 from the top and 4 from the sides.
- The keys have sealing gaskets to ensure the mechanism is fully protected when the guard is closed.
- When the guard is not closed, ensure that dirt and swarf do not enter the exposed key entry point.
- Maximum head screw torque 0.8Nm (8kg cm).
- Mechanical life of the actuator head >106 operations.
- After adjusting the head to the required position, it is advisable to secure it with the 2 tamper-proof screws which are supplied inside the switch.

## General installation



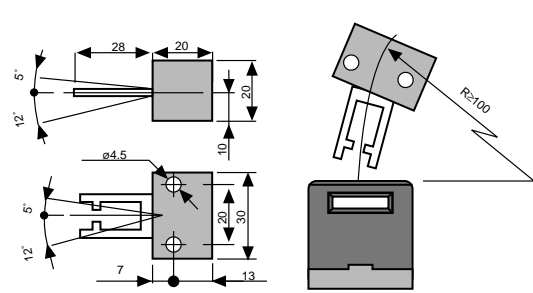
- Always use washers under the heads of the screws.
- The switch must never be used as a mechanical end stop.
- It is recommended in BS EN1088 that the key is fixed to the moving part with rivets.
- Verify repeatedly the correct operation of the switch. That is, when the machine is started, it must not be possible to open the guard. Also, it must not be possible to start the machine unless the guard is closed and locked.

## Dimensions (mm)



90° key supplied with 'F1' models

Flexible key supplied with 'F2' models. The tongue can flex in four directions for applications where the door alignment is not precise.



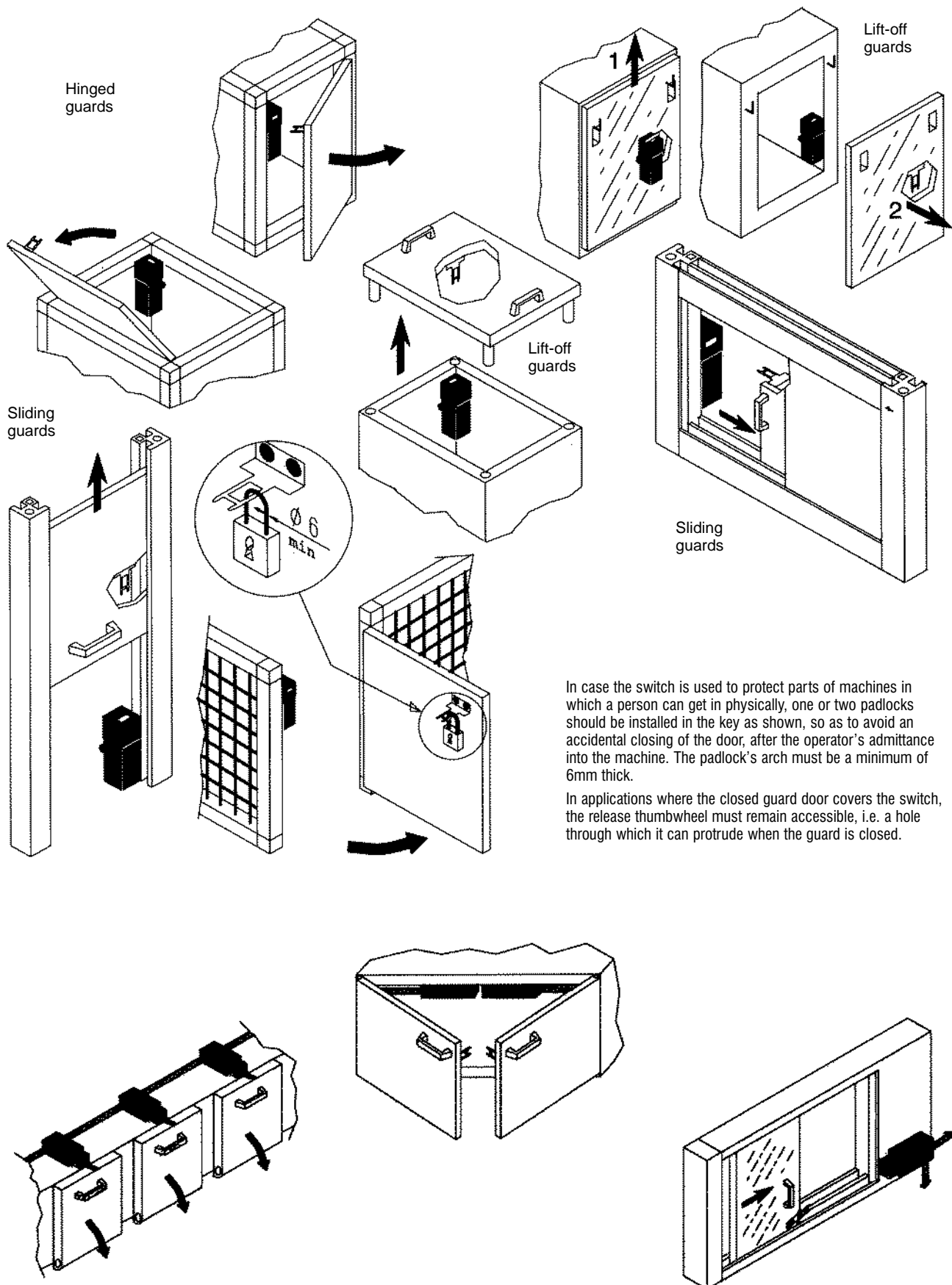
Adjustable, flexible key supplied with 'F3' models. The tongue can be adjusted in four directions for doors of small dimensions where the door radius is down to 100mm.

1NO	13	21	➔	FS 0696 – D24F
+	7	7		
1NC	14	22		
<hr/>				
2NC	11	21	➔	FS 0996 – D24F
	7	7		
	12	22		

# Solenoid Locking Key Operated Safety Switches FS continued



## Applications



In case the switch is used to protect parts of machines in which a person can get in physically, one or two padlocks should be installed in the key as shown, so as to avoid an accidental closing of the door, after the operator's admittance into the machine. The padlock's arch must be a minimum of 6mm thick.

In applications where the closed guard door covers the switch, the release thumbwheel must remain accessible, i.e. a hole through which it can protrude when the guard is closed.