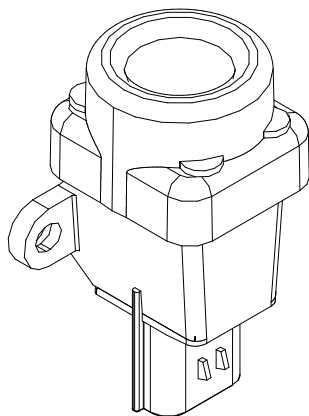


## **INERTIA SWITCH 'TYPE 505'**

### **Summary of characteristics and mounting instructions**



21068-B Outline

## **SPECIFICATION SUMMARY**

### **2. Application**

- 2.1 For use in motor vehicles where either a normally closed, normally open or change-over switch is required to be operated by acceleration stimuli such as those typical of vehicle collision conditions.
- 2.2 Suitable for mounting in the vehicle interior or certain under bonnet locations to a rigid body member. Electrical connection is by a sealed connector.
- 2.3 Typical applications for the normally closed (N.C.) circuit would be in series with the electric fuel pressurizing system or controlling relay and or the spark ignition system (low voltage circuit) or controlling relay.
- 2.4 Typical applications for the normally open (N.O.) circuit would be to initialize the release of electric door locks, illumination of hazard warning lamps, dashboard warning indicator or trigger a distress/emergency radio signal.

### **3. Principle of Operation**

- 3.1 A steel ball mounted in a conical seat is normally held at rest by the attractive force of an adjacent magnet.
- 3.2 Under specific acceleration loads the ball breaks free from the magnetic restraint and continues to move out of the conical seat in an upward motion dependent on the cone angle.
- 3.3 Positioned above the ball is a snap action mechanism, which forms the N.C. electrical circuit. When struck by the ball the mechanism changes state causing the N.C. circuit to open and allowing the closure of the N.O. circuit.
- 3.4 Both the N.C. and N.O. circuits have a common terminal (C), thus only the electrical connections need to be made to the switch to use the changeover function.
- 3.5 Electrical connection to the switch is by an integral 3 way connector designed to accept an AMP Econoseal Mk.3 or similar harness connector.

3.6 Once actuated the switch may be reset manually by depression of a button protected by a flexible cover. The button is also protected physically such that foreign objects are unlikely to obstruct actuation or cause resetting.

## **5. Installation**

5.1 Switches should be mounted vertically (Max. recommended on vehicle  $\pm 3^\circ$ ) with the reset button uppermost by fitting screws through the fixing holes provided.

5.2 Fixing screws should have a head of 10mm nominal dia. For standard M5 machine screws into welded nuts or plunged holes, tightening torque should not exceed 3Nm. If load bearing washers are used these should be plain, "wavy" or "crinkle" style spring washers. Coiled or serrated spring washers should not be employed.

5.3 The vehicle manufacturer is responsible for the chosen mounting means and verification of correct switch operation in response to shock loading and immunity from spurious operation or environmental contamination.

## **6. Operational Specification**

All parameters apply at 15°C - 28°C ambient unless otherwise stated.

### **6.1 Horizontal Impact performance (response to shock)**

When subjected to a  $\frac{1}{2}$  sine shaped pulse the switch will perform as follows.

Low Range: Sensata partnumber 500FCS01-01 (20769/12)

6.1.3 Operate above 12 'g' peak, 60ms duration.

6.1.4 Not operate below 6 'g' peak, 60ms duration.

### **6.4 Maximum load current**

6.4.1 N.C. circuit: 20A DC for max. duration 30s (resistive load).  
10A DC continuous (resistive load).

6.4.2 N.O. circuit: 16A DC for max. duration 10s (resistive load).  
0.7A DC continuous (resistive load).

### **6.5 Minimum load current**

6.5.1 N.O. circuit: 0.01A DC (resistive load).

6.5.2 N.C. circuit: 0.1A.

### **6.6 Initial Contact resistance**

6.6.1 N.C. circuit : 16 mOhm max. (reset condition).

6.6.2 N.O. circuit : 320 mOhm max. (actuated condition).

6.7 Dielectric Strength

6.7.1 500V RMS. (1414V Pk-Pk) between open terminals.

6.8 Insulation resistance

6.8.1 N.C. circuit : 10 MOhm minimum (actuated condition).

6.8.2 N.O. circuit : 10 MOhm minimum (reset condition).

6.10 Reliability/Endurance

Typically IP64 ingress protection is provided.

6.11 Operating temperature range

6.11.1 Maximum : +120°C

6.11.2 Minimum : -30°C (subject to freedom from inhibition by ice).

## **MOUNTING SUMMARY**

### **2. ASSESSMENT**

The vehicle should be examined for potential mounting positions, which will enable the following criteria to be achieved.

#### **2.1 ATTITUDE**

The switch must be mounted to a surface on the vehicle either directly or with an intermediate bracket such that it is vertical within +/- 3 degrees. The surface on the vehicle or on the intermediate bracket is required to be flat. Any deviation from the vertical will modify the release threshold slightly but for practical purposes variations within 3 degrees may generally be neglected.

#### **2.2 ACCESS**

The switch must be located to provide unobstructed access. A minimum space of 38mm above the reset button for finger access or 75mm if the entire hand must be inserted is recommended.

#### **2.3 CLEARANCE**

Vehicle body sheet metal or interior trim must be located to provide clearance to the projecting reset button (or button sealing Boot) of the switch in order to gain access to reset the switch when tripped. Adjacent vehicle parts and structures must not protrude into the button, or button sealing Boot, or add additional resetting force requirements which mask the reset tactile feel.

#### **2.4 MAGNETIC FIELDS**

The switch must not be located near strong magnetic fields. Sensata will undertake susceptibility tests against customer's magnetic devices when requested and samples of the devices made available.

#### **2.5 HAZARDOUS LOADS**

The switch must be located in an area where it will not be subjected to corrosive liquids or materials such as fertiliser, which may be carried in the vehicle.

#### **2.6 PROJECTILES**

The switch location must be such that loose objects, which may be transported in the vehicle, cannot strike the switch, or switch mounting structure, and cause the switch to operate.

#### **2.7 MECHANICAL SHIELDING**

A protective shield should be added to the vehicle structure if crash tests indicate possible damage as a result of a crash. A shield should also be used to protect the associated wiring from accidental damage or disconnection by inadvertent contact with transported objects or the vehicle user.

## 2.8 RIGIDITY

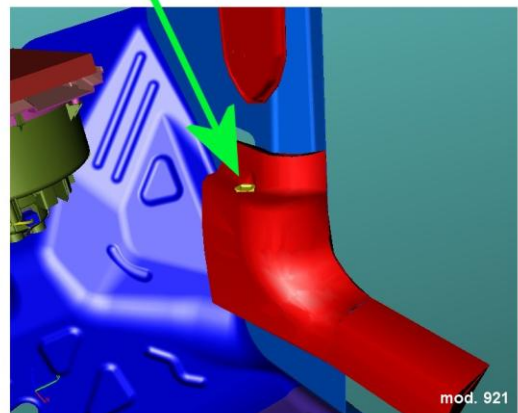
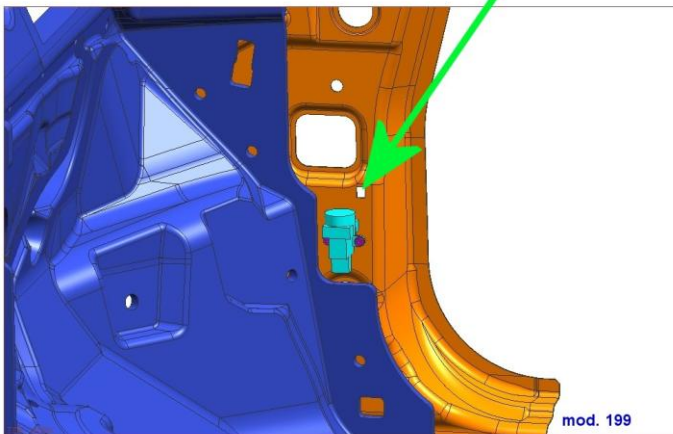
The switch and any supporting bracket should be mounted to a rigid body panel not susceptible to flexing or harmonic vibration under vehicle test or operating conditions. If brackets are used then these should be rigid and made from 2mm minimum thickness steel. Simple cantilever brackets should be avoided.

For information on the assessment of rigidity refer to the "Simple mounting tests" of this procedure.

**EXAMPLE OF A GOOD INSTALLATION:**

The switch is installed directly on the body of the car in a structural area. The pictures below show a detail of the RHS A-pillar. This area is usually very rigid and is not influenced by door slams and other misuse events. In the right picture protection around the switch to prevent any hitting or kicking whilst still maintaining access for resetting the switch, is also shown.

## A-Pillar installation



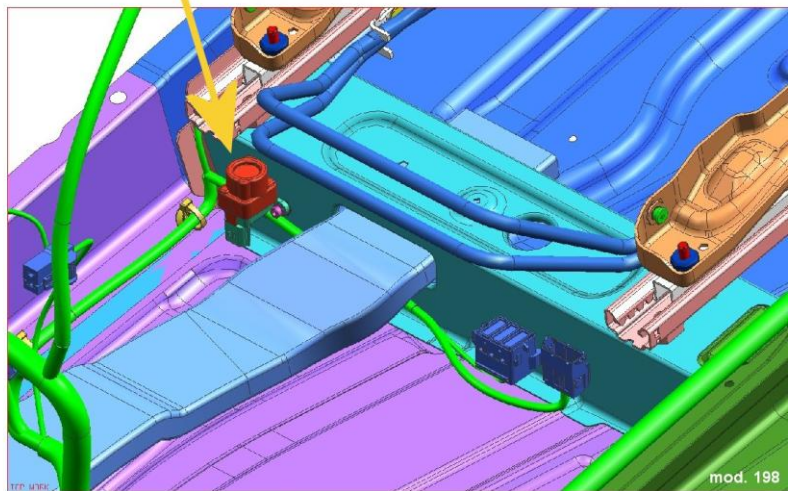
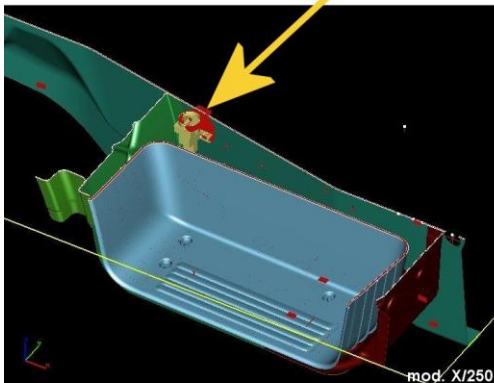
#### EXAMPLE OF INSTALLATION NOT RECOMMENDED:

The following picture shows a non recommended installation.

The first picture shows the switch installed on the sill - this area can be easily kicked and is sensitive to door slams and to seat slams.

The second picture shows the switch installed under the seat - this area is usually very sensitive to seat slams and it is easy to suffer from misuse operation.

## NOT Recommended

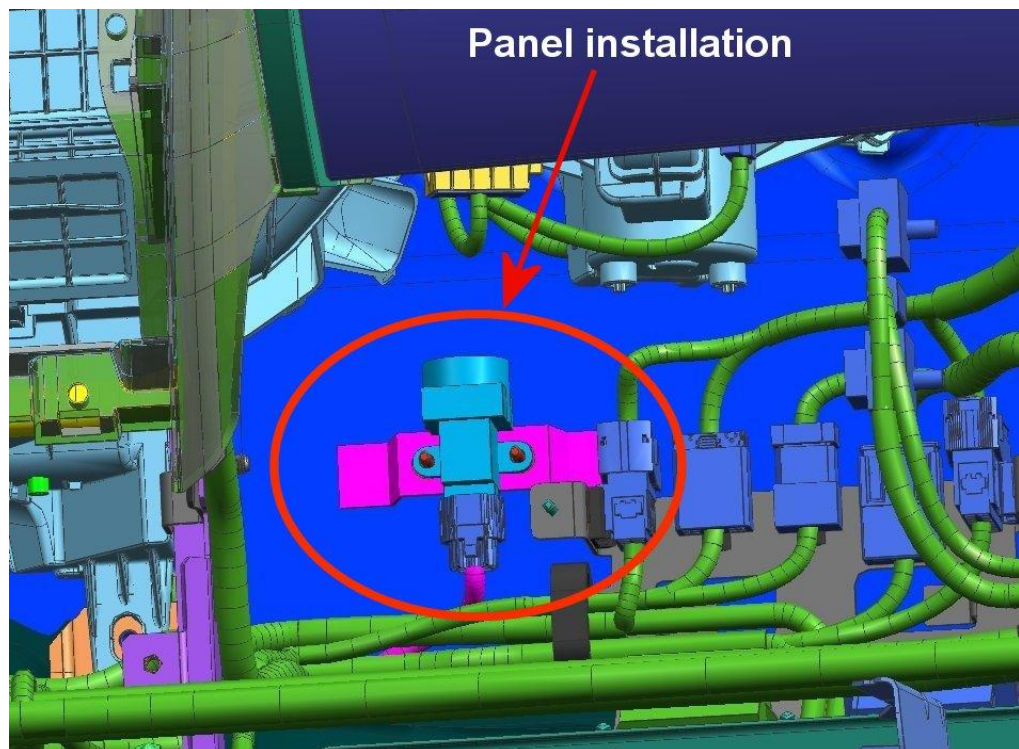




#### EXAMPLE OF A BAD INSTALLATION:

In the following picture, it is easy to identify at least 2 features to avoid in a good installation.

1. The switch is not installed in a suitable area. In this case it is on the firewall of the car - the firewall is a panel therefore is not a rigid area of the chassis.
2. The switch is mounted on a bracket with just two welded lugs. If the bracket is absolutely necessary it is best to have at least 3 fixing points



## 2.9 WEATHER RESISTANCE

Switches without protective reset button rubber boots and sealed electrical connectors must be located within the vehicle i.e. passenger compartment or boot/ trunk, protected from the weather elements.

Switches with protective reset shielding boots and sealed connectors may also be mounted within the vehicle outer skin and not subject to direct impingement of rain water, pressure cleaning fluids etc. a typical position would be under bonnet / hood. Switches must not be mounted under wheel arches.

## **3. SIMPLE MOUNTING TESTS**

In positions selected by using criteria from the "PRELIMINARY ASSESSMENT", mount the inertia switch to the panel (via the intended bracket where required).

Once in place the panel area around the mounting should be tapped **lightly** with both a hard and soft faced mallet. If the ball inside the switch can be heard to rattle then this immediately suggests that the mounting is not rigid enough and is likely to be unsuitable for the installation.