

INSTALLATION MANUAL

FSS1 HIGH SECURITY DOOR MONITORING SENSOR

1. Introduction

The FSS1 is a patented device designed to provide a high security door position monitoring solution. It is the ideal high security alternative for traditional balanced magnetic reed switches on **hinged doors**. Space is provided inside the sensor housing for the inclusion of an end of line module (for the Australian high security market). The FSS1 is not designed to operate on sliding doors or roller shutter doors.

2. Design Features

The products consist of two main components, the sensor on the door frame, and the magnetic array plate on the door. The product is designed for installation on hinged doors only.

The FSS1 consists of 7 magnetic sensors that are used to detect the magnetic footprint from an array of magnets on the magnetic array plate. One sensor is used to detect the position of the magnetic array plate in relation to the FSS1, while the other 6 sensors are used to determine the polarity, size, strength and position of the magnets on the magnetic array plate in relation to the memorized recorded pattern.

The FSS1 is calibrated with the first closing of the door, storing the magnetic measurements into the devices memory. The FSS1 can be re-calibrated to allow for potential door drop or door warp.

Using at least 4 magnets in different positions, strength and polarity in the magnetic plate provides at least 1,820 permutations. In addition the magnetic plate position, orientation, door gap and surrounding material adds more door specific variables, greatly expanding on the base permutation. These door unique parameters and magnetic matrix are learnt by the sensor during the calibration procedure.

This far exceeds the Australian Government SL4 and European Grade 4 standard of 8 permutations of magnets.

The FSS1 is not factory calibrated (mated) to its supplied magnetic array plate, and only learns the magnetic matrix when first powered and upon the first door closure.

3. Models

FSS1-F

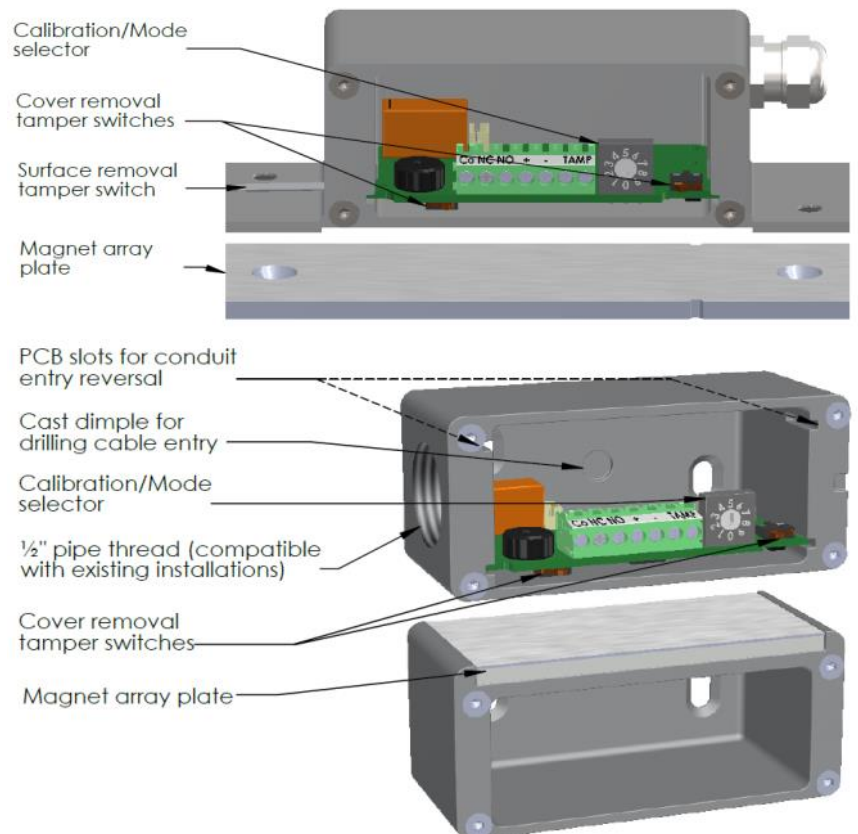
Flush mounted into the door frame with the magnetic array plate in the top of the door. The FSS1 must be fully mortised into door frame using tabs to the door frame to ensure **Australian Government compliance**

FSS1-S Surface Mount

Surface mount with side conduit entry. The FSS1-S provides a conduit entry of 20mm (1/2" NPT pipe thread) to enable retro and new installation compatibility. The sensor housing is not handed and can be used in either left or right hand conduit entry. Slight conduit realignment on retrofit installations may be necessary.

FSS1-S-NC Surface Mount No Conduit

Surface mount with rear cable entry - NC stands for No Conduit. This is the same product as the FSS1-S but does not provide a conduit entry. Cable entry is via a hole drilled in a predetermined location to suit the cable size being used. Not shown, same as FSS1-S but without conduit hole.



4. Technical Specifications

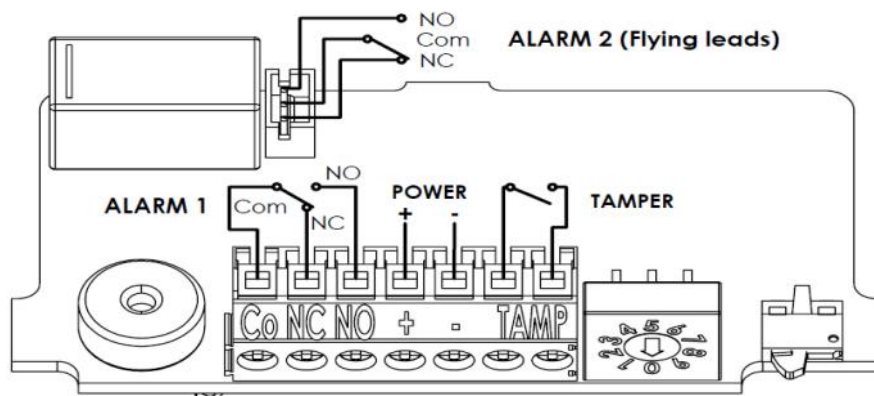
Operating Voltage	10 – 30 volts DC
Max Current (12VDC) - reduces at higher voltages	<45mA - secure (normal operating current) 45mA - during initial calibrating or buzzer activated
Tamper contacts	N.C. common, 0.2A @ 30V
Alarm contacts	2 x N.C., Common, N.O. contacts, 0.5A outputs - one on circuit board terminal strip, second on flying lead designed for access control.
Door gap and door movement trigger	1.5 – 7mm vertical on a hinged door. Up to 15mm of door movement for alarm to trigger
Mounting	FSS1-F - Flush mount FSS1-S - Surface mount with conduit entry FSS1- S-NC - Surface mount without conduit
Operating temperature / humidity	Temperature -35 to +66 degrees C Humidity 0 to 85%
IP Rating (Australia)	IP67
Fire rating (Australia)	2 hour
End of Line compatibility (Australia)	Space for type 1 & 2, Class 5 Encrypted End Of Line Modules
Australian Approvals / Patents	<ul style="list-style-type: none"> • SCEC Security Level 4 (SL4) Approved • Listed in the Security Equipment Evaluated Product List (SEEPL) • Patented design

UL 634 High Security Level 2 Specification	
Operating Voltage	10 – 30 volts DC
Max Current (12VDC) - reduces at higher voltages	< 45mA - secure (normal operating current) 75mA - during initial calibrating or buzzer activated
Tamper contacts	N.C. common, 0.2A @ 30V
Alarm contacts	2 x N.C., Common, N.O. contacts, 0.5A outputs - one on circuit board terminal strip, second on flying lead designed for access control.
Door gap and door movement trigger	0.06" – 0.28" vertical on a hinged door. Up to 0.60" of door movement for alarm to trigger
Cable specification (for U.L. only)	Minimum 22 AWG or 26 AWG solid
U.S. and Canadian Approvals	UL634 High Security Level 2 - Listed Equipment BP21118
Operating temperature / humidity	Temperature -4 to +140 degrees F Humidity 0 to 85% Suitable for Indoor and Outdoor use

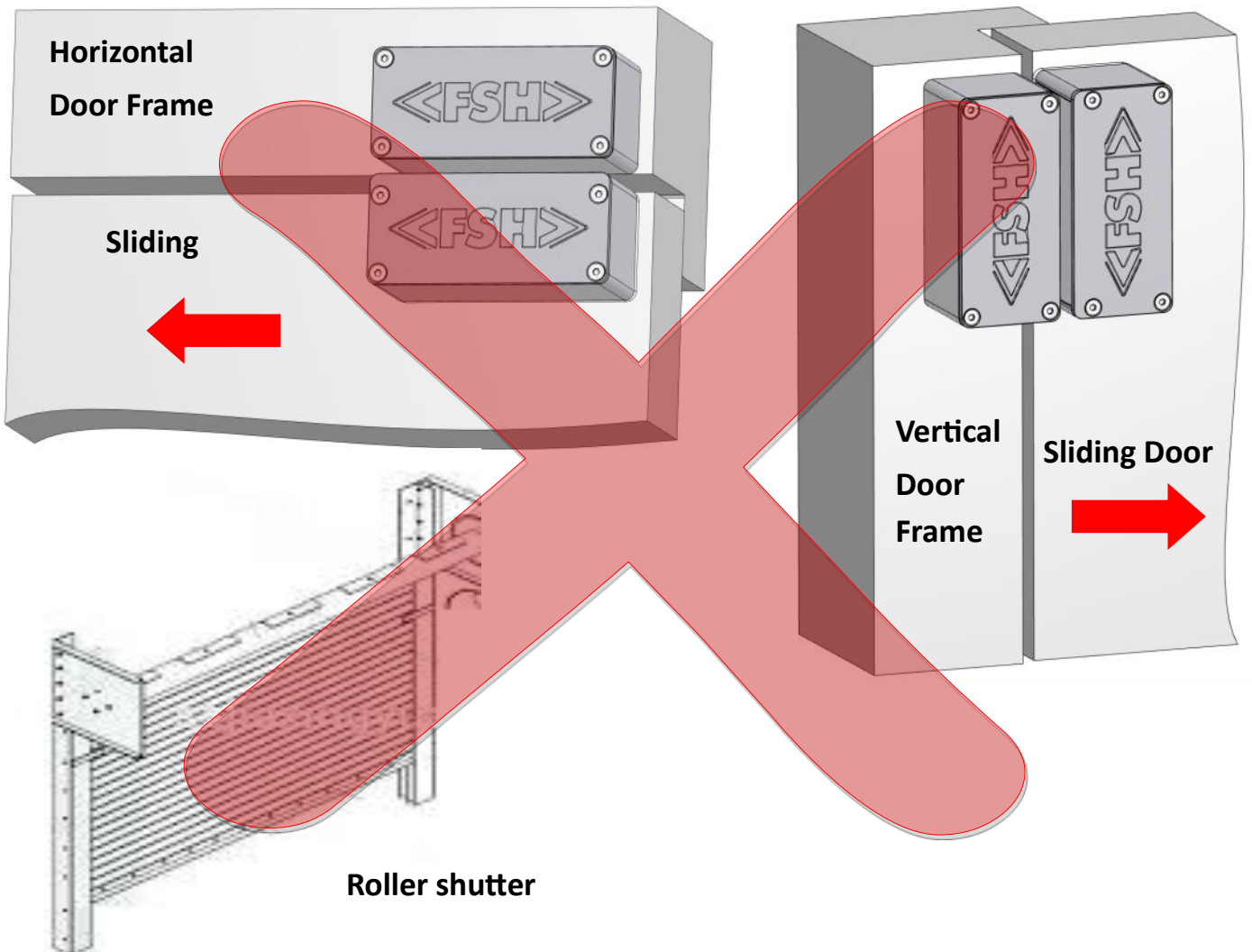
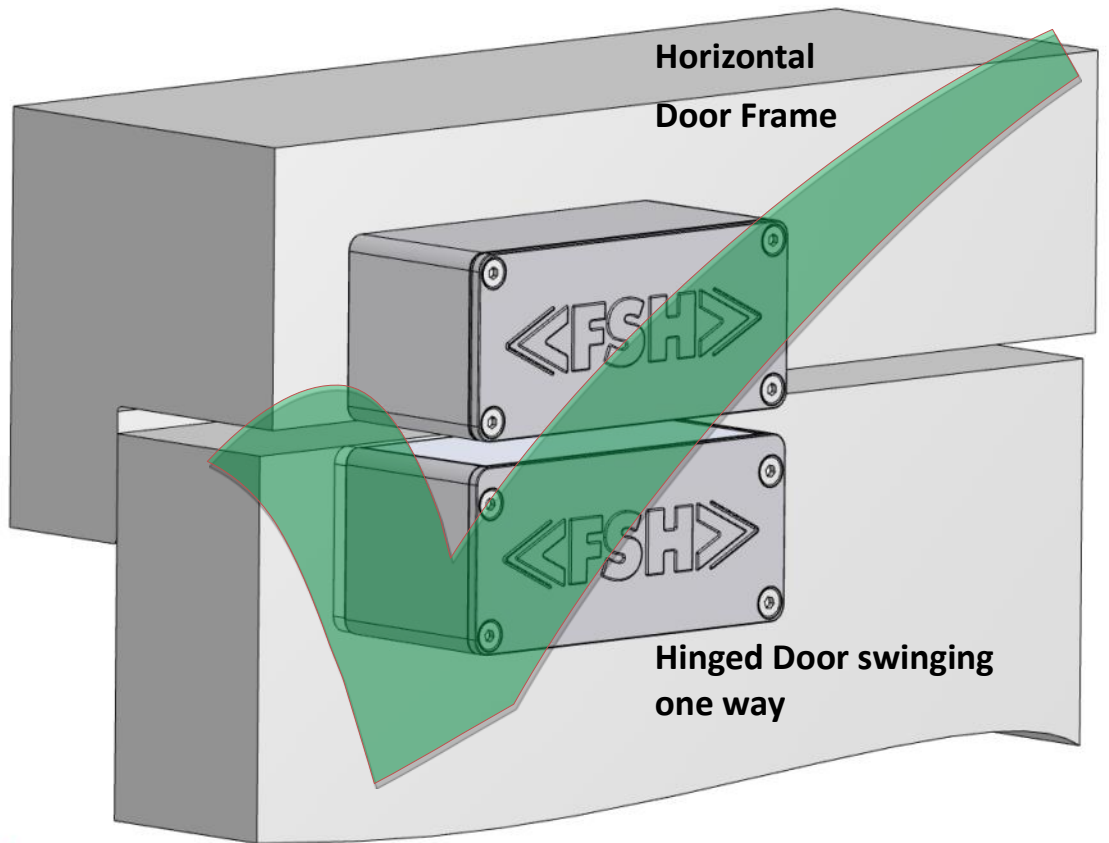
5. Wiring

Alarm wiring must be connected to COM (Common) and N.O. (Normally Open). The N.O. will close (short) when the door is secure and power is applied to the sensor. Power failure or alarm will cause the N.O. contact to open. The N.O. contacts are closed when power is applied and door is sealed. The second set of alarm contact operate in the same way as above. Tamper contacts are N.O. when the device is in tamper and closed when the is not tampered.

A second set of independent contacts are provided on the flying leads can be attached to an access control in the facility. U.L. requires a minimum cable size of 22AWG of 26AWG solid (does not apply for Australia use)



6. Mounting



7. Installation

FSS1-F – Flush Mount

The flush mount model of the FSS1 is designed to be recessed into the door frame with the magnetic array plate recessed into the top of the door adjacent to the sensor. The flush mount is non handed.

- a) The sensor housing is to be installed using the supplied mounting tabs such that the face of the sensor is reasonably flush with the door frame.
- b) **The tabs and flush mounting is a Australian Government compliance requirement.**
- c) Mount the sensor housing and magnet array plate on the door frame and door at a point farthest away from the hinge side as possible.
- d) The magnet plate is normally recessed into the top of the door adjacent to the sensor housing with the countersunk fixing holes facing upwards. If space permits the magnetic plate can be surface mounted. Please note the alignment marks on both the sensor and the magnet plate are to be aligned.
- e) The vertical centreline alignment of the sensor housing and the magnet array plate centre lines is critical.
- f) Run cable through the side of the sensor housing through the cable gland and tighten to retain IP67 rating (not tested by U.L. Rated for indoor and outdoor use).

FSS1-S, FSS1-S-NC - Surface Mount

Two models are available of the surface mount FSS1 - one with a conduit fitting, and the other without a conduit fitting, designed for rear cable entry.

Please note that this product is **not** a balanced reed switch and operates in a different manner to a reed switch. The FSS1 is suitable for installation on both ferrous and non-ferrous doors, and either inward or outward swinging doors. It is recommended that the FSS1-F (flush mount) is used for outward swinging doors. Please read below carefully.

FSS1-S-NC Surface Mount without conduit fitting

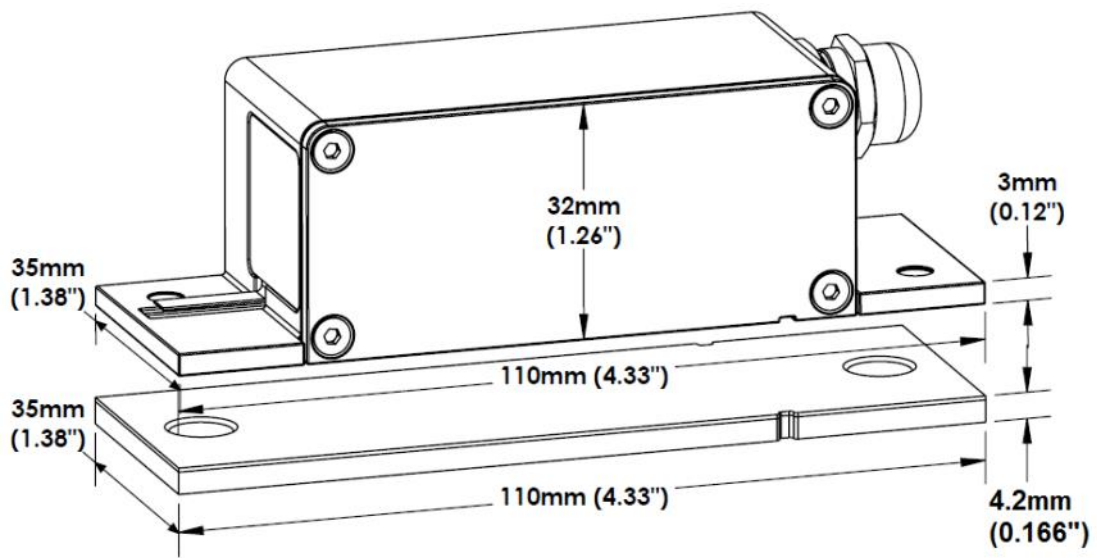
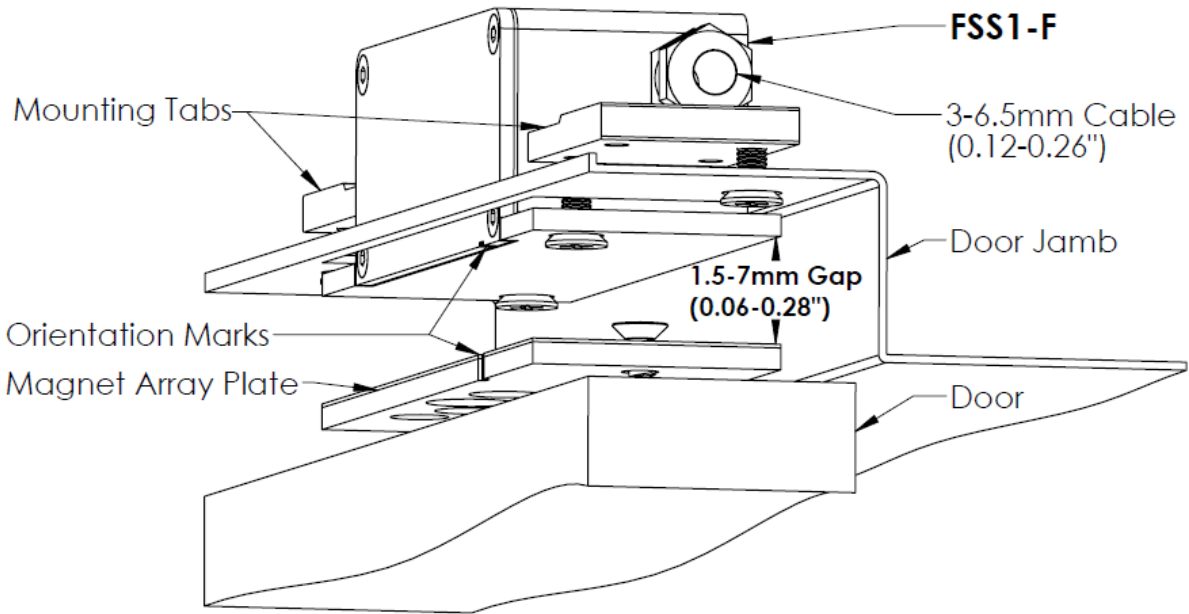
- a. Mount the two housings on the door frame and door at a point farthest from the hinge. The FSS1 may also be mounted to the side of the door.
- b. The magnet housing is installed on the door with the magnet plate facing upwards, and the sensor housing is to be installed directly above the magnet housing using the side of both housings for alignment. The FSH logos must be orientated as in the diagram below.
- c. Maximum gap between the two housings is 7mm (0.28”), however a gap of approximately 3.5mm to 5mm (0.14” to 0.20”) is preferable to allow for possible door drop.
- d. The operational trigger distance (causing an alarm to be triggered) from the vertical centreline is approximately 15mm (0.60”). (See more detail in the “What to do when it doesn’t work” below).
- e. A cast dimple is provided in the back of the sensor housing as a cable drilling guide. The drilled hole must not be 1mm (0.04”) larger than the cable diameter and sealed with a suitable waterproofing sealant such as Sikaflex 291. Ensure no foreign material or swarf is left in the sensor housing. A strain relief cable tie is to be fitted to the cable on the inside of the sensor housing. Apply the supplied stick-on rubber gasket behind the sensor housing. Hole diameter and strain relief is a Australian Government compliance requirement. Use of a sealant such as Sikaflex 291 is required to seal the cable entry in external applications, and on the rear of the housing when the surface the sensor housing is attached to is not flat i.e. a brick wall to prevent water ingress.

FSS1-S (Conduit Version) Additional Notes

- f. Take care when screwing an existing or new conduit into the housing. Ensure the threaded conduit does not screw beyond the inner wall of the housing. If the conduit is existing it may be necessary to slightly lower the conduit to suit the FSS1-S conduit entry.
- g. To convert to the required handing remove the cover Allen key screws and slide the circuit board out of the housing. Reinstall the circuit board into the opposite slots.
- h. The conduit model requires a 1/2” NPT conduit fitting. Use of a water sealing thread tape is required for external applications.

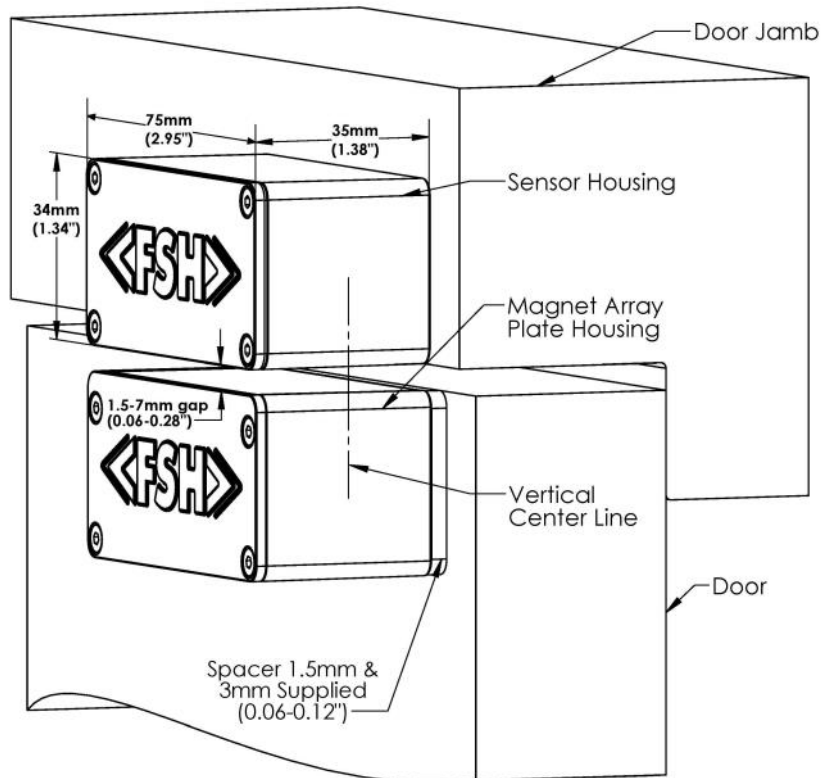
Both surface mount models are supplied with a 1.5mm (0.06”) and a 3mm (0.12”) spacer to cater for door / frame horizontal misalignment. Additional spacer kits are available.

A “L” bracket is also available to mount the surface mount sensor boxes to the underside of an outward opening door.



FSS1-S

FSS1-S-NC



8. New Calibration

The FSS1 is supplied ready to be calibrated when it is first powered on.

- a) To start calibration the rotary selection switch must be set at 0,1,2, or 3 and the door must be open. See rotary switch positions below.
- b) If there is a foreign magnetic field present then slow beeping will occur until the magnetic field is removed.
- c) With the sensor power connected, slowly close the door.
- d) At ~20mm (0.78") from being closed the beeping will get faster, keep **slowly** closing the door - the sensor is learning magnet positions at this stage.
- e) The beeping will get faster as the door gets to its fully closed position.

Pressure should be applied on the door near the FSS1 and held in its fully closed position until the beeping gets more rapid. The sensor needs to learn the full door travel, not the "resting" position of the door. If the door is fitted with an acoustic seal then this must be compressed. After several seconds the beeping will stop and the sensor is programmed.

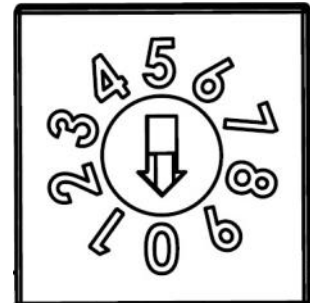
9. Recalibration

When a door drops more than 2mm (0.08"), or a magnetic plate has been replaced, then the sensor will need to be recalibrated, as follows:

- a) Open the door and remove the sensor from the case.
- b) With the power connected, set the rotary switch to position 9 for 2 seconds, then back to the same position.
- c) Slowly close the door to allow the door to recalibrate as above.

10. Rotary Switch Positions

0. Immediate alarm. No buzzer - NORMAL SETTING
1. Immediate alarm. Buzzer when in alarm.
2. Door can be unsealed for 0.2 seconds before alarm is activated. No buzzer
3. Door can be unsealed for 0.2 seconds before alarm is activated. Buzzer when in alarm.
- 4-8. No function.
9. Clear memory for recalibrate mode - set for 2 seconds.



11. Door Gap Considerations

The maximum gap between the sensor and magnet array plate is 7mm (0.28") for both the surface and flush mounted products, however a 3 - 5mm (0.12 - 0.20") gap is preferable to allow for possible door drop. If this measurement is exceeded in the flush mount model it is recommended that a suitable packing piece be installed under the magnet plate to maintain this gap. In the case of the surface mount model the fixing holes are vertical slots to allow a small vertical adjustment.

Once programmed the sensor can accommodate up to 2mm (0.08") door drop before requiring reprogramming. There is a sticker on the inside sensor lid which allows you to note the install date and door gap at that time. This is handy as the door drop may be outside your control.

12. Testing.

To test the installed sensor it is recommended to insert a steel object (not stainless steel) between the two sensing surfaces. This action should cause the alarm to trigger. To assist in testing the sensor rotary switch can be placed in setting 1 which will cause the buzzer to activate on alarm. Removing the sensor lid will also enable testing of the tamper switches. Make sure the rotary switch is reset to the desired setting prior to replacing the sensor lid.

Inserting a ferrous metal strip between the magnet plate and sensor housing, or placing of a powerful magnet adjacent to the sensor face will also cause an alarm to trigger.

13. F.A.Q.

The sensor won't calibrate.

- Check voltage is D.C. and polarity
- On a flush mount sensor check that magnet array plate is in the correct orientation - facing up and the orientation marks are lined up.
- Make sure there aren't any foreign magnet fields near the sensor. This is indicated by a slow beep when the door is closed.
- Magnet plate is too close to sensor - minimum 1.5 mm (0.06") gap.
- The FSS1 is designed for installation on a hinged door with a door jamb swinging one direction only. Refer to drawing on page 3 of this manual for correct product orientation.

I have a loop-in loop-out cable requirement and require two cables to enter the housing.

- Provision is made for a single cable only in the FSS1-F flush model. The FSS1-S conduit model will allow for two cables. The FSS1-S-NC surface mount without the conduit entry normally requires one hole to be drilled. A second hole can be drilled in both the surface and flush models.
- Please note the position of circuit boards and tamper switches when drilling additional holes. The FSS1-F flush model will require careful removal of the circuit board taking care not to damage the tamper switch cables attached to the circuit board prior to drilling the housing.
- If the sensor is installed in an external environment please use the supplied stick on rubber gasket behind the sensor box.

The sensor goes into alarm when the door is moved towards the jamb.

- The fully door closed position has not been learnt into the sensor. Recalibrate again and ensure door is fully pushed closed against jamb or seal to enable all door movement in the closed or sealed state to be learnt.
- It may be necessary to move the magnet housing closer to the door by removing a packing piece, or conversely adding a packing spacer behind the sensor.

Double door causing false alarms.

- Normally caused by excessive movement of the passive leaf with auto flush bolts. Passive leaf must have minimal movement. Gap between mortice lock tongue and strike keeper should also be at manufacturers recommended 1mm (0.04"). Combination of loose passive leaf combined with sloppy mortice / strike causes door movement beyond the 15mm (0.60") sensors tolerance.

14. What to do when it doesn't work !

Please note that this product is **not** a balanced reed switch and operates in a different manner to a reed switch.

Unlike a conventional reed switch this sensor learns the magnetic profile during the calibration process.

It learns multiple positions covering the approximate 20mm (0.78") of total door movement - 15mm (0.60") on the door opening side, and 5mm (0.20") on the closed side. It is **vitaly important that the fully closed position is learnt**. This is particularly important when the door is fitted with a dust or acoustic seal, this seal must be partially compressed to enable the sensor to learn the extremes of door movement that may be experienced in service. An example may be security personnel shaking the door during a routine round or movement caused by wind. A warped door may also cause the FSS1 to not learn the potential extremes of the door movement. Again apply pressure to the door from the opposite side to ensure the fully closed data is learnt for the warped door. In both cases the additional 1mm (0.04") or so of additional movement not learnt into the sensor will cause an alarm to be generated.

If a **larger distance** is required then the sensor housing can be packed out using the supplied packers off the frame by approximately 4mm (0.16") giving an effective operational distance of 18mm (0.71"). You may need to experiment with the thickness of packers to suit the specific environment.

As is the case with a flush mounted conventional reed switch on a swing door, the vertical centrelines of the FSS1 sensor and its magnetic array plate should be roughly aligned along their vertical centrelines. With the flush model care must be taken with the vertical centreline alignment taking note of where the door stops (consider the effect of dust or acoustic seals) within the door frame. The magnet array plate can be installed such that its vertical centreline is towards the door jamb by as much as 4mm (0.16"). Conversely the sensor will not work or calibrate if magnet centreline is outside (away from the door jamb) of the sensor vertical centreline.

The FSS1 is designed for installation on a hinged door with a door jamb swinging one direction only.

Refer to drawing on page 3 of this manual for correct product orientation.

The FSS1 is not designed for roller or sliding doors and its use is not recommended.



CE



RoHS