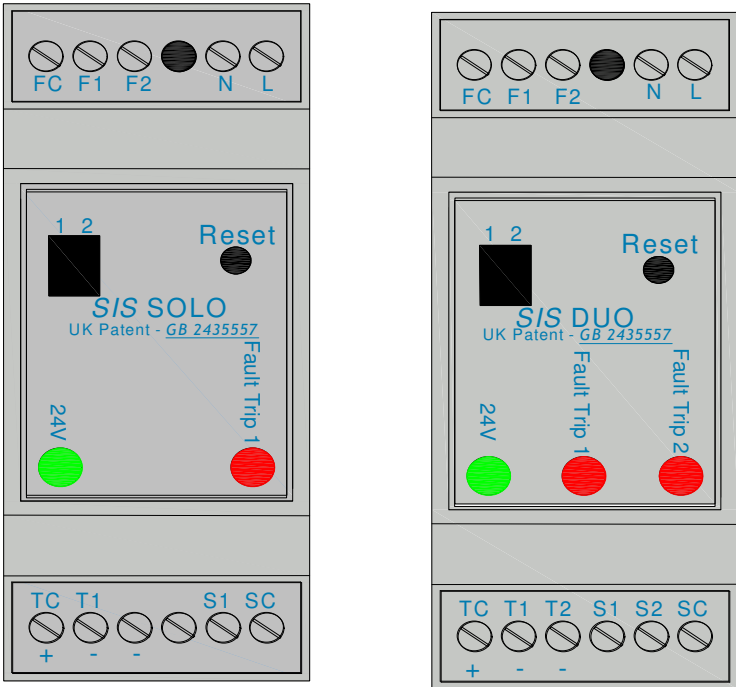


Guide For The *SIS SOLO/Duo*

UK patent GB 2435557B

ELECTRICAL DISCONNECTION SYSTEM





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1.0 Overview

The SIS SOLO/Duo system is designed to provide electrical isolation under impact to any illuminated street furniture. It allows compliance with BS EN 12767 by electrical disconnection within 0.4 seconds. The SOLO/Duo units can be mounted on standard DIN rail in a distribution panel to isolate a single structure or circuit from its supply point.

The units incorporate dual microprocessors to maintain reliability.

In addition, the fitting of this system allows local electrical isolation. By disconnecting the sensor, the structure is isolated and cannot be accidentally switched back on. This assists compliance with current CDM regulations in allowing safe maintenance operations with the supply completely removed.

2.0 Equipment Detail

2.1 Monitor Units

The monitor unit is a bespoke unit specifically designed for this purpose, SOLO for single circuit or structure, Duo for two circuits or structures. The unit has onboard software coupled with dual processors to monitor the sensors and its own operation making it very reliable. The unit also has in built system monitoring which continually checks the system is operational, the Red channel LED will flash once every few seconds (Heartbeat) to show all is well. If a failure is detected it will provide a fault output and also flash the Red led. The number of flashes will indicate the error. If the unit is unable to continue operation it will attempt to isolate the equipment it is protecting, to bring the failure to attention.

The unit also provides fault outputs, which will operate, if the system fails or if the sensor is triggered. These outputs can if required be connected to a remote monitoring system to give remote indication of activation or system malfunction. A table of these outputs is given on page 7.

F1 Output will provide an indication of trip operation (DIP switch 1 will turn off monitoring and the F1 output if required). F2 Output will provide indication of a system malfunction, the F2 output will also cause the unit to switch off the monitored circuit or structure to draw attention to the failure.

Once the unit has seen an impact it will operate the shunt trip operating the associated circuit breaker and illuminate the

red channel LED. When this has occurred, manual intervention will be required to reset the unit. Once the impact has been cleared or a make safe has been carried out, the SOLO/Duo unit can be reset. The **unit will**

first check to see if the fault has cleared, if it has the red LED will go out, and the circuit breaker can be reset, re-energising the circuit. If it has not the unit will still show a red LED, and the isolation device cannot be reset.

In addition, when tripped the monitor unit will also disconnect the supply to the sensor to ensure that absolutely no voltage is present.

In the unlikely event of a structure being struck during a general power failure, the system will start up and isolate any damaged structure in less than 5 seconds.

2.2 Isolation Device

The devices used are standard circuit breakers with the addition of a shunt trip; these units are supplied rated as per customer specification, curve C, 10Kva are supplied as standard and can be supplied at most current ratings. These units are mechanical devices, so they draw no current under normal operation. Under operation the tripping coil will energise for 0.2 seconds or less. Once the device has been tripped the tripping coil is also disconnected, again leaving the circuit drawing no current, and protecting the tripping coil. The circuit breakers cannot be reset whilst a sensor remains open circuit.

Only certain units are approved to work with the SIS system, to ensure correct operation these units will be supplied with the SIS units, the use of unapproved MCBs may damage the SOLO/Duo units.

To ensure complete isolation, the system however configured will use double pole circuit breakers to ensure both live and neutral are disconnected, this ensures the structure or circuit is completely isolated.

2.3 Sensors

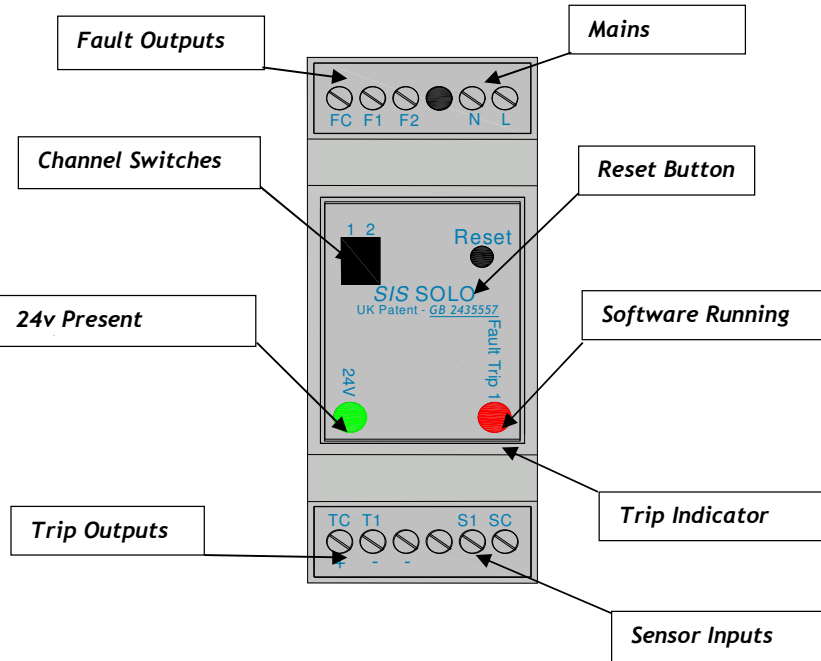
The sensor unit will be supplied ready wired using the normally closed contacts, looking for an open circuit to indicate operation. This is intentional as the unit may get destroyed during an impact, using normally closed contacts will ensure operation even if the unit is disconnected completely.

The recommended Sensor cabling is an Orange PVC sheathed 2.5mm twisted one pair armoured cable such as that used for traffic signal detector feeder cables. This was chosen for its integral strength and being twisted its immunity to induced voltages. The contractor carrying out the installation will carry out the supply and installation of the sensor cabling.

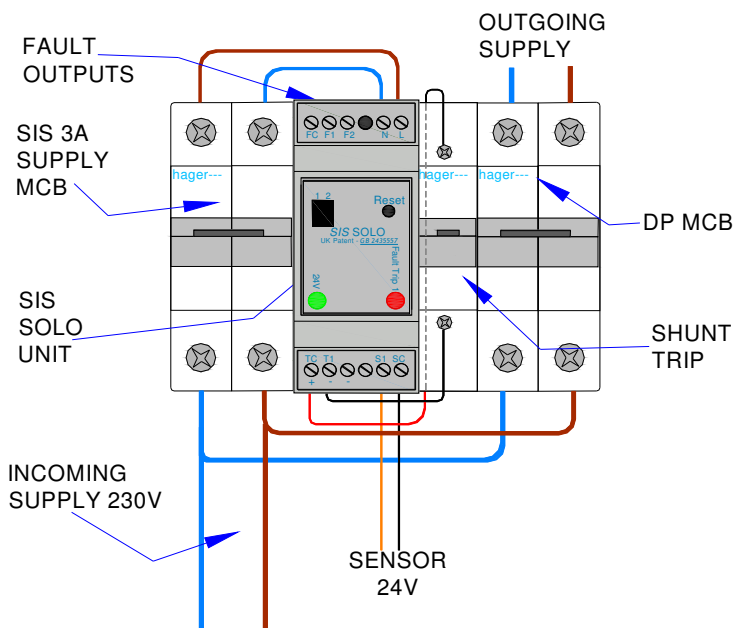
(The reference number for the cabling is Table 4E 3A & 4E 4A – Armoured Multicore Cable having Thermo set insulation)

3.0 Connections and Indicators

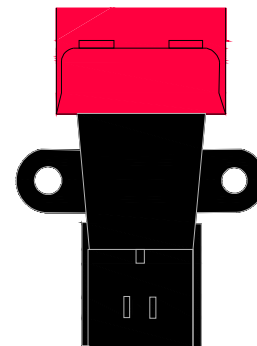
3.1 SOLO/Duo Monitor Unit



3.2 SIS SOLO Typical Wiring Layout



3.3 SIS IMPACT SENSOR



<p>4.0 Installation</p> <p>4.1 Monitor Units</p> <p>The units are DIN rail mounted suitable for a standard 35mm top hat rail, they can therefore be fitted to any standard distribution enclosure. The SOLO/Duo unit itself will require two ways of space and the shunt trip and MCB three ways, making a total of five ways per circuit or structure. Monitor units have a number of screw terminal connections, two for mains supply, two/three for the sensor input, two/three for the trip output, and four for fault outputs.</p> <ul style="list-style-type: none"> • The mains supply should be taken from a 3A circuit breaker or fuse, which will enable isolation should a unit need to be replaced, due to its low power consumption of 3w a number of units can be taken from the same 3A supply. • The trip connections will be taken one to either side of the shunt trip, this is not polarity sensitive but for continuity we have considered the bottom terminal to be positive. • Due to the size of the cabling, we would recommend the sensor lead is to be soft wired to separate incoming sensor cabling terminations. • The fault outputs will be taken to a monitoring unit if required. <p>4.2 Isolation Device</p> <p>Isolation devices are standard Hager MCBs curve C with 10Kva rating; they can be supplied in different ratings to suit the installation. Units are mounted on standard 35mm top hat DIN rail.</p> <p>4.3 Sensors</p> <p>The impact sensors should be installed in the <u>vertical position</u>, with the red cap at the top, at installation the red cap should be <u>depressed to ensure the sensor is reset</u>. Impact sensors can be supplied in a number of possible ways and with a number of different bracket options.</p> <ul style="list-style-type: none"> • With 0.5metre of wiring, for mounting directly to a backboard. • With additional length of flex for connection to an underground termination unit. • Mounted on a small enclosure, fitted with SWA cable glands, a standard detail drawing is available for this. • With a post top bracket where there is no access door. • We can of course provide bespoke options as required. 	<p>5.0 Testing</p> <p>5.1 Once all items comprising the installation are connected the <i>SIS</i> system should be powered up, the flashing channel LED on the front of the Monitor unit will indicate system is running.</p> <p>5.2 All the red LEDs should be unlit (a single flash every few seconds is a heat beat indicating all is well), a solid red LED illuminated will prevent a circuit from switching on and will need to be rectified by checking the sensor circuit. A quick check would be to apply a temporary short to the sensor terminals, if the unit can then be reset it would indicate a fault on street.</p> <p>5.3 Switch all isolation devices on.</p> <p>5.4 Each structure fitted with an impact sensor should now be visited and the sensor operated by hand or disconnected to create an open circuit to simulate sensor operation. It is preferable to operate the sensor itself where practicable.</p> <p>5.5 With the sensor operated or open circuit created, the supply pillar housing the isolation devices should be checked to ensure the correct device has tripped on the relevant structure.</p> <p>5.6 Whilst the open circuit remains the isolation device should be operated to ensure it cannot reconnect whilst an open circuit is present.</p> <p>5.7 Subject to these tests being satisfactory the sensor or open circuit can be reset or restored. The isolation devices can now be reset.</p> <p>5.8 This procedure <u>must</u> be carried out on all columns fitted with isolation devices.</p> <p>5.9 Only suitably qualified personnel should undertake installation of this equipment.</p> <p>5.10 Finally, it is recommended that an annual inspection of all the columns fitted with sensors take place to check sensors and isolation devices for correct operation.</p> <p>6.0 Equipment Supply</p> <p>Currently the system is only offered as a prewired system within a feeder pillar, one impact sensor per structure will be supplied separately, to be cabled on site using twisted one pair armoured cabling 2.5mm (see 2.4).</p>
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7.0 Sample Specification

1. To provide electrical disconnection and ensure safety in the event of a collision with passively safe lighting equipment, all passively safe equipment shall utilise a passively safe electrical disconnection system.
2. The system will comprise an impact sensor located within the passively safe equipment, a monitoring unit and sensor cable. The monitoring equipment will be located in the local feeder pillar or chamber.
3. Monitoring units should have dual processors to provide a failsafe mode that will switch off the passively safe equipment should the unit develop a fault. In this way it is possible to draw attention a fault which would continue unnoticed.
4. To provide optimum safety to maintenance operatives the disconnection system will operate at ELV for the sensor circuits. Systems utilising mains voltages for sensor circuits shall not be permitted.
5. There will not be two separate 230v supplies within an item of passive equipment. Unless both supplies are isolated there is a risk that an operative may not be aware of a second live 230v and therefore be exposed to a potential electric shock.
6. Additional space to be allowed for sensor cabling, one additional cable per outgoing circuit. Sensor cable glands will be 20mm CW-S. Sensors to be cabled in 2.5mm 2 core Orange PVC sheathed SWA cable as used for traffic signal detector loop feeder.
7. All switchgear to be Metalclad to IP65 or greater, plastic enclosures can be considered by the engineer if requested.
8. All outgoing circuits to be protected by double pole 10Kva circuit breakers, the cable design to reflect this with regard to disconnection times. Full range of current ratings to be available 6A to 40A
9. Where calculations require a BS88 fuse, this will be placed in line with the double pole circuit breaker. The circuit breaker is to be up rated to 40A to provide discrimination.
10. Circuits to be so designed that upon trip activation no more than every third column is switched off i.e. First column circuit 1, second column circuit 2 and third column circuit 3 then repeat with 4,5, 6 etc. This method will keep 2 out of 3 columns on if there is an impact.
11. The isolation will be so designed that on impact both live and neutral circuit conductors are disconnected, together with any sensor voltages.
12. Disconnection must be achieved in under 0.4 seconds in accordance with BS EN 12767.
13. The isolation system must give a positive visual indication it is functioning normally (Heartbeat) and of trip activation by using an LED or similar.
14. It must not be possible to re-energise a circuit that has been tripped.
15. The isolation system is to provide fault outputs for remote indication of any trip activation or a system fault.
16. The sensor is to be a mechanical device operated by inertia of greater than 10G. Upon trip activation the power to the sensor is to be removed.
17. The impact sensors are to be mounted vertically.
18. The cabling to the sensors is to be run in separate ducts to the lighting circuit cables, using orange PVC sheathed SWA 2 core 2.5mm cable, as used for traffic signal loop feeder cable.
19. The sensor cable is to be terminated using a cable gland, with the armouring being earthed.

8.0 Fault Indication Table

Operation	Indication	F1 State	F2 State
Normal operation	Flashes once	Closed	Closed
Channel tripped	Continuous on	Open	Closed
Coil open circuit fault	Flashes twice	Closed	Open
No sensor power	Flashes 3 times	Closed	Open
No sensor isolation	Flashes 4 times	Closed	Open
Low voltage	Both LED's flash 5 times	Closed	Open
Power fail	LED's off	Open	Open
Watchdog override	LED's off	Open	Open

9.0 Technical Data



Technical Information

Input Voltage 230v AC 50/60Hz	Unit Initialisation time	<5 Seconds
Power Consumption 3.0 watts continuous	Operating Time	<150ms

(Umsug code 821002000100)

Dimensions: Height 90 mm Depth 60mm Width 36mm

Inputs/Outputs

Sensor	24v DC
Trip	24v DC (Shunt Trip)
F1	(Trip Alert N/C)
F2	(System Failure N/C)

F1 Output can be used to indicate trip operation to a remote system, DIP switch 1 will turn off monitoring and the F1 output.

F2 Output can be used to indicate system failure to a remote system, and to automatically switch off a monitored structure if the system has failed. The option to switch off the monitored structure is user selectable by DIP switch 2. With switch 2 ON a system failure will cause the monitored structure to switch off, with switch 2 OFF the unit will give an F2 output only. F2 output will be provided regardless of DIP switch 2 position.



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