

CAUTION This information is designed to help suitably qualified personnel install and operate Mechan Safety Switch equipment. Before using this product, read this guide thoroughly along with any relevant European and/or National standards e.g. Machinery Directive 89/392/EEC and it's amendments, Provision and Use of Work Equipment Regulations.

Further information can be obtained from Mechan Controls PLC

***** KEEP THIS GUIDE FOR FUTURE REFERENCE *****

DESCRIPTION

The ISIS safety system is a tamper resistant non-contact safety switch system, suitable for use in most types of machine guarding applications where guard locking is not required. The system comprises of a control unit and 1 or more safety switches and actuators. The ISIS non-contact safety switches are easy to install, tolerant to misalignment and suitable for use in harsh or wet environments.

ISIS-4 - Control Unit

The ISIS-4 is a combined Safety Switch and E-Stop control unit. Along with the ability to monitor up to four ISIS safety switches it can also monitor the normally closed contacts of emergency stop buttons or mechanical safety switches in dual channel control circuits.

The ISIS-4 has 2 normally open safety contact outputs and 1 normally closed auxiliary output, an external re-set/proving circuit and LED indication for 'Power', 'Run' and the status of each activated gate switch.

ISIS-2 - Control Unit

The ISIS-2 control unit is a 24V ac/dc system that can monitor up to 2 ISIS safety switches.

The ISIS-2 has 2 normally open safety contact outputs and 1 normally closed auxiliary output, an external re-set/proving circuit and LED indication for 'Power', 'Run' and the status of each activated gate switch.

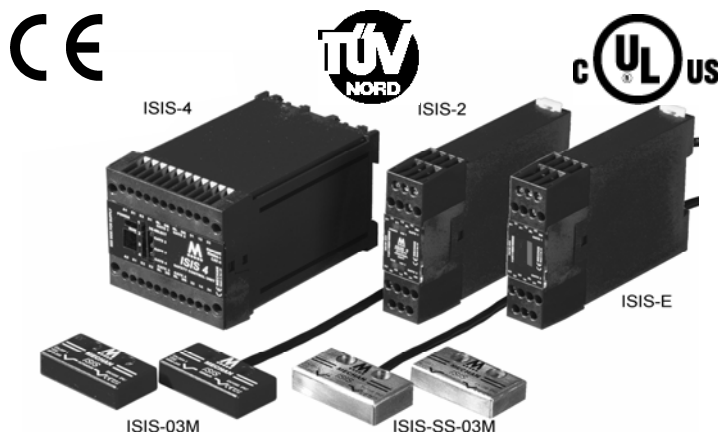
ISIS-E - Extender Module

The ISIS-E Extender module is a 24V ac/dc unit that can be added to either the ISIS-4 or ISIS-2 to monitor an additional 5 ISIS safety switches. Connection to the main control unit is by a simple 2-wire bus connection. The status of each guard switch is shown by the YELLOW LED's. Additional ISIS-E extender modules can be added to monitor larger systems.

ISIS-03M / ISIS-SS-03M - Safety Switches

The ISIS safety switches are non-contact, tamper resistant safety switches. Resin encapsulated into an ABS or Stainless Steel case providing environmental protection to IP67, the switches can withstand most conditions including: water, dust and high pressure hose cleaning.

The 2-wire connection to each safety switch is monitored by the control unit, detecting both open and short circuit faults immediately and returning the control unit to the off state even if the gate is not operated.



APPLICATIONS

Interlocked guards where door locking is not required. Food and Beverage packing/filling systems; Dairy, Pharmaceutical, Paper Industry, Can Forming and Filling, (Aluminum, Steel, Plastic), Semiconductor Manufacture/ Assembly. Concrete Block Manufacture.

APPROVALS

| | |
|-----|--|
| CE | Complies with the relevant sections of the CE marking directive. |
| UL | Tested by the Underwriters Laboratories, USA, to comply with the relevant USA and Canadian requirements. UL 508 Industrial Control |
| TUV | CAT 3 SIL 3 PL |

EUROPEAN DIRECTIVES

| |
|---|
| Machinery Directive 2006/42/EC |
| Low Voltage Directive 2006/95/EC |
| Electromagnetic Compatibility Directive 2004/108/EC |

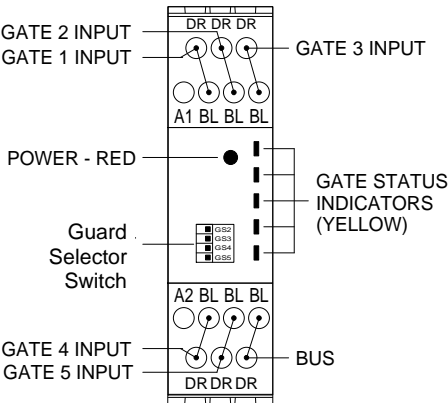
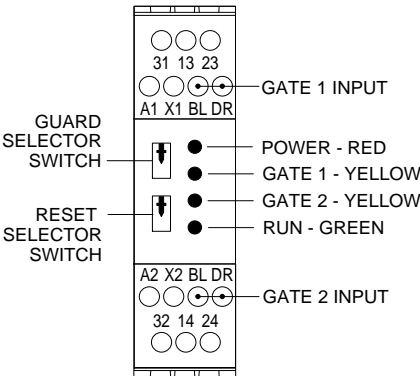
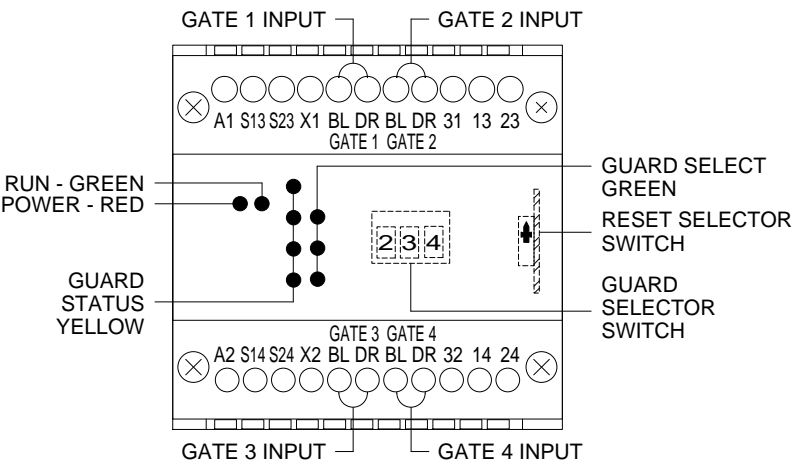
EUROPEAN STANDARDS

| | |
|----------------|--|
| EN ISO 13849-1 | Safety of Machinery - Safety related parts of control systems |
| EN ISO 62061 | Safety of Machinery - Functional safety of safety related electrical, and electronic and programmable electronic control systems |
| EN 60204 | Safety of Machinery - Electrical equipment of machines. |
| EN 1088 | Interlocking devices associated with guards. |
| EN 60947-5-1 | Low voltage switchgear and control gear. |
| EN 60947-5-3 | Safety of Machinery - Specification for low voltage switchgear and control gear. |

CERTIFICATE OF CONFORMITY

A certificate of conformity can be supplied covering Mechan non-contact safety switch equipment. Call our technical help-line on +44 (0)1695 722264

PRODUCT IDENTIFICATION AND TERMINAL LAYOUT



| ISIS-4 TERMINAL INFORMATION | |
|------------------------------|--|
| TERMINAL NUMBER | DESCRIPTION |
| A1 ; A2 | Power Supply |
| S13 ; S14 | E-Stop / Mechanical Safety Input—Channel 1 |
| S23 ; S24 | E-Stop / Mechanical Safety Input—Channel 2 |
| X1 ; X2 | External Proving / Reset |
| BL ; DR - Gate inputs 1 to 4 | Guard Switch Inputs |
| 13 ; 14 | N/O Safety Contact 1 |
| 23 ; 24 | N/O Safety Contact 2 |
| 31 ; 32 | N/C Auxiliary Contact |

| ISIS-2 TERMINAL INFORMATION | |
|-----------------------------|--------------------------|
| TERMINAL NUMBER | DESCRIPTION |
| A1 ; A2 | Power Supply |
| X1 ; X2 | External Proving / Reset |
| BL ; DR - Gate inputs 1 & 2 | Guard Switch Inputs |
| 13 ; 14 | N/O Safety Contact 1 |
| 23 ; 24 | N/O Safety Contact 2 |
| 31 ; 32 | N/C Auxiliary Contact |

| ISIS-E TERMINAL INFORMATION | |
|------------------------------|-------------------------------------|
| TERMINAL NUMBER | DESCRIPTION |
| A1 ; A2 | Power Supply |
| BL ; DR - Gate inputs 1 to 5 | Guard Switch Inputs |
| BL ; DR - BUS | Bus connection to main control unit |

SYSTEM INSTALLATION

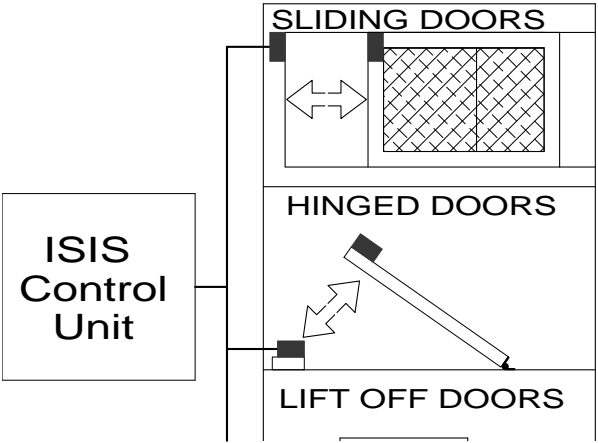
This installation guide is to help trained personnel to install the ISIS non-contact safety switch system.

The ISIS system is suitable for most types of machine guarding applications where guard locking is not required. The safety switches can be fitted to sliding, hinged or removable machine guards.

Comprising of a Safety Control Unit (ISIS-4 / ISIS-2 / ISIS-E) and one or more Safety Switch and Actuators, systems can easily be assembled to monitor 30+ machine guards whilst retaining the high control category performance required in many applications. (CAT 3 according to EN954-1)

To assemble the system, mount the control unit in a suitably IP rated control panel (Min IP54) and fix the safety switches to the gates as shown. Connect the safety switches to the control unit. Using the appropriate selection table set the required active gate inputs and reset options.

IMPORTANT :

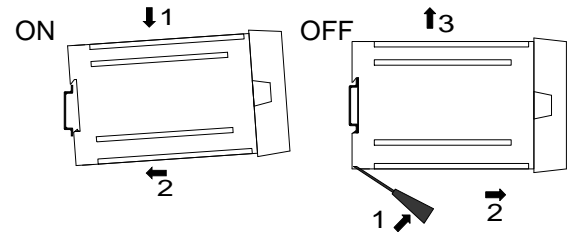


FITTING THE CONTROL UNIT

The ISIS control units are designed to fit standard 35mm symmetric DIN rail.

TO FIT : Hook the unit onto the DIN rail (1) and gently push into place (2). The catch should hold the unit securely in place.

TO REMOVE: Place the tip of a small screwdriver into the white catch at the bottom of the box (1) and gently lever out. This releases the retaining clip and allows the unit to be tilted (2) and removed (3).

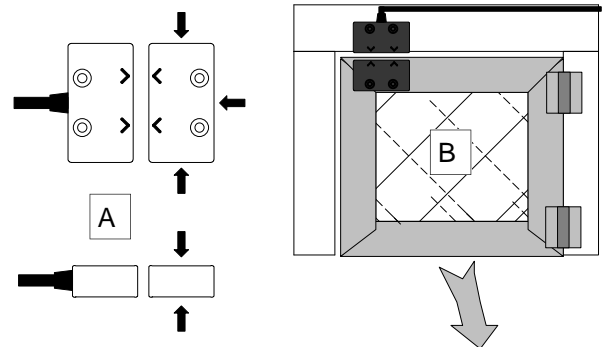


FITTING THE SAFETY SWITCHES

The ISIS safety switch sensors have 2 pre-drilled fixing holes and are supplied with M4 x 20mm TORX Tamper Proof fixing screws. (see page 7 for dimension details)

The gate switches can approach each other from any angle (A), but must end up with the arrows on the printed face pointing towards each other. Mount the fixed part of the safety switch to the machine frame and the actuator on to the opening edge of the door (B).

For the best results, mount the sensors with a gap of approximately 1mm. when the guard is closed. This gives a high level of lateral tolerance to allow for 'gate sag' and freedom from nuisance tripping due to machine / guard vibration.



CONNECTING SWITCHES TO THE CONTROL UNIT

The ISIS safety switches are supplied with 3 or 5 metres of cable encapsulated into the fixed switch. This ensures a completely water-tight connection at the switch.

Cables can be extended using the same type of screened cable.

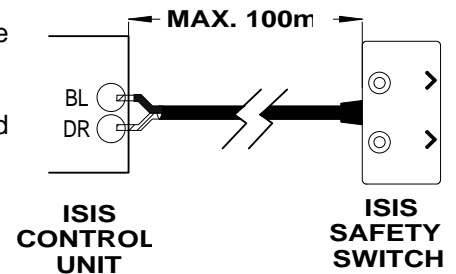
Run the cable back to the control unit through cable protection (if required) and terminate into the appropriate control unit input channel.

Follow the colour coding of the wires to the labels on the control unit input terminals.

i.e. BLUE wire to BL and DRAIN wire to DR.

NOTE : High Temp Switches use Blue wire to BL & Brown wire to DR

Longer cable lengths are available to order.



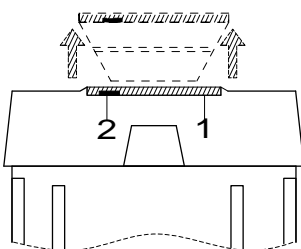
IMPORTANT: Use the GATE inputs in sequence. Examples:

One Guard System—Use input 1 on the ISIS-2 (Or input 1 on the ISIS-4 if E-Stop function required);

Three Guard System—Use inputs 1, 2 & 3 on the ISIS-4;

Seven Guard System—Use inputs 1,2 & 3 for Guard Switches on the ISIS-4 and Input 4 to connect to the ISIS-E Extender module Bus connection. Then use inputs 1,2,3 & 4 on the ISIS-E

GUARD SELECTOR & RESET SWITCHES



The central part of the ISIS control unit lid (1) is removable. Using a small screwdriver in the recess (2) gently prise the lid upwards. This allows access to the Automatic/Manual monitored Reset switch and the Guard Selector Switch.

Using the table next to the relevant control unit overleaf, set the ISIS control unit to the required number of guard switch inputs and type of reset required.

IMPORTANT:

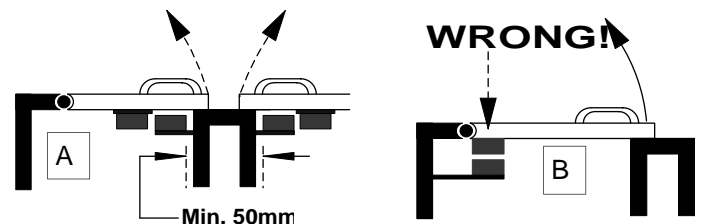
The number of inputs (safety switches) must match the gate selector setting. Any incorrect setting will stop the system from operating correctly.

APPLICATION NOTES

1) Always try to mount the safety switch on non-ferrous material. Ferrous materials will reduce the switching distance.

2) Leave a minimum 50mm gap between actuators. (A)

3) Avoid mounting the safety switch on the hinged side of the door, as this may allow the door to be opened too far before the switch de-activates. (B)



ISIS-4 CONNECTIONS

POWER SUPPLY : 24Vac/dc ; 110Vac or 230Vac

POWER SUPPLY FUSING : Internal resetable fuse with 2 second delay after fault removal.

INDICATION : RED - Power On; GREEN - Run.
YELLOW - Guard Status indicators.
GREEN - Guard Selected status.

GUARD SELECTION : See ISIS-4 switch table.

RE-SET & MONITORING : The X1, X2 circuit is for reset buttons and/or monitoring external contactors.

Set to **Manual Reset** (see table) a normally open momentary push button should be placed across X1 & X2. The push button must be pressed and released as it is monitored for short circuit faults.

Set to **Automatic Reset**, link X1, X2 and the system will reset when all active guards are closed.

To **Monitor External Contactors** (K1 & K2) place a normally closed contact off each contactor in series with X1 & X2 (with or without a reset button as required) If either K1 or K2 welds during operation, the other contactor will operate correctly and on the next demand on the safety system the X1 X2 circuit will prevent a restart. Use PGC relays for K1 & K2 if monitoring required.

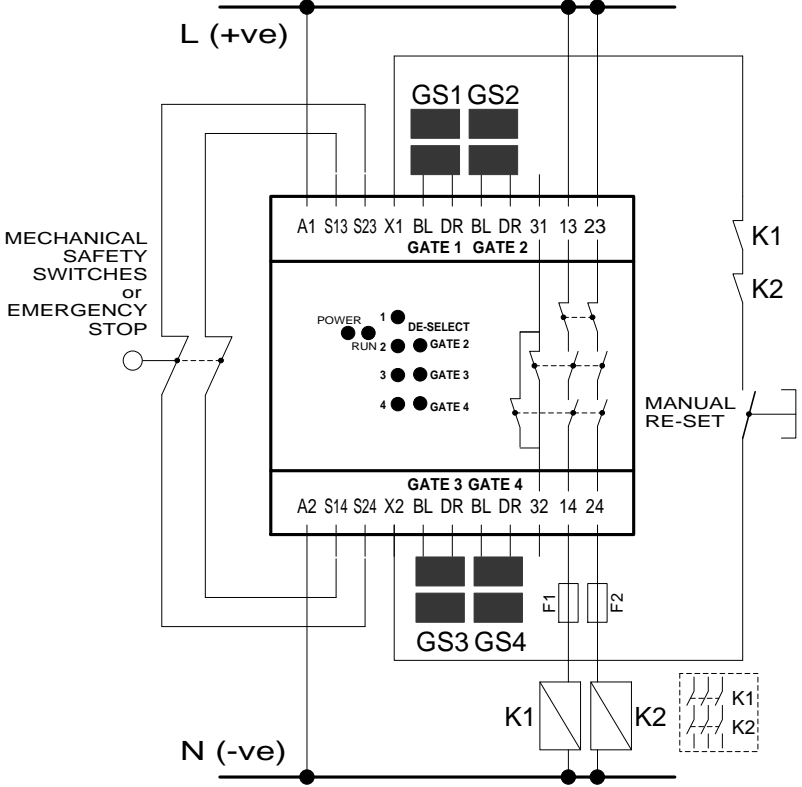
CONTROL CONTACTS : Two sets of positively guided N/O safety contacts on terminals, 13,14; and 23,24 (rating 4 Amps). One auxiliary N/C contact, (31-32). External fusing is recommended.

EMERGENCY STOP MONITORING : Dual channel emergency stop buttons and/or mechanical safety switches can be monitored using the S13/S14 & S23/S24 circuits. **If this feature is not used link terminals S13 to S14 and S23 to S24.**

OPERATION : When power is applied to the control module, the RED 'Power Led' will illuminate. The GREEN 'De-select' indicators will show how many guard switch inputs are activated. NOTE: The number of inputs selected must match the number of guard switches, more or less and the control unit will not operate. The YELLOW 'Guard status' indicators will be illuminated if the guard is closed or be permanently on if the guard is de-selected.

If all the monitored machine guards are closed, the EMERGENCY STOP buttons (when used) are re-set and the RE-SET button is pressed and released (Manual Re-set Option), the control relays will energize closing the normally open safety contacts on terminals 13,14 / 23,24 and the normally closed auxiliary contact 31 & 32 will open. The GREEN Run LED will illuminate. If set to automatic re-set (i.e. link in X1 & X2) the control relays will energize when all active guards are closed and the emergency stop button(s) are re-set. Faults on the safety switch cables, either open or short circuit will be detected immediately causing the control relays to de-energize.

Single faults on the Emergency stop contacts will be detected upon the next demand and will prevent a restart.



| ISIS-4 GUARD SELECTION SWITCH & INDICATION | | | | ISIS-4 RESET AND MONITORING SWITCH | |
|--|-----------------------------|-------------------------|--|------------------------------------|---|
| Guard Indication (Yellow) | De-select Indicator (Green) | Channel Selector Switch | Operation | Reset Switch Position | Operation |
| 1 | | | 1 Gate Operation—Yellow LED No. 1 will illuminate when gate switch 1 is closed. All other Yellow gate indicators will remain illuminated. No green LED's illuminated. | | Automatic Reset Link required between terminal X1 & X2. ISIS-4 will reset when all active guards are closed. |
| 2 | | | 2 Gate Operation—Yellow LED's 1 & 2 will illuminate when corresponding gate switch is closed. All other Yellow gate indicators will remain illuminated. Top green LED illuminated. | | |
| 3 | | | 3 Gate Operation—Yellow LED's 1, 2 & 3 will illuminate when corresponding gate switch is closed. All other Yellow gate indicators will remain illuminated. Top two green LED's illuminated | | Manual / Monitored Reset Requires a reset button in the X1—X2 connection. The system will reset when all |
| 4 | | | 4 Gate Operation—Yellow LED's 1, 2, 3 & 4 will | | |

ISIS-2 CONNECTIONS

POWER SUPPLY :
24Vac/dc

POWER SUPPLY FUSING :
Internal resetable fuse with 2 second delay after fault removal.

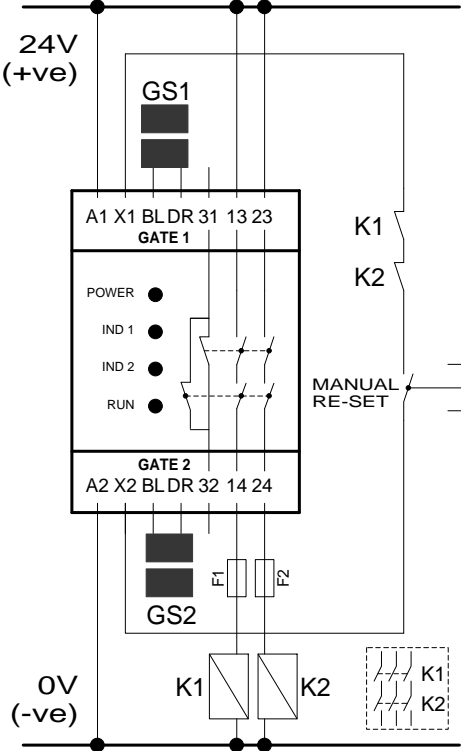
INDICATION :
RED - Power On.
GREEN - Run.
YELLOW - Guard Status.

GUARD SELECTION :
See ISIS-2 Guard selection chart.

RE-SET & MONITORING :
The X1, X2 circuit is for reset buttons and/or monitoring external contactors.
Set to **Manual Reset** (see table) a normally open momentary push button should be placed across X1 & X2. The push button must be pressed and released as it is monitored for short circuit faults.
Set to **Automatic Reset**, link X1, X2 and the system will reset when all active guards are closed.
To **Monitor External Contactors** (K1 & K2) place a normally closed contact off each contactor in series with X1 & X2 (with or without a reset button as required) If either K1 or K2 welds during operation, the other contactor will operate correctly and on the next demand on the safety system the X1 X2 circuit will prevent a restart. Use PGC relays for K1 & K2 if monitoring required.

CONTROL CONTACTS :
Two sets of positively guided N/O safety contacts on terminals, 13,14; and 23,24 (rating 4 Amps). One auxiliary N/C contact, (31-32). External fusing is recommended.

OPERATION :
When power is applied to the control module, the RED 'Power Led' will illuminate. The number of inputs selected must match the number of guard switches, more or less and the control unit will not operate. The YELLOW 'Guard status' indicators will be illuminated if the guard is closed or be permanently on if the guard is de-selected.
If all the monitored machine guards are closed and the RE-SET button is pressed and released (Manual Re-set Option), the control relays will energize closing the normally open safety contacts on terminals 13,14 / 23,24 and the normally closed auxiliary contact 31 & 32 will open. The GREEN Run LED will illuminate.
If set to automatic re-set (i.e. link in X1 & X2) the control relays will energize when all active guards are closed and the emergency stop button(s) are re-set. Faults on the safety switch cables, either open or short circuit will be detected immediately causing the control relays to de-energize.



IMPORTANT

On all ISIS safety control units use the guard inputs in sequence.

Always set the control unit guard selector switch to match the number of safety switches fitted

Any other setting may cause improper operation.

| ISIS-2 GUARD SELECTOR SWITCH & INDICATION | | |
|---|----------------------|---|
| Gate Indication Yellow | Gate Selector Switch | Operation |
| 1 2 | | 1 Gate Operation—Yellow LED No. 1 will illuminate when gate switch 1 is closed. Yellow LED No. 2 will remain illuminated. |
| 1 2 | | 2 Gate Operation—Yellow LED's 1 & 2 will illuminate when corresponding gate |

| ISIS-2 RESET AND MONITORING SWITCH | |
|------------------------------------|---|
| Reset Switch Position | Operation |
| | Automatic Reset Link required between terminal X1 & X2. ISIS-2 will reset when all active guards are closed. |
| | Manual / Monitored Reset Requires a reset button in the X1—X2 connection. The system will reset when all |

ISIS-E CONNECTIONS

POWER SUPPLY :

24Vac/dc

POWER SUPPLY FUSING :

Internal resettable fuse with 2 second delay after fault removal.

INDICATION :

RED - Power On.

YELLOW - guard status indicators.

GUARD SELECTION :

See ISIS-E Guard selection chart.

CONNECTION TO MAIN CONTROL UNIT:

The ISIS-E can be connected to any active guard switch input on an ISIS-2 or ISIS-4.

Connect the 2-wire BUS (BL DR) terminals on the ISIS-E module to any activated guard input on the main control module. (Max distance 100 metres)

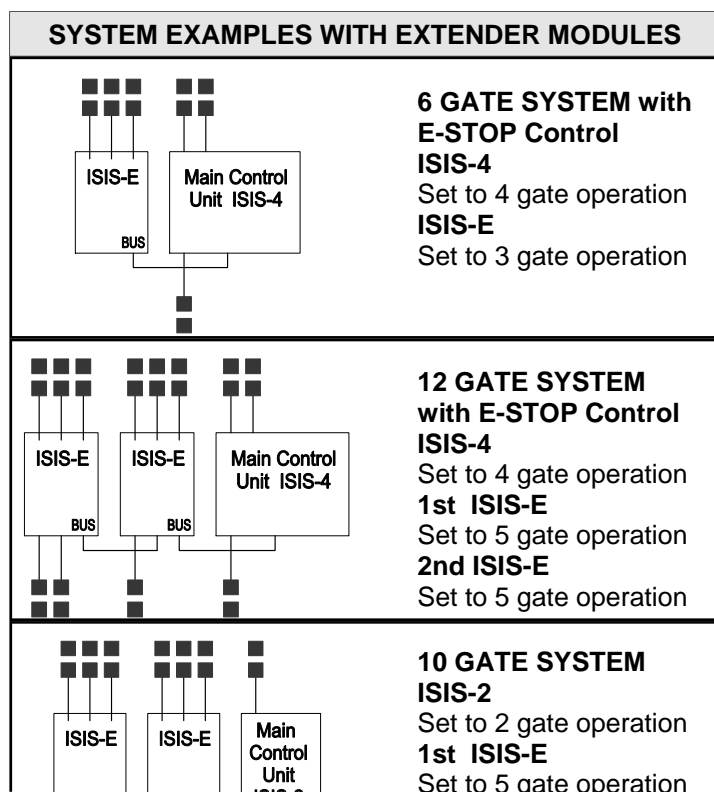
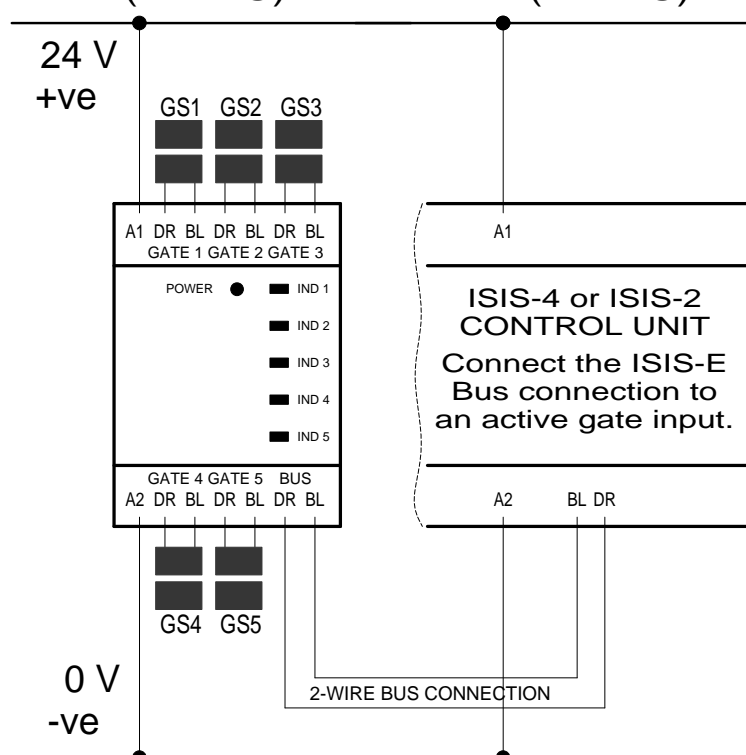
For larger systems further ISIS-E extender modules can be connected to active guard switch inputs on an ISIS-E extender module.

OPERATION :

When power is applied to the control module, the RED 'Power Led' will illuminate. The number of inputs selected must match the number of guard switches, more or less and the control unit will not operate. The YELLOW 'Guard status' indicators will be illuminated if the guard is closed or be permanently on if the guard is de-selected.

If all the monitored machine guards are closed and the RE-SET button is pressed and released on the main control unit, the control relays will energize and the normally open safety contacts on terminals 13,14 / 23,24 (main control unit) will close. The normally closed auxiliary contact 31 & 32 (main control unit) will open. If set to automatic re-set (i.e. link in X1 & X2) the control relays will energize when all active guards are closed and the emergency stop button(s) (if connected) are re-set. Faults on the safety switch cables, either open or short circuit will be detected immediately causing the control relays to de-energize.

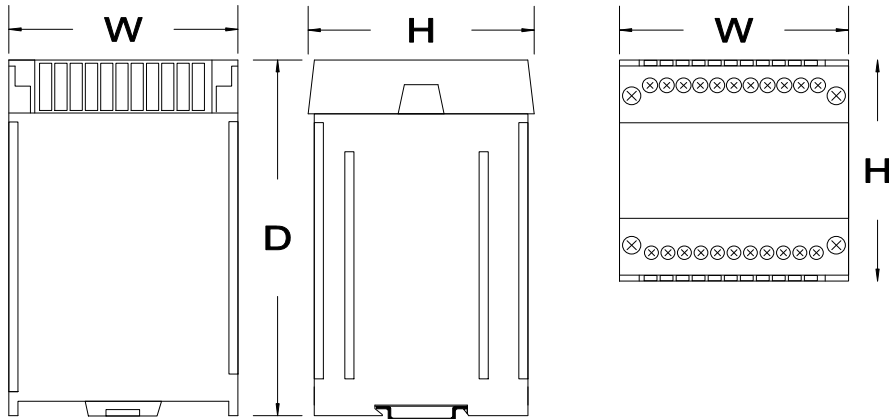
ISIS-E Extender Module ISIS Control Unit (24VDC)



| ISIS-E GUARD SELECTOR SWITCH & INDICATION | | |
|---|--|--|
| Guard Indication (Yellow) | Channel Selector Switch | Operation |
| <div> <div>IND 1</div> <div>IND 2</div> <div>IND 3</div> <div>IND 4</div> <div>IND 5</div> </div> | <div> <div>GS2</div> <div>GS3</div> <div>GS4</div> <div>GS5</div> </div> | 1 Gate Operation—Yellow LED No. 1 will illuminate when gate switch 1 is closed. All others gate indicators remain illuminated. |
| <div> <div>IND 1</div> <div>IND 2</div> <div>IND 3</div> <div>IND 4</div> <div>IND 5</div> </div> | <div> <div>GS2</div> <div>GS3</div> <div>GS4</div> <div>GS5</div> </div> | 2 Gate Operation—Yellow LED's 1&2 will illuminate when corresponding gate switch is closed. IND 3, 4 & 5 remain illuminated. |
| <div> <div>IND 1</div> <div>IND 2</div> <div>IND 3</div> <div>IND 4</div> <div>IND 5</div> </div> | <div> <div>GS2</div> <div>GS3</div> <div>GS4</div> <div>GS5</div> </div> | 3 Gate Operation—Yellow LED's 1,2 & 3 will illuminate corresponding gate switch is closed. IND 4 & 5 remain illuminated. |
| <div> <div>IND 1</div> <div>IND 2</div> <div>IND 3</div> <div>IND 4</div> <div>IND 5</div> </div> | <div> <div>GS2</div> <div>GS3</div> <div>GS4</div> <div>GS5</div> </div> | 4 Gate Operation—Yellow LED's 1,2,3 & 4 will illuminate when corresponding gate switch is closed. IND 5 remains illuminated. |
| <div> <div>IND 1</div> <div>IND 2</div> <div>IND 3</div> <div>IND 4</div> <div>IND 5</div> </div> | <div> <div>GS2</div> <div>GS3</div> <div>GS4</div> </div> | 5 Gate Operation—Yellow LED's 1,2,3,4 & 5 will illuminate when corresponding gate switch is |

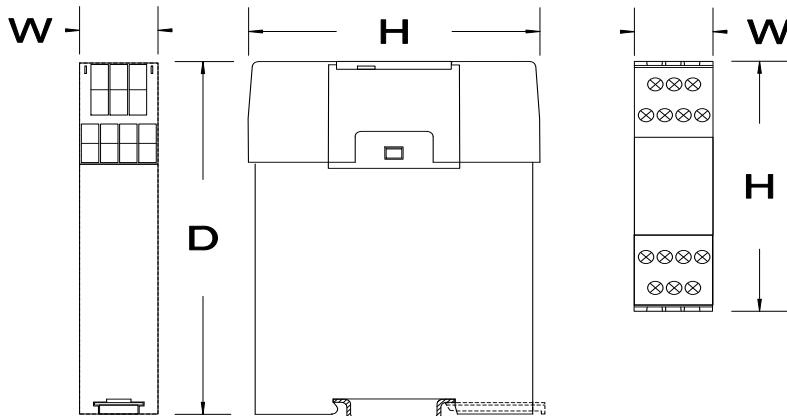
DIMENSIONS

ISIS-4 (all voltages)



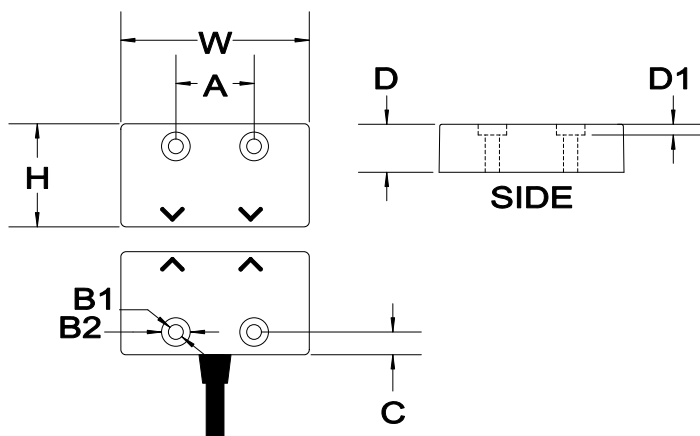
| Dimensions | |
|------------------|-------------------------|
| | ISIS-4 (mm / inches) |
| W | 75 / 2.95 |
| H | 74 / 2.91 |
| D | 119 / 4.68 |
| Information only | |

ISIS-2 & ISIS-E



| Dimensions | |
|------------------|----------------------------------|
| | ISIS-2 & ISIS-E (mm / inches) |
| W | 22.5 / 0.88 |
| H | 84 / 3.3 |
| D | 119 / 4.68 |
| Information only | |

ISIS SAFETY SWITCHES ABS / STAINLESS STEEL



| Dimensions | | |
|------------------|---------------------------|------------------------------|
| | ISIS-03M (mm / inches) | ISIS-SS-03M (mm / inches) |
| H | 28 / 1.1 | 29 / 1.14 |
| W | 52 / 2.04 | 53 / 2.08 |
| D | 14 / 0.55 | 13.5 / 0.53 |
| D1 | 3 / 0.11 | 3 / 0.11 |
| A | 22 / 0.86 | 22 / 0.86 |
| B1 | 4.2 / 0.16 dia. | 4.2 / 0.16 dia. |
| B2 | 8.1 / 0.32 dia. | 8.1 / 0.32 dia. |
| C | 6.4 / 0.25 | 6.4 / 0.25 |
| Information only | | |

TECHNICAL INFORMATION

| SPECIFICATIONS | ISIS CONTROL UNITS | | | ISIS SAFETY SWITCHES | |
|-------------------------------------|--|----------|-------------------------|---|------------------------|
| | ISIS-4 | ISIS-2 | ISIS-E | ISIS-03M / 05M | ISIS-SS-03M |
| Supply nominal voltage | 24Vac/dc 110 or 230Vac | 24Vac/dc | 24Vac/dc | - | - |
| Nominal power consumption | 6VA | 3VA | 3VA | - | - |
| Safety contacts | 2 x N/O | | - | - | - |
| Auxiliary contact | 1 x N/C | | - | - | - |
| Output contact rating (max) | 4A/230Vac; 2A/24Vdc(Res.)@Cos=1 | | - | - | - |
| Output contact rating (min) | 10V/10mA | | - | - | - |
| Output contact fuse rating | AC=5A; DC=2.5A; Quick blow | | - | - | - |
| Drop out time | Deactivation by sensor 13ms | | - | - | - |
| Nominal voltage across BL/DR sensor | ON: 4V; OFF 0 to 10Vdc | | | | |
| Internal fuse | 500mA Resettable | | | - | - |
| Internal fuse recovery time | >2 Seconds | | | - | - |
| Internal switches | Active gate selector; Manual or Monitored reset selection | | Active gate selector | - | - |
| Max conductor size | 1 x 2.5mm stranded with sleeves, 1 x 4mm solid | | | - | - |
| Installation group (Control unit) | C in accordance with VDE0110 | | | - | - |
| Contamination level | III | | | | |
| Vibration resistance | Amplitude 2mm, frequency 10 to 55 Hz | | | - | |
| Enclosure protection | Housing IP40, Terminals IP20 | | | IP67 | |
| Switching distance | - | - | - | 5-7mm ON; 8-12mm OFF | |
| Minimum gap | | | | 1mm | |
| Cable length | | | | 3 or 5 metres (Max 100 metres) | |
| Operating temperature | -10C to +55C (85% Humidity max) | | | -10C to +55C -10C to + 125C (SS High Temp.) | |
| Storage temperature | -20C to +60C | | | -20C to +60C | |
| Housing material | Polycarbonate Red | | | ABS Red | 316 Stainless Steel |
| Mounting / Fixing | 35mm Symmetric DIN Rail | | | 22mm Centres; M4 security screws supplied Tightening torque 1.0NM | |
| Weight (AC/DC) (3m/5m) | 575g max. | 183g | 135g | 207g max | 265g |
| Dimensions | See page 7 | | | | |

| Safety Related Data | |
|--------------------------------------|---|
| PL In accordance with EN ISO 13949-1 | PL e, CAT 3 |
| SIL In accordance with EN ISO 62061 | SIL 3 |
| PFHd in accordance with EN ISO 62061 | 3.37×10^{-8} |
| PFH | 5.63×10^{-8} |
| B10d | 2,000,000 |
| MTTFd | High > 100 Years (Based on usage rate of 360 days/year, 24 hours/day, 10 operations/hour |
| TM (Mission Time) | 20 Years |
| DC | 99% |
| SFF | 99.4% |
| | |

Document Number : 370-400v13