
MACHINERY SAFETY SYSTEMS

# MULTIFUNCTION SAFETY UNIT
## (MFU) 011-155

# INSTALLATION GUIDE

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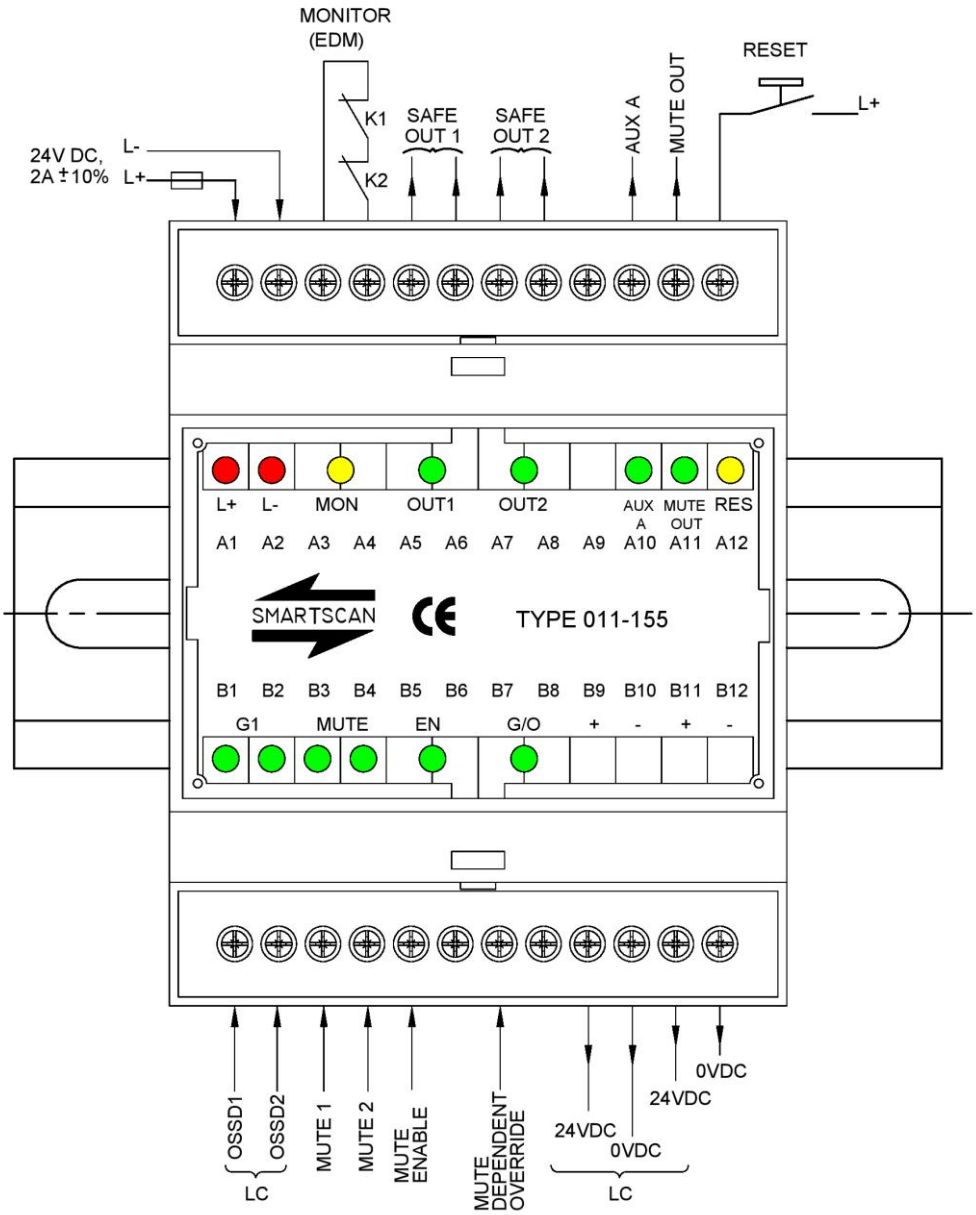
## Important!

Failure to read and follow the instructions provided on the Installation Sheet and Installation Guide can lead to the incorrect application or use of the multifunction safety unit (MFU) 011-155. This could lead to personal injury and damage to equipment. All applicable machine safety standards and regulations should be taken into account when installing the multifunction safety unit (MFU) 011-155 or any machine safety product.

The Installation Sheet and Installation Guide can be downloaded from our web site at www.smartscan.co.uk

The MFU 011-155 Installation Guide (CD224) is subject to change without notice. Smartscan Ltd shall not be held responsible for technical errors, editorial errors or omissions contained herein, nor for incidental or consequential damages resulting from the use of this material.

## Multifunction Safety Unit (MFU) 011-155




## Status / Diagnostic Indicators

| Function | Colour | Status |
|---|---|---|
| Inputs | Green | LED on when input on |
| Outputs | Green | LED on when output on |
| Reset | Amber | LED on when reset input is on |
| Guard override | Green | LED on when override input is on |
| EDM | Amber | LED on when EDM inputs are active |
| Diagnostic indicators | Red<br>+ Red | Flashing On /Off = System ok<br>Steady On = Lockout<br>A1 off and A2 on = Mute fault<br>A1 on and A2 Flashing = EDM fault<br>A2 on and A1 Flashing = MDO fault |

## Features – (MFU) 011-155

- Dual safety inputs for connecting the safety light curtain.
- Dual inputs for muting the safety light curtain.
- 3rd mute input (mute enable) for increased safety integrity.
- Safety monitored output relays. Contacts rated at 250V AC, 2A.
- Monitored electronic output for mute indication.
- Auxiliary non-safety PNP output
- Manual reset control function.
- External Device Monitoring (EDM).
- LED indicators for all inputs and outputs.
- Mute Dependent Override (MDO).
- Electronic solid state PNP output for status indication.
- Simultaneous monitoring between related channels.
- Built to EN ISO 13849 PL e.

## Specification – (MFU) 011-155

| Specification | (MFU) 011-155 |
|---|---|
| Response time | 20ms |
| Operating temperature | 0° to +50°C |
| Enclosure rating | IP40 |
| Enclosure | (H x W x D) 90 x 70 x 60mm<br>DIN rail mounting 35mm x 7.5mm |
| Power supply requirements | 24V DC ± 10% regulated |
| Current consumption | 120mA (NO LOAD) |
| Status indicators | LEDs for all inputs and outputs |
| Classification | EN 62061 SIL 3, EN ISO 13849 PL e |

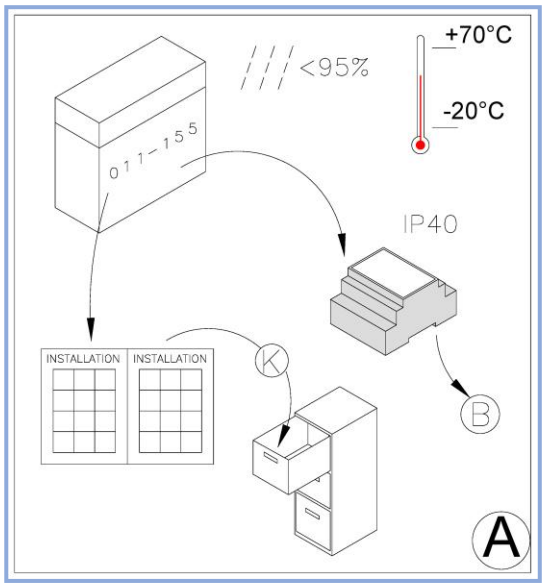
| Inputs | |
|---|---|
| Dual inputs for light curtain | 24V DC = On, 0V DC = Off |
| Dual inputs for mute sensors | 24V DC = On, 0V DC = Off |
| 3rd mute input (mute enable) | 24V DC = On, 0V DC = Off<br>Mute permissive |
| External device monitoring (EDM) | Use voltage free switch contacts (normally closed) |
| Reset function | 24V DC (Momentarily) = On |
| Mute Dependent Override | 24V DC = On |

| Outputs | |
|---|---|
| Safety output relays | 2 x Normally open - fail safe contacts (Safe out 1 and Safe out 2), each rated at 250V AC, 2A |
| Auxiliary solid-state switch (non-safety) | Electronic output switch, rated at 24V DC, 500mA |
| Auxiliary solid-state switch for mute indication | Electronic output switch, rated at 24V DC, 500mA |

**Installation Sheet (CD255/170321)**

## Figure A - Unpacking

- Remove all packaging material and retain it.
- Locate and keep the delivery note.
- Inspect all items for transit damage.
- Match goods supplied to those specified on the delivery note.
- Keep the Installation Sheet in a safe place.




Each unit supplied would normally include:

- MFU 011-155 unit
- Installation sheet
- Service/ repair questionnaire form

Storage requirements:

- Humidity - <95%
- Temperature range between –20°C and +70°C

## Figure B - Mounting

MFU 011-155 has a protection rating of IP 40. The control unit is designed for DIN rail mounting (35mm) inside a suitable control enclosure.

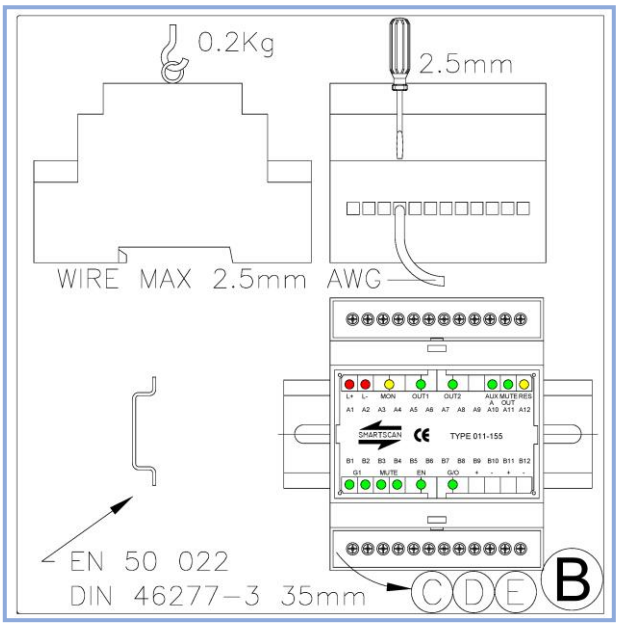


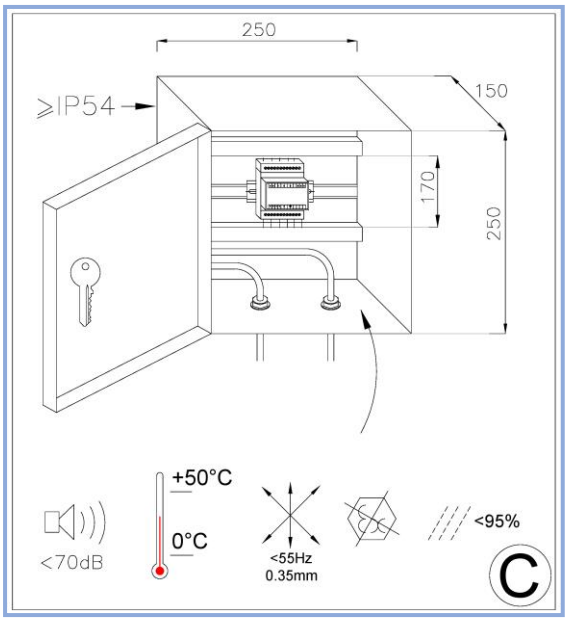
**Figure C – Control Enclosure and Operation**

It is recommended that the control enclosure must have a minimum protection rating of IP54.

Ensure the allotted space for the 011-155 inside the control enclosure satisfies the dimensions as specified in Fig. C.

Operating requirements

- Humidity <95%
- Temperature range between 0° C and 50 ° C
- Vibration: Frequency <55Hz Max. Movement <0.35mm
- Do not use the equipment in explosive atmospheres (Contact the manufacturer for further advice)




Before installation read and understand the Installation Sheet provided paying particular attention to the information provided in Figure E and H.

Every 6 months check the entire installation, regular maintainence helps keep the product in good condition and also provides an opportunity to record any modification, manipulation or change to the machine application. This allows for appropriate action including a new risk assessment.

**Figure D - Dimensions**

Shows the units dimensions (H x W x D) 90mm x 70mm x 58mm and technical label position.

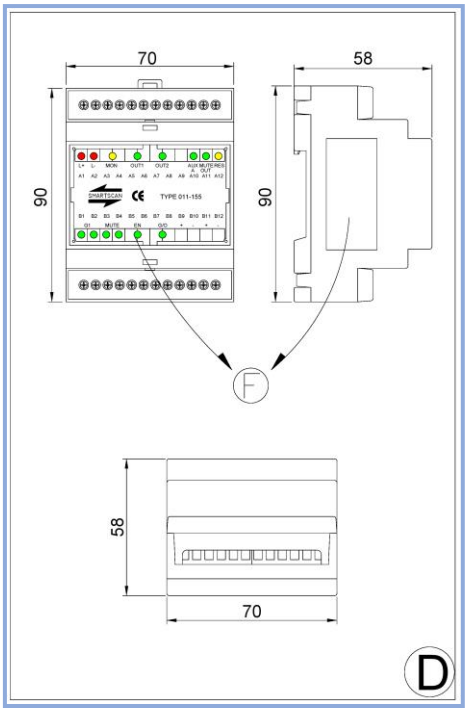
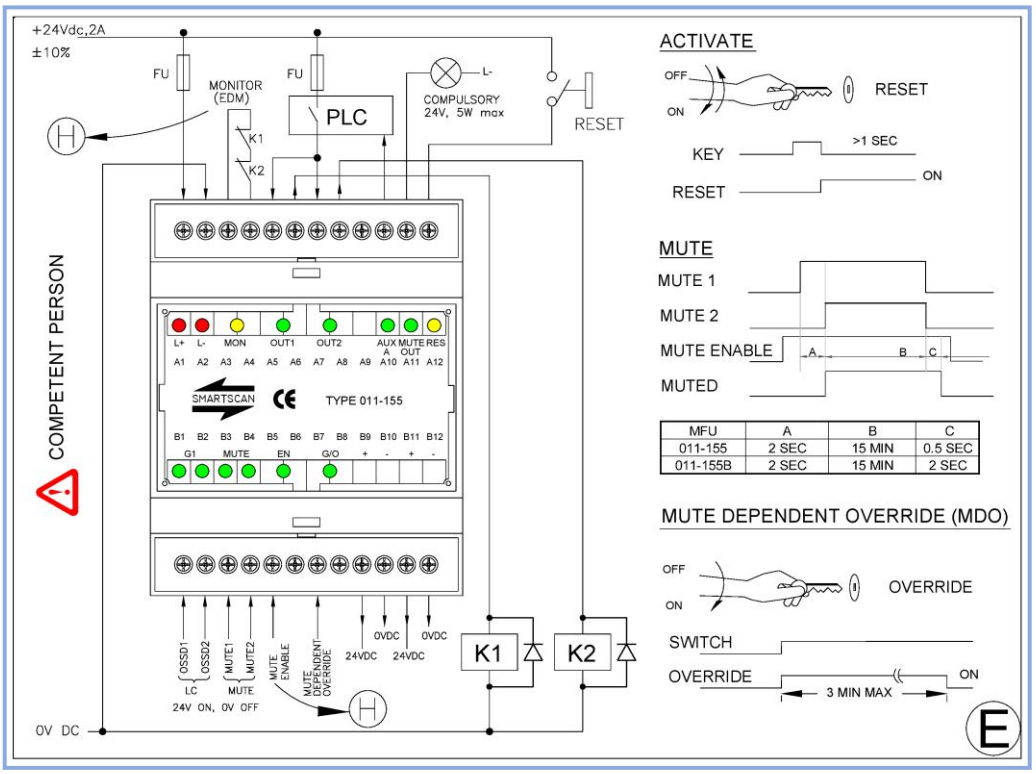


**Figure E – I/O Connections**




## MFU 011-155 Terminal wiring

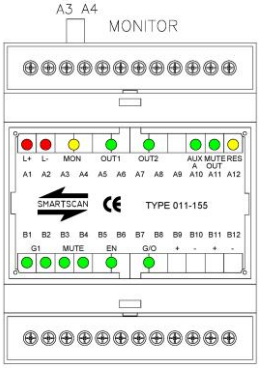
### Terminals A1 and A2 – Power supply input

Connect a suitably stabilised 24V DC ±10% power supply to terminals A1 = +24V DC and A2 = 0V DC. The current consumption of the MFU with no load applied on the output switching terminals is 120mA.

### Terminals A3 and A4 – External device monitor (EDM)

An External Device Monitoring input facility is provided for monitoring the external Final Switching Devices (FSDs) to ensure those devices respond in unison with the safety outputs each and every time the safety light curtain is interrupted. Failure of the external Final Switching Device (FSD) during monitoring will not allow the safety light curtain to reset.

The normally-closed contact from each FSD are wired in series and connected across terminals A3 and A4 of the MFU.




**Note**: If the EDM circuit is not being used it is necessary to link terminals A3 to A4.

If the EDM connection between A3 and A4 is missing the MFU will be in a lockout condition. This condition is indicated by the A1 and A2 LEDs both flashing on and off in unison. To reset the MFU from a lockout condition it is necessary to recycle power.

**Terminals A5 and A6 – Safety output 1 switch contact**
Connect terminals A5 and A6 to channel 1 of the machine's stop circuitry, for example, via an external power-switching relay, directly to a safe PLC input or a machines final control element.

**Terminals A7 and A8 – Safety output 2 switch contact**
Connect terminals A7 and A8 to channel 2 of the machine's stop circuitry, for example, via an external power-switching relay, directly to a safe PLC input or a machines final control element.

If a single channel safety circuit is used link terminals A6 and A7. Terminals A5 and A8 are then connected to the machine's safety circuit. Connecting in this way links safety output switch 1 and safety output switch 2 in a series configuration.

**Terminal A9 – No connection**

**Terminal A10 – Auxiliary electronic switching output**
This Auxiliary solid state PNP switching output should only be used for non-safety critical applications, for example connecting an indicator lamp or as feedback to a PLC to confirm the safety outputs have de-energised.

Auxiliary output energises when safety output switches 1 and 2 energise and both de-energise when the safety outputs de-energise. Auxiliary outputs ON = 24V DC and OFF = 0V DC.

**Terminal A11 – Auxiliary electronic switch – (mute out)**
The Mute Out is a solid state monitored PNP output which energises when the MFU is in mute condition, e.g. when mute signals have been applied to terminals B3, B4 and B5. This output is for connection of a 24V DC 5W filament lamp. The lamp will illuminate when the safety light curtain is in a muted condition.

> **Note**: The MUTE OUT is monitored by the MFU and it must have a 24V, 5 watt filament lamp connected between A11 and 0V for the MFU to work.

**Terminal A12 – Reset**
A suitable switch should be connected between terminals A12 and +24V DC. The reset switch must be of the type Normally Open spring-return contact block, either push button or key switch, depending on the customer's risk assessment.

The MFU's safety output switches will re-energise when the reset switch is pressed and then released. The MFU will only reset on the trailing edge of the reset signal.

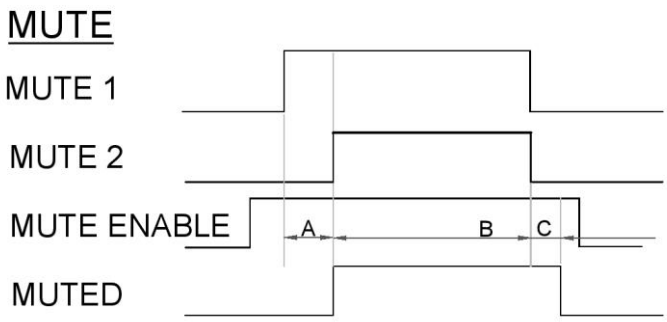
**Terminal B1 and B2 – light curtain inputs (OSSD1 and OSSD2)**
Connect the electronic output switches (OSSD1 and OSSD2) of a safety light curtain to terminals B1 and B2 respectively.

> **Note**: An internal circuit monitors disparity between the two input channels. If the inputs do not switch together (within 300ms of each other) the system will go into a lockout condition. To reset from a lockout condition, it is necessary to recycle the 24V DC supply from the MFU.

**Terminal B3 and B4 – mute input signals**
Connect suitable mute initiating signals to terminals B3 and B4 respectively. The two signals need to be independent of one another and at 24V DC. Mute signals override the light curtain so they should only be active during safe periods of the machine's operating cycle.

The two mute inputs to the MFU are monitored by the MFU in the form of a disparity check (A). If the inputs do not respond within 2 seconds of each other the system will trip.

The MFU can be muted up to a maximum of 15 minutes (B) before the mutes will time out. If the light curtain's sensing field is blocked during a time out then the MFU will trip, or if the sensing field is clear during a time out then the MFU will not trip but revert back to protect mode. To reinitiate the mute condition both mute inputs will need to be reactivated, that is remove 24V DC and reapply.




The MFU 011-155 has a delay-off timer (C) of 0.5 of a second to allow for the pallet load to clear the safety light curtain sensing field.

If the conveyor speed is slow, or it is a special application requirement the MFU 011-155B model provides a 2 second delay-off time.

| MFU | A | B | C |
|---|---|---|---|
| 011-155 | 2 SEC | 15 MIN | 0.5 SEC |
| 011-155B | 2 SEC | 15 MIN | 2 SEC |

**Terminals B5 –Third mute input (mute enable)**
This is a permissive signal for the Mutes inputs (B3 and B4) and is sometimes referred to as a Conveyor-run signal. In pallet entry/exit applications the input is typically connected to a conveyor 'run' signal thus initiating a mute condition only when the appropriate conveyor is running. It is a control system requirement that a conveyor 'run' signal be provided, so as to maintain a high level of safety integrity.

**Terminal B6 – no connection**

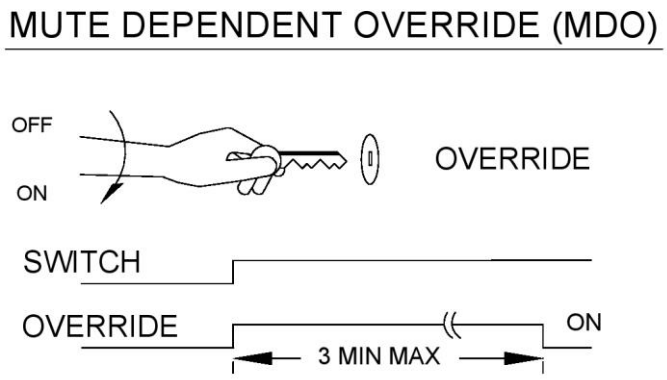
**Terminal B7 – Mute Dependent Override (MDO)**
For pallet entry/exit applications, should the MFU trip during a period when a pallet is transferring through the safety light curtain detection zone, it is necessary to remove the load from the sensing field of the light curtain before the MFU can be reset.

The MDO function is implemented by connecting a spring return normally open contact key or push button switch between terminal B7 and +24V DC.

The override function can only be operated if a pallet load is obstructing the detection zone and the safety light curtain is in a tripped condition.

Operate the override function as follows:

Activate and hold the override switch in the on position. This will automatically activate the MDO function, confirmed by the Mute Lamp in the on state, a maximum period of three minutes. The timer will turn off should the safety light curtain's sensing field become clear of the obstruction with mute lamp in the off condition, or the 3 minutes timer has timed out, or if the MDO switch has been released (deactivated).




During the MDO function if the blockage has not been cleared then the MDO function can be reactivated by turning the switch off and back to hold position. This will provide a further 3 minutes timer to remove the blockage.

If the safety light curtain has been configured as a self-muting light curtain for an entry/exit application then during the MDO function as soon as the sensing field is cleared from the blockage, the MFU/safety light curtain will revert back to protect mode and will continue to operate normally as a self-muting system.

**Terminals B9 and B11 – 24V DC supply**
Additional + 24V DC outputs for connecting to the safety light curtain etc.

**Terminals B10 and B12 – 0V DC supply**
Additional 0V DC outputs for connecting to the safety light curtain etc.

**Figure F – Facia and Technical Label**

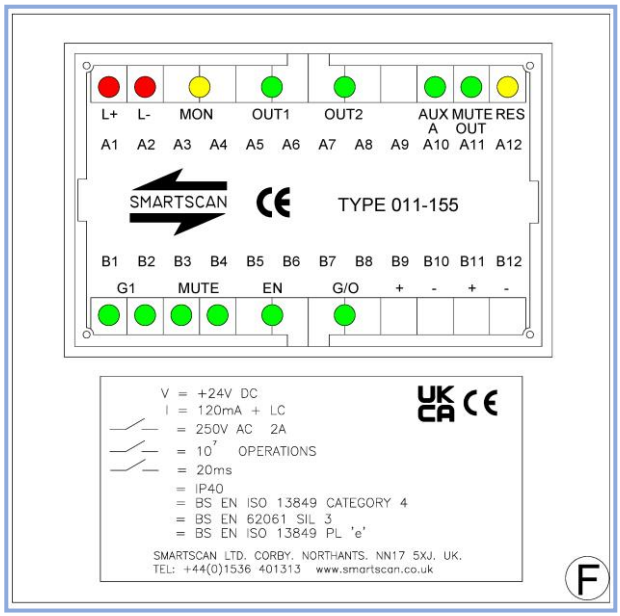



**Figure G – Manual Reset with Safety Light Curtain**

In applications where it is a possible for a person to stand between the safety light curtain and the danger then it is a requirement that the safety outputs cannot be reinstated without the operator first checking that the dangerous area is clear of personnel and therefore safe.

The reset switch must also be located so that the operator cannot reset the light curtain from inside the dangerous area.

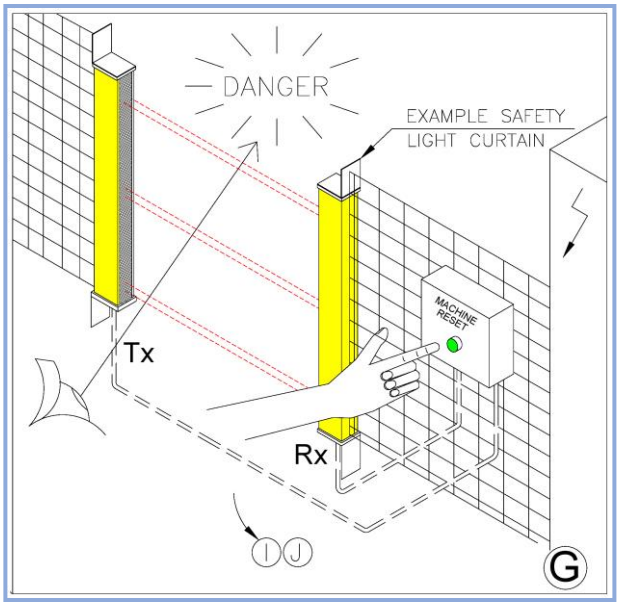


**Figure H – Function Selection/Override**

Shows terminal wiring for functions EDM monitor and Mute enable when not being used.

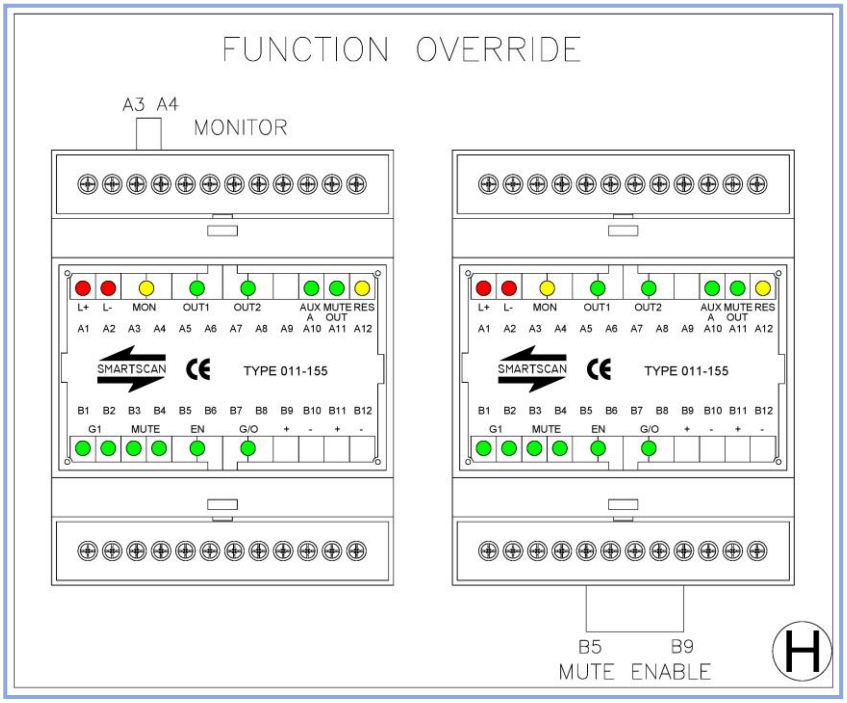
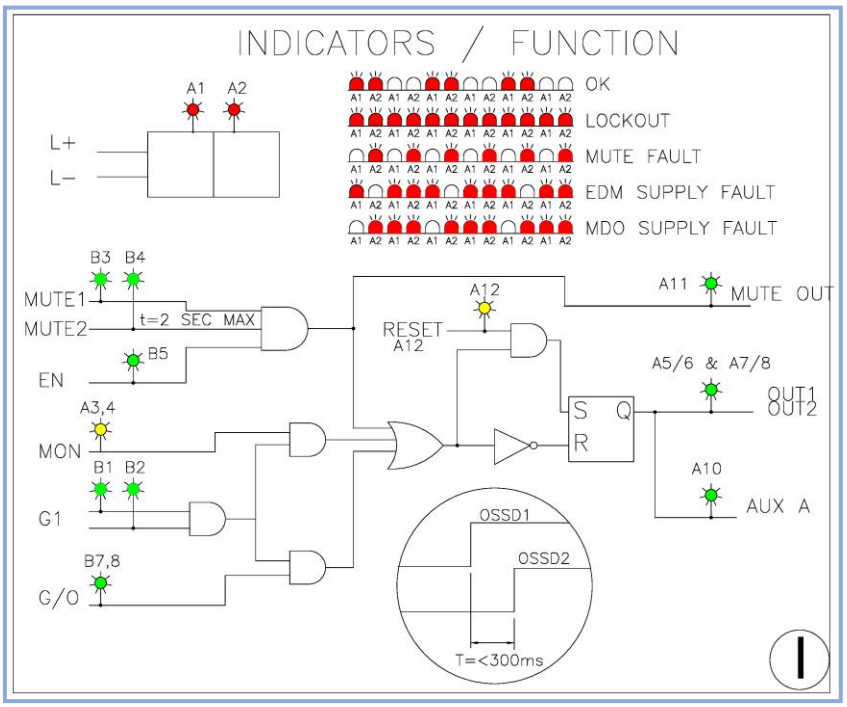
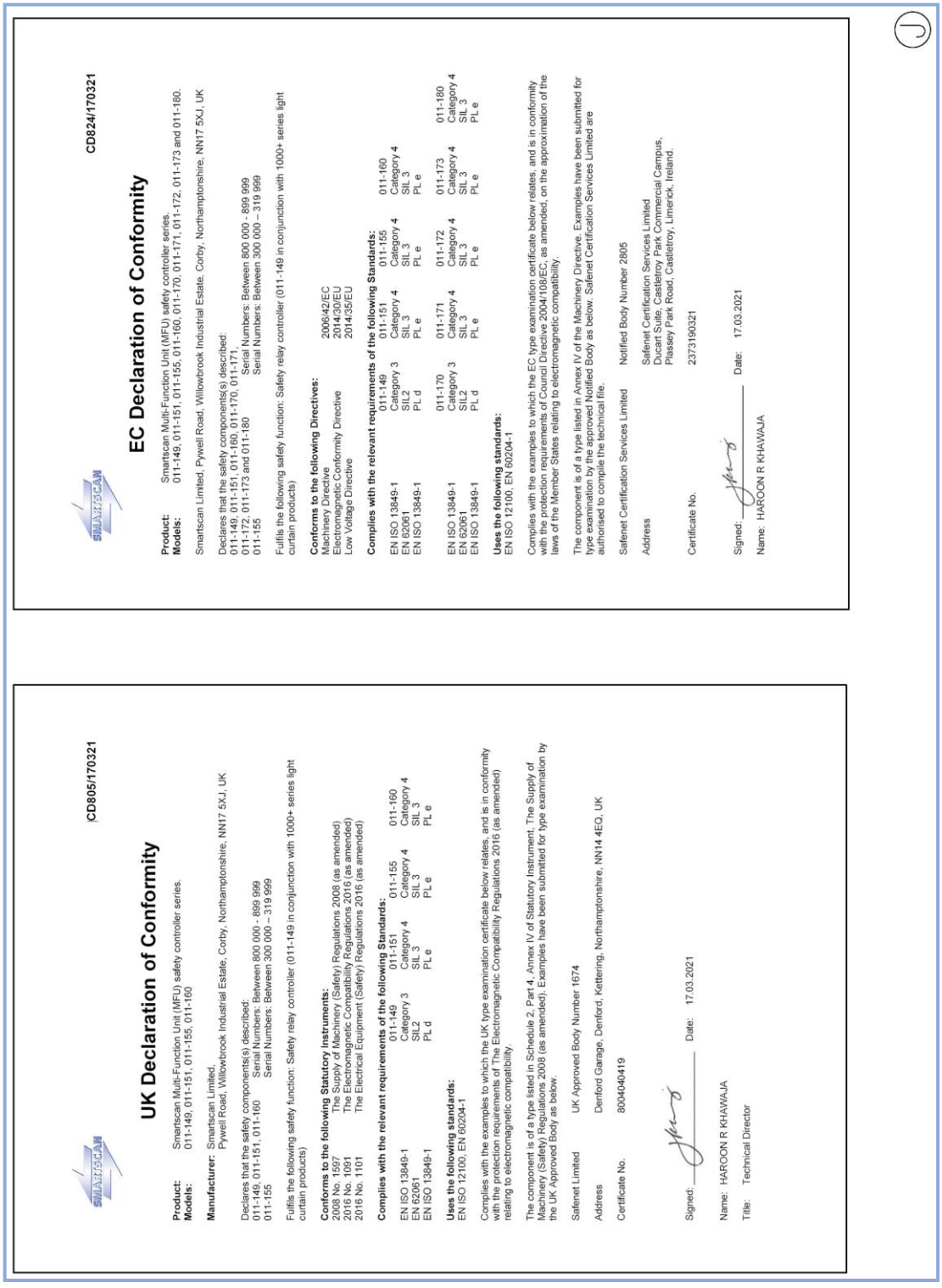



**Figure I- Status Indicators and Logic Functions**



## Figure J – EC Declaration of Conformity



CD824/170321

# EC Declaration of Conformity

**Product:** Smartscan Multi-Function Unit (MFU) safety controller series.
**Models:** 011-149, 011-151, 011-155, 011-160, 011-170, 011-171, 011-172, 011-173 and 011-180.

Smartscan Limited, Pywell Road, Willowbrook Industrial Estate, Corby, Northamptonshire, NN17 5XJ, UK

Declares that the safety components(s) described:
011-149, 011-151, 011-160, 011-170, 011-171,
011-172, 011-173 and 011-180 Serial Numbers: Between 800 000 - 899 999
011-155 Serial Numbers: Between 300 000 – 319 999

Fulfils the following safety function: Safety relay controller (011-149 in conjunction with 1000+ series light curtain products)

**Conforms to the following Directives:**

| | |
|---|---|
| Machinery Directive | 2006/42/EC |
| Electromagnetic Conformity Directive | 2014/30/EU |
| Low Voltage Directive | 2014/35/EU |

**Complies with the relevant requirements of the following Standards:**

| | 011-149 | 011-151 | 011-155 | 011-160 |
|---|---|---|---|---|
| EN ISO 13849-1 | Category 3 | Category 4 | Category 4 | Category 4 |
| EN 62061 | SIL2 | SIL 3 | SIL 3 | SIL 3 |
| EN ISO 13849-1 | PL d | PL e | PL e | PL e |

| | 011-170 | 011-171 | 011-172 | 011-173 | 011-180 |
|---|---|---|---|---|---|
| EN ISO 13849-1 | Category 3 | Category 4 | Category 4 | Category 4 | Category 4 |
| EN 62061 | SIL2 | SIL 3 | SIL 3 | SIL 3 | SIL 3 |
| EN ISO 13849-1 | PL d | PL e | PL e | PL e | PL e |

**Uses the following standards:**
EN ISO 12100, EN 60204-1

Complies with the examples to which the EC type examination certificate below relates, and is in conformity with the protection requirements of Council Directive 2004/108/EC, as amended, on the approximation of the laws of the Member States relating to electromagnetic compatibility.

The component is of a type listed in Annex IV of the Machinery Directive. Examples have been submitted for type examination by the approved Notified Body as below. Safenet Certification Services Limited are authorised to compile the technical file.

Safenet Certification Services Limited — Notified Body Number 2805

Address — Safenet Certification Services Limited
Ducart Suite, Castletroy Park Commercial Campus,
Plassey Park Road, Castletroy, Limerick, Ireland.

Certificate No. — 2373190321

Signed: _____ Date: 17.03.2021

Name: HAROON R KHAWAJA

CD805/170321

# UK Declaration of Conformity

**Product:** Smartscan Multi-Function Unit (MFU) safety controller series.
**Models:** 011-149, 011-151, 011-155, 011-160

**Manufacturer:** Smartscan Limited.
Pywell Road, Willowbrook Industrial Estate, Corby, Northamptonshire, NN17 5XJ, UK

Declares that the safety components(s) described:
011-149, 011-151, 011-160 Serial Numbers: Between 800 000 - 899 999
011-155 Serial Numbers: Between 300 000 – 319 999

Fulfils the following safety function: Safety relay controller (011-149 in conjunction with 1000+ series light curtain products)

**Conforms to the following Statutory Instruments:**

| | |
|---|---|
| 2008 No. 1597 | The Supply of Machinery (Safety) Regulations 2008 (as amended) |
| 2016 No. 1091 | The Electromagnetic Compatibility Regulations 2016 (as amended) |
| 2016 No. 1101 | The Electrical Equipment (Safety) Regulations 2016 (as amended) |

**Complies with the relevant requirements of the following Standards:**

| | 011-149 | 011-151 | 011-155 | 011-160 |
|---|---|---|---|---|
| EN ISO 13849-1 | Category 3 | Category 4 | Category 4 | Category 4 |
| EN 62061 | SIL2 | SIL 3 | SIL 3 | SIL 3 |
| EN ISO 13849-1 | PL d | PL e | PL e | PL e |

**Uses the following standards:**
EN ISO 12100, EN 60204-1

Complies with the examples to which the UK type examination certificate below relates, and is in conformity with the protection requirements of The Electromagnetic Compatibility Regulations 2016 (as amended) relating to electromagnetic compatibility.

The component is of a type listed in Schedule 2, Part 4, Annex IV of Statutory Instrument, The Supply of Machinery (Safety) Regulations 2008 (as amended). Examples have been submitted for type examination by the UK Approved Body as below.

Safenet Limited — UK Approved Body Number 1674

Address — Denford Garage, Denford, Kettering, Northamptonshire, NN14 4EQ, UK

Certificate No. — 8004040419

Signed: _____ Date: 17.03.2021

Name: HAROON R KHAWAJA

Title: Technical Director

**Figure K – Product Return Procedure**

If a fault occurs that cannot be resolved or the equipment is damaged return the equipment to the nearest Smartscan distributor or Smartscan Ltd. Indicate the nature of the fault and the symptoms displayed on the form provided for the Service/Repair Department.

Disposal of the product should be done in accordance with the regulations of the country where the product is used.

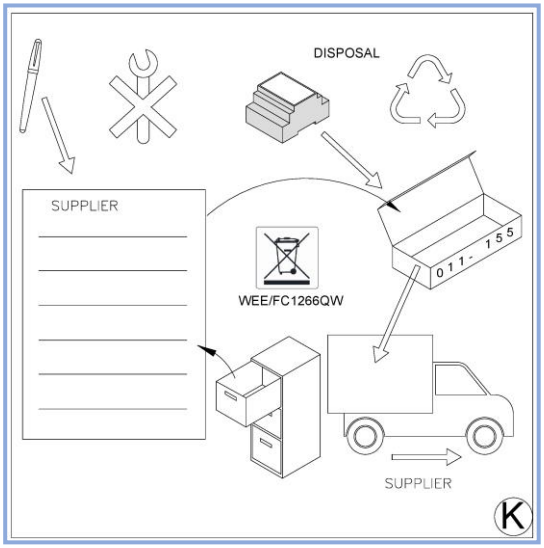


**Figure L - Glossary of Words and Language Translation**

| ENGLISH | DANSK | DEUTSCHE | DUTCH | FRANCAIS | ITALIANO | ESPAGNOL | SVENSKA |
|---|---|---|---|---|---|---|---|
| ACTIVE | Aktiv | Aktiv | Actief | Actif | Attivo | Activo | Aktiva |
| ACTIVATE | Aktiv | aktivieren | activeren | activer | attivazione | activar | aktivering |
| CATEGORY | Aktivere | kategorie | categorie | Catégorie | categoria | categoría | kategori |
| COMPULSORY | kategori | verpflichtend, vorgeschrieben | verplicht | obligatoire | obbligatorio | obligatorio | obligatorisk |
| CONTROL | obligatorisk | ausuerfergeraet | besturing | contrôle | controllo | controlar | kontroll |
| DANGER | kontrol | gefahr | gevaar | danger | pericolo | peligro | fara |
| DISPOSAL | fare | entfernen | weg doen | disposition | smaltimento | disposicion | slängas |
| ENABLE | rådighed | berührung | in staat stellen | activation | abilitazione | permitir | möjliggör |
| E-STOP | mulig | notstop | noodstop | arrêt d'urgence | arresto d'emergenza | paro de emergencia | nödstopp |
| EXAMPLE | e-stop | beispiele | voorbeelden | exemples | esempio | ejemplos | exempel |
| FAULT | eksempel | fehler | fout | défaut | guasto | incidente | fel |
| FUNCTION | fejl | funktion | functie | fonction | funzione | funcion | funktion |
| GUARD | funktion | sicherheit | beschermen | garde | proteggere | proteger | skydda |
| INDICATORS | sikkerhed | bewachen | indicator | indicateur | indicatore | indicador | indikering |
| INSTALLATION | indikation | anzeige | installatie | installation | installazione | instalacion | installation |
| INSTRUCTIONS | installation | installation | instructie | instructions | istruzioni | instrucciones | instruktion |
| LIGHT CURTAIN | instuktioner | instuktionen | lichtscherm | barrière | barriera ottica | cortina de seguridad | ljus barrier |
| LOCKOUT | Lysgitter | lichtgitter | systeem blokkering | blocage | bloccaggio | cierre | felsäkert läge |
| MACHINE | fejlmode | aussperren | machine | machine | macchina | máquina | maskin |
| MAX | maskine | Maschine | machine | maximum | massimo | maximo | max |
| MONITOR | maksimal | maximum | bewaking | surveillent | sorveglianza | el vigilar | overakande |
| MUTE | afløse | überwachung | overbruggen | muet | inibizione | mudo | förbikoppling |
| OFF | mute | stummer | uit | off | non attivo | apagado | från |
| ON | Slukke | aus | aan | on | attivo | en | till |
| OPERATIONS | Tænde | ein | in bedrijf | opération | funzionamento | operacion | drift |
| ORIGINAL | operation | in betrieb | originee | original | originale | original | ursprunglig |
| OUT | original | das Original | uit | hors / dehors/ extérieur | uscita | fuera | ut |
| OVERRIDE | ud | aus | overbrugging | enfoncer | esclusione automatismo | override | överstyrning |
| POWER | overstyre | ueberbrueken | vceelingsspanning | puissance | potenza | alimentacion | spänning |
| RELAY | forsyning | Spannung | relais | relais | rele | rele | rela |
| REPAIR | Relæ | relais | herstellen | réparation | riparazione | reparar | reparation |
| RESET | reparere | reparatur | reset | réinitialiser | Ripristina | Reiniciar | återställa |
| SAFETY | Nulstil | zurücksetzen | veiligheid | sécurité | sicurezza | seguridad | säkerhet |
| STATUS | sikkerhed | sicherheit | status | statut | stato | estado | status |
| SUPPLIER | sikkerhed | status | leverancier | fournisseur | fornitore | proveedor | leverantör |
| SWITCH | status | leverant | schakelaar | interrupteur | interruttore | interruptor | andra |
| USER | leverancier | schalter | gebruiker | | utilizzatore | usario | användare |
| WIRE | bruger | nutzer | draad | câble | filo | cable | tråd |
| | tråd | Draht | | | | | |

L

## Appendix 1 – **Important Safety Information**

- Ensure that the Smartscan Multifunction safety unit (MFU) is installed by a competent person using the installation information provided.
- All I/O functions must use the same source supply to the MFU (A1/A2).
- It is the responsibility of the employer that the Multifunction safety unit (MFU) is properly installed, operated and maintained as well as the suitable machinery on which the safety product is installed. All the applicable national and international legislation and technical standards for the corresponding machine application must be complied with including a Risk Assessment.
- The Multifunction safety unit (MFU) is only one element in the overall machine safety circuit, the whole machine safety control circuit must be a fail-safe design.
- Do not use equipment in explosive atmospheres (contact the manufacturer for further advice).
- Do not operate the machine/safety circuit until 2 seconds or more after power-up. The machine must be stopped by electrical control when using a safety light curtain.
- The stopping elements of the machine should be regularly checked to make sure the machine stop time performance is reliable and within the specified parameters. It must be possible to achieve a safe stop from any point in the dangerous part of the machine cycle.
- Do not repair, disassemble or modify the Smartscan Multifunction safety unit (MFU). Smartscan products can only be repaired by the manufacturer. Any work carried out on the product that is not done by the manufacturer will invalidate the warranty terms.
- The Smartscan Product installation sheet and installation guide do not provide instruction or operation information for the machine that it is integrated to.
- The Smartscan Product Installation instructions should be kept with the Multifunction safety unit (MFU) during its entire working life.
- Any wiring or re-wiring of the Multifunction safety unit (MFU) must be done with the power supply disconnected.
- The machine must be disconnected during electrical installation to ensure no inadvertent start-up of the machine occurs.

Appendix 2 **- Certifications**

Company

FM27829

Smartscan Limited has a certified quality assurance system in compliance with ISO 9001-2015. Certificate number FM27829.

Products

Smartscan safety light curtains are developed and manufactured in compliance with UK, European and International Legislation and Standards.

Smartscan products are Third Party approved by Safenet Limited, UK Approved Body number 1674 and Safenet Certification Services Limited, Notified Body number 2805.

**Notes**