MACHINERY SAFETY SYSTEMS

MULTIFUNCTION SAFETY UNIT
(MFU) 011-160

INSTALLATION GUIDE

Smartscan Ltd
Pywell Road
Willowbrook Industrial Estate
Corby
Northamptonshire
NN17 5XJ - England

Tel. +44 (0)1536 – 401 313
sales@smartscan.co.uk
www.smartscan.co.uk

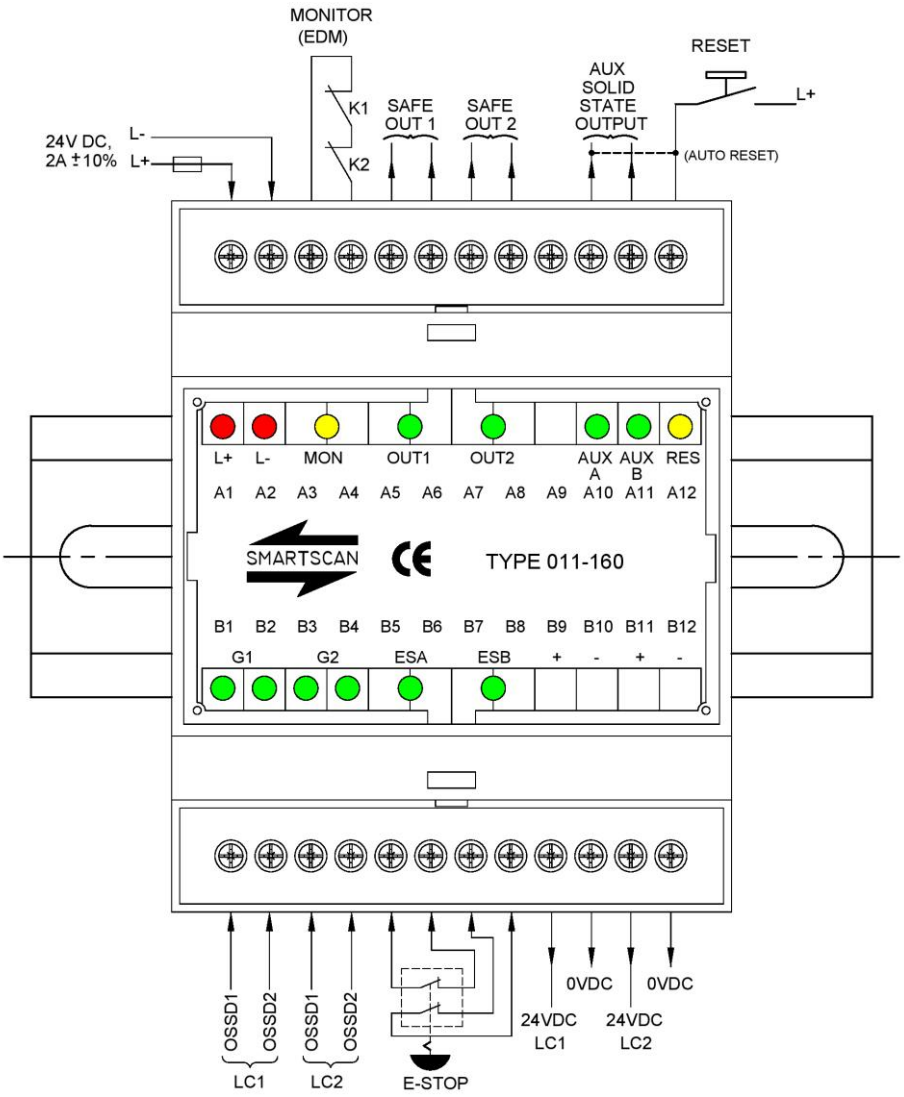
Important!

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) 011-160. 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) 011-160 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 011-160 Installation Guide (CD171) 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) 011-160



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 (Auto reset mode - LED on continuously)
EDM	Amber	On when EDM inputs are active
Diagnostic indicators	Red + Red	Both Steady on = system ok Both Flashing = EDM fault (Lockout) Alternate flashing on/ off = lockout
	Red + Off	A1 flashing = OSSD2 G1/G2 disparity fault or E Stop 2 disparity fault
	Off + Red	A2 flashing = OSSD1 G1/G2 disparity fault or E Stop 1 disparity fault

Features – (MFU) 011-160

- Two dual safety inputs for connecting up to 2 safety light curtains.
- Dual inputs for connecting the emergency stop circuit.
- Safety monitored output relays. Contacts rated at 250V AC, 2A.
- Auxiliary electronic output switches for status indication.
- Auto/ Manual Reset function.
- External Device Monitoring (EDM).
- LED indicators for all inputs and outputs.
- DIN rail mounting – 35mm x 7.5mm.
- Automatic self-testing.
- Simultaneous monitoring between related channels.
- Built to EN ISO 13849, PL e.

Specification – (MFU) 011-160

Specification	**(MFU) 011-160**
Response time	20ms
Operating temperature	0° to +50°C
Enclosure rating	IP40
Enclosure	(H x W x D) 90 x 70 x 58mm 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

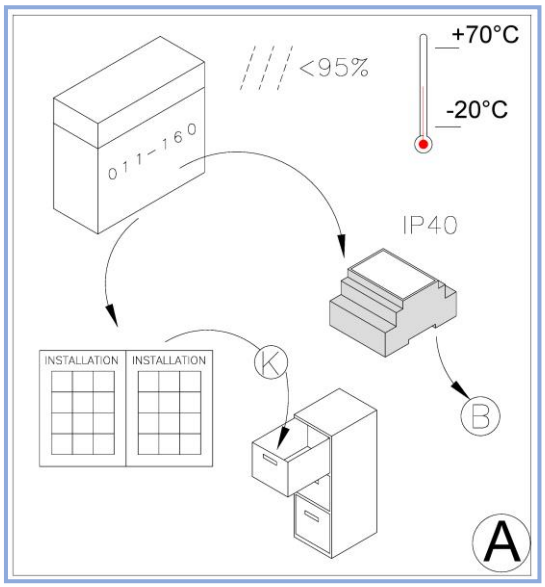
Inputs	
Dual inputs for light curtain 1 Dual inputs for light curtain 2	24V DC = On, 0V DC = Off
Dual inputs for emergency stop circuit	Use voltage free switch contacts
External device monitoring (EDM)	Use voltage free switch contacts (normally closed)
Reset function (selectable)	24V DC (Momentarily) = 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 switches (non-safety)	2 electronic output switches, each rated at 24V DC, 500mA

Installation Sheet (CD292/170321)

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 011-160 unit
- Installation sheet
- Service/ repair questionnaire form

Storage requirements:

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

Figure B - Mounting

MFU 011-160 has a protection rating of IP 40. The control unit is designed for DIN rail mounting (35mm) inside a suitable control enclosure.

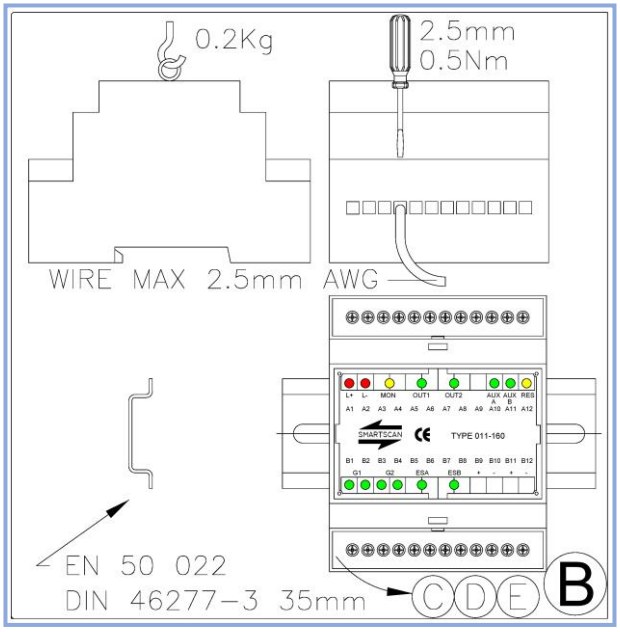


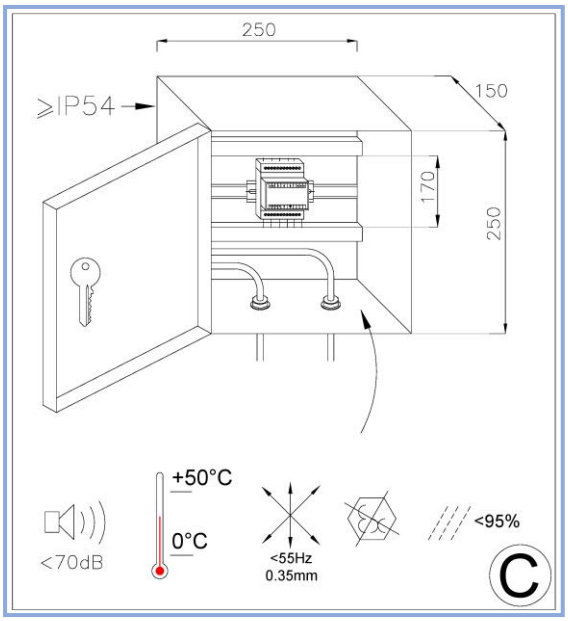
Figure C – Control Enclosure and Operation

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

Ensure the allotted space for the 011-160 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.

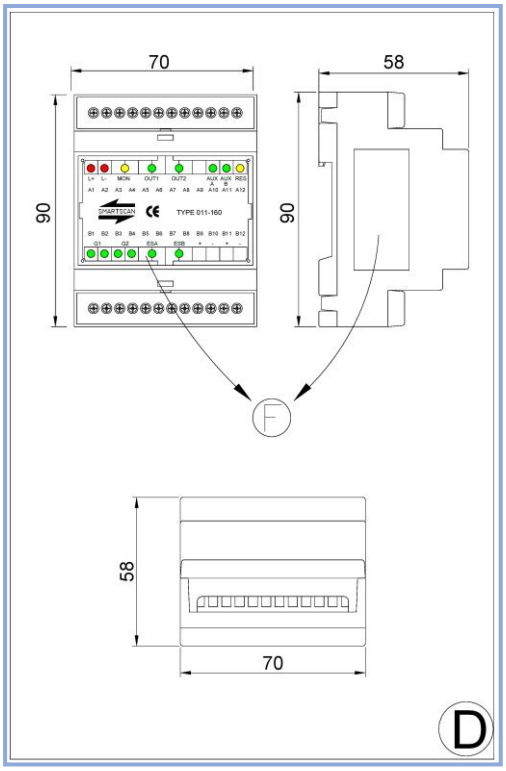
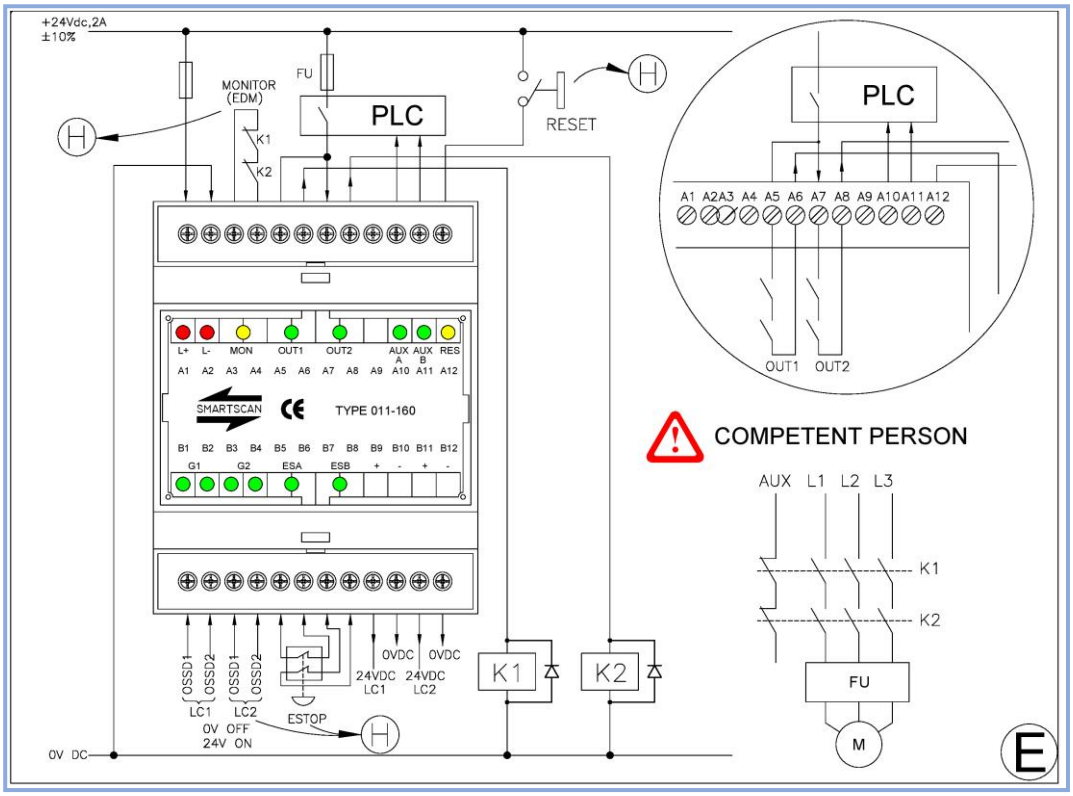


Figure E – I/O Connections



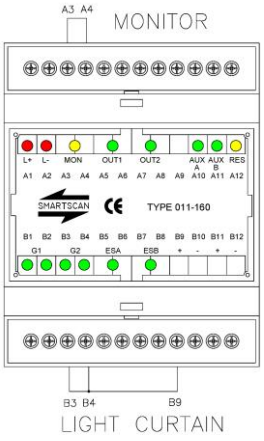
MFU 011-160 Terminal wiring

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 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 terminal 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 A1 and A2 LEDs both flashing On and Off in unison. To reset the MFU from a lockout condition it is necessary to fix EDM connection and recycle power.

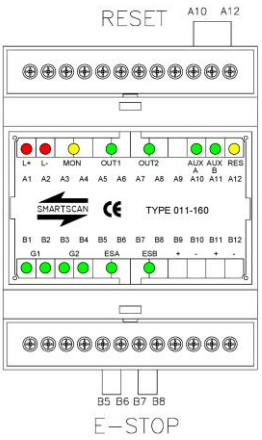
Terminals A5 and A6 – Safety output 1 switch contact
Connect terminals A5 and A6 to channel 1 of the machine's stop circuitry, for example, via an external power-switching relay, directly to a safe PLC input or a machines final control element.

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 A
This Auxiliary solid state PNP output is reserved for when the MFU is required to be used in the automatic reset mode. Link terminal A10 to terminal A12 for the automatic reset function. The configuration of the MFU in the Automatic reset mode will depend on the customer risk assessment for the machine application.



If not used in Auto Reset then this Auxiliary 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.

Terminal A11 – Auxiliary electronic switching output B
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 outputs A and B both energise 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 A12 – Reset
If the MFU is required to be in the manual/latch reset mode 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.

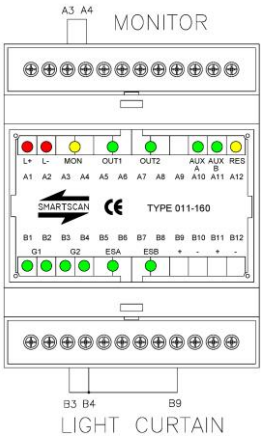
The MFU's safety output switches will only re-energise when the reset switch is pressed and then released. The MFU will only reset on the trailing edge of the reset signal.

Terminal B1 and B2 – light curtain 1 inputs (OSSD1 and OSSD2)
Connect the electronic PNP safe outputs from light curtain 1 (OSSD1 and OSSD2) to terminals B1 and B2 respectively.

Terminal B3 and B4 – light curtain 2 inputs (OSSD1 and OSSD2)
Connect the electronic PNP safe outputs from light curtain 2 (OSSD1 and OSSD2) to terminals B3 and B4 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.

Important If either terminals B1/B2 or B3/B4 are not used, for example, if only one safety light curtain is employed for a particular application, it is necessary to link the unused input terminals to the 24V DC supply available on terminal B9. If not the MFU output will not reset.



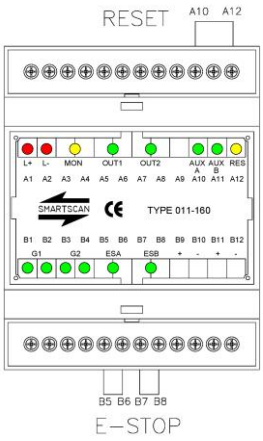
Terminals B5/B6 and B7/B8 – dual channel emergency stop circuit
This switch provides a stop function of Safety output 1 (A5/A6) and Safety output 2 (A7/A8). If the two Safety outputs of the MFU are interfaced to the Emergency-stop circuit of the machine then this switch will truly be an E-stop function of the machine.

This function tends to be commonly used on Robot applications as the Robot has one safety stop function (E-stop).

Connect the E-stop switch, contact block channel 1 to the terminals B5 and B6 and the second contact block channel 2 between terminals B7 and B8.

> **Note**: An internal circuit monitors for short circuits and switching disparity between the two input channels. If the inputs do not switch together (within 100ms of each other) the system will go into a lockout condition. This configuration meets the requirements for ‘control reliability’ and cannot be used in a single channel configuration.
>
> To reset from a lockout condition, it is necessary to recycle the 24V DC supply from the MFU.

Important If the emergency stop inputs on the MFU are not used it is necessary to put a link between terminals B5 and B6 and a link between terminals B7 and B8.



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

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

Figure F – Facia and Technical Label

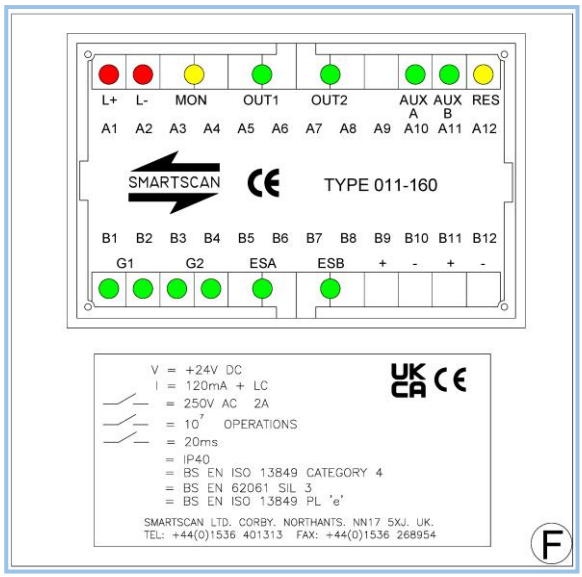


Figure G – Manual Reset with Safety Light Curtain

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.

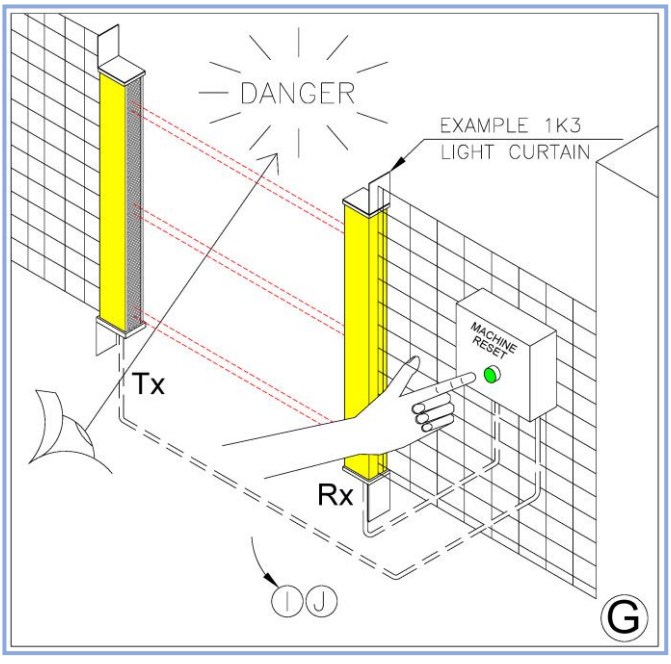


Figure H – Function Selection/Override

Shows terminal wiring for functions EDM monitor and E-Stop if not being used, single safety light curtain connection and selection of automatic reset (reset override).

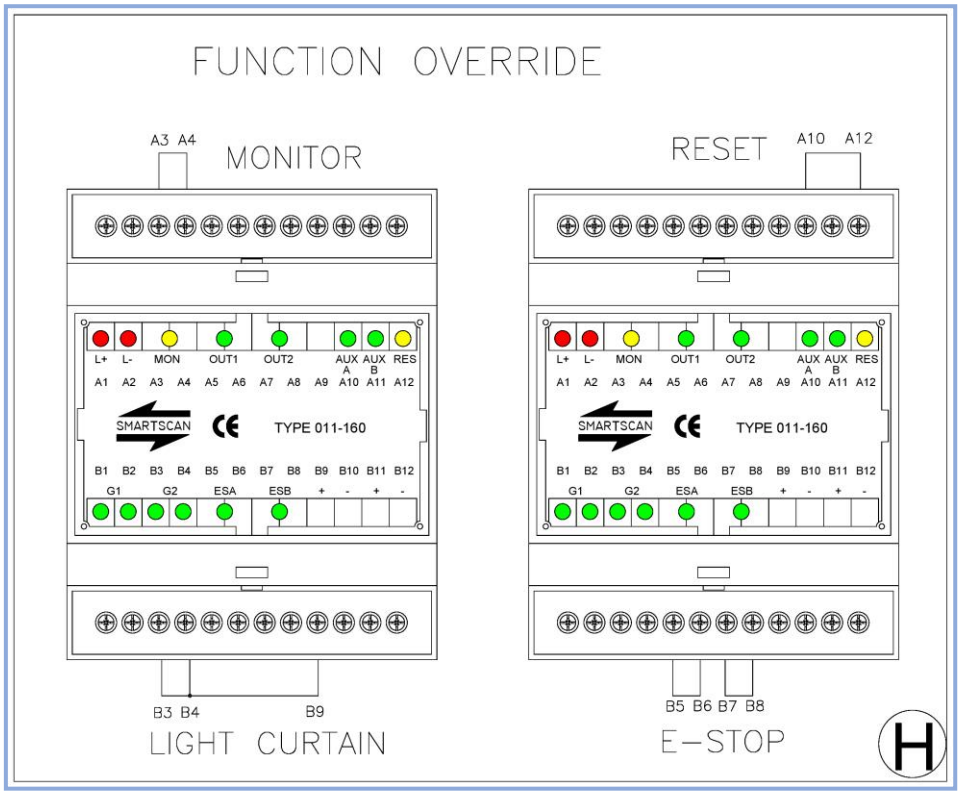


Figure I- Status Indicators and Logic Functions

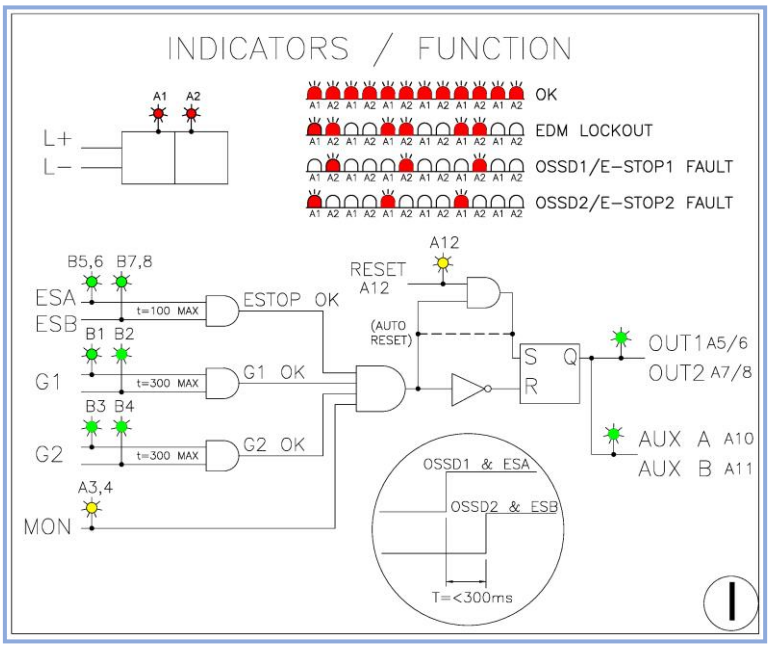
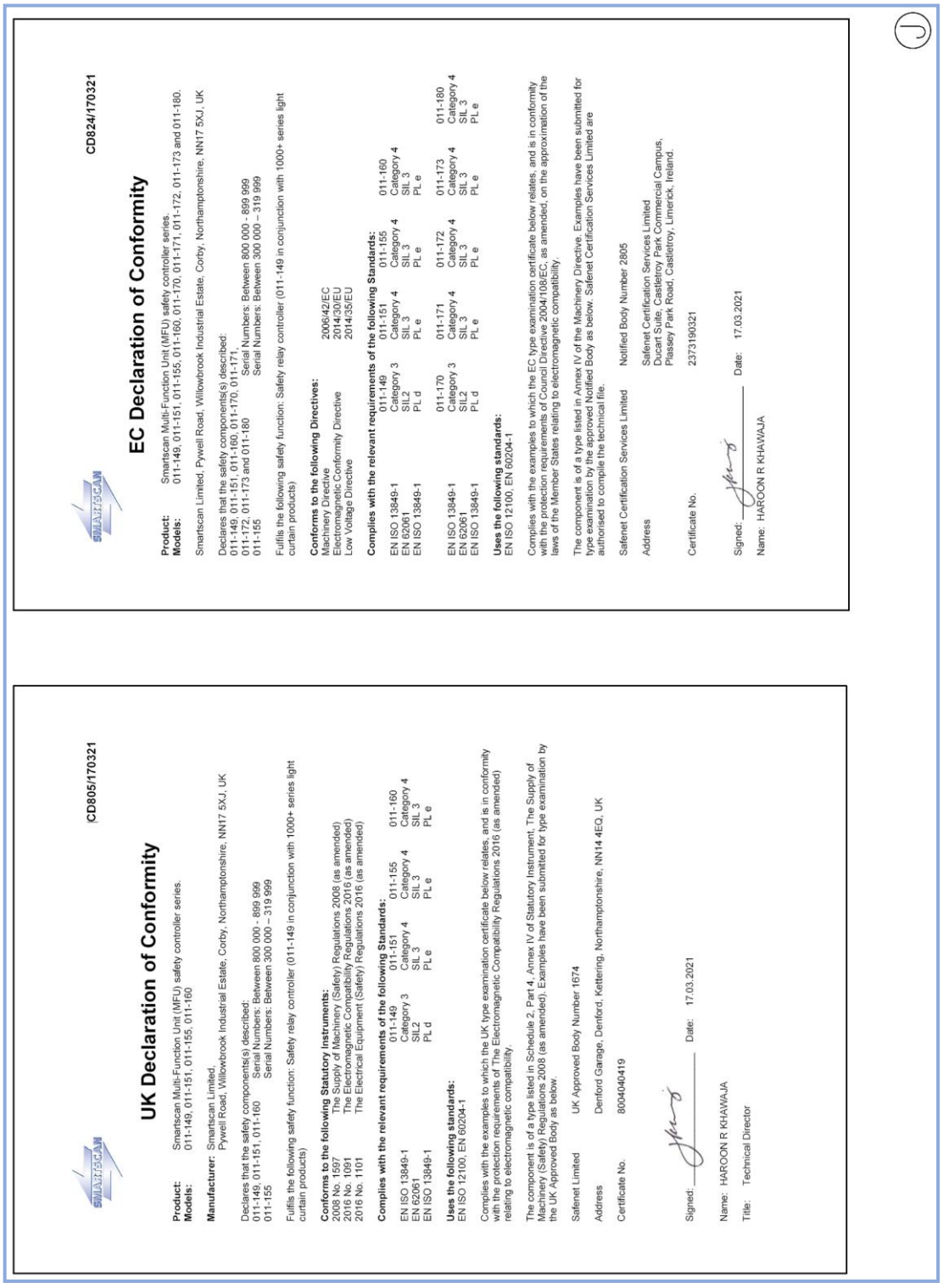


Figure J – EC Declaration of Conformity



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.

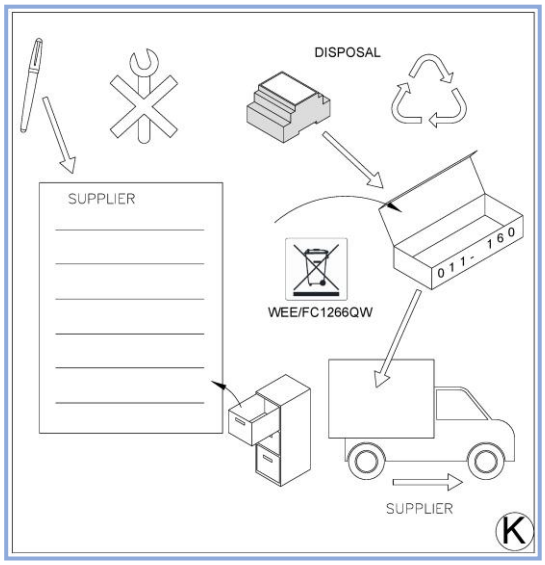


Figure L - Glossary of Words and Language Translation

ENGLISH	DANSK	DEUTSCHE	DUTCH	FRANÇAIS	ITALIANO	ESPAGNOL	SVENSKA
ACTIVE	Aktiv	Aktiv	Actief	Actif	Attivo	Activo	Aktiva
CATEGORY	kategori	kategorie	categorie	Catégorie	categoria	categoria	kategori
CONTROL	kontrol	auswertegeraet	besturing	contrôle	controllo	controlar	kontroll
DANGER	fare	gefahr	gevaar	danger	pericolo	peligro	fara
DISPOSAL	rådighed	entfernen	weg doen	disposition	smaltimento	disposicion	slängas
E-STOP	e-stop	notstop	noodstop	arrêt d'urgence	arresto d'emergenza	paro de emergencia	nödstopp
EXAMPLE	eksempel	beispiele	voorbeelden	exemples	esempio	ejemplos	exempel
FUNCTION	funktion	funktion	functie	fonction	funzione	funcion	funktion
INDICATORS	indikation	anzeige	indicator	indicateur	indicatore	indicador	indikering
INSTALLATION	installation	installation	installatie	installation	installazione	instalacion	installation
INSTRUCTIONS	instruktioner	Instruktionen	instructie	instructions	istruzioni	instrucciones	instruktion
LIGHT CURTAIN	Lysgitter	lichtgitter	lichtscherm	barrière	barriera ottica	cortina de seguridad	ljus barrier
LOCKOUT	fejlmode	aussperren	systeem blokkering	blocage	bloccaggio	cierre	felsäkert läge
MACHINE	maskine	Maschine	machine	machine	macchina	máquina	maskin
MAX	maksimal	maximum	max	maximum	massimo	maximo	max
MONITOR	aflæse	unberwachung	bewaking	surveillent	sorveglianza	el vigilar	overakande
OFF	Slukke	aus	uit	off	non attivo	apagado	från
ON	Tænde	ein	aan	on	attivo	en	till
OPERATIONS	operation	in betrieb	in bedrijf	opération	funzionamento	operacion	drift
ORIGINAL	original	das Original	origineel	original	originale	original	ursprunglig
OUT	ud	aus	uit	hors / dehors/ extérieur	uscita	fuera	ut
OVERRIDE	overstyre	ueberbrueken	overbrugging	enfoncer	esclusione automatismo	override	överstyrning
POWER	forsyning	Spannung	voedingsspanning	puissance	potenza	alimentacion	spänning
RELAY	Relæ	relais	relais	relais	relè	rele	reiä
REPAIR	reparere	reparatur	herstellen	réparation	riparazione	reparar	reparation
RESET	Nulstil	zurücksetzen	reset	réinitialiser	Ripristina	Reiniciar	återställa
SAFETY	sikkerhed	sicherheit	veiligheid	securité	sicurezza	seguridad	säkerhet
STATUS	status	status	status	statut	stato	estado	status
SUPPLIER	leverandør	lieferant	leverancier	fournisseur	fornitore	proveedor	leverantör
USER	bruger	nutzer	gebruiker		utilizzatore	usario	användare
WIRE	tråd	Draht	draad	câble	filo	cable	tråd

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