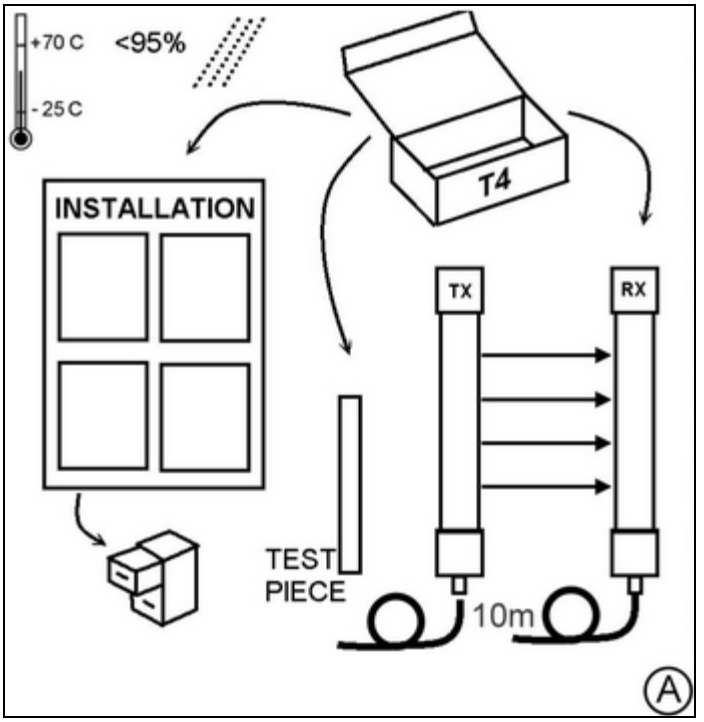
T4 Series Safety Light Curtain
Installation Sheet (CD232/301008)

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 T4 system supplied would normally include:

- Light curtain
- Test piece
- Installation sheet
- Service questionnaire form

Storage requirements:

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

Figure B - Operating Requirements

- Humidity <95%
- Temperature range between 0°C and 50°C with internal heater Selected 'OFF' (standard setting)
- Temperature range between -30°C and 40°C with internal heater Selected 'ON' (contact Smartscan)
- Vibration: Frequency <55Hz Max. Movement <0.35mm
- Do not use equipment in explosive atmospheres (contact the manufacturer for further advice).

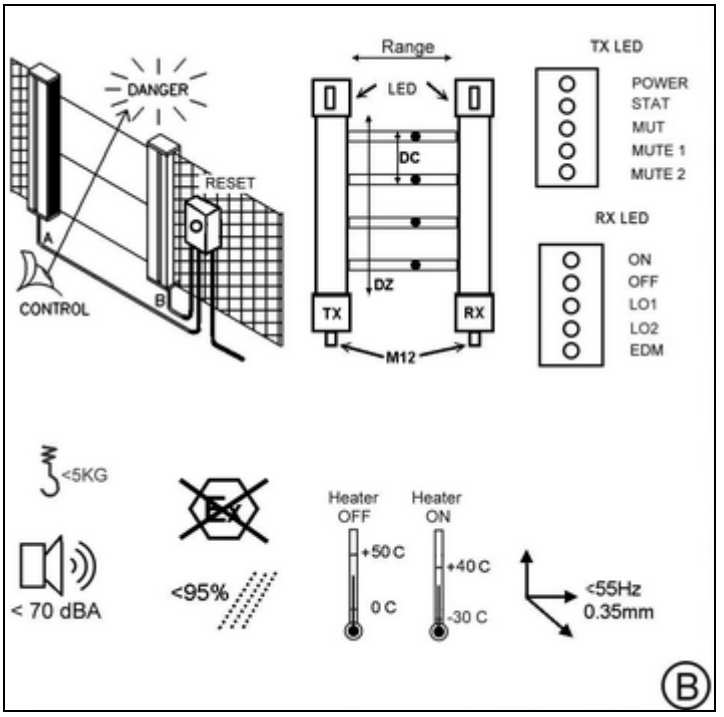


Figure B also describes important parameters associated with the light curtain.

DZ – Detection zone width
RG – Maximum scanning range of the light curtain
ODC – Object Detection Capability (The minimum size of object guaranteed to be detected when placed in the light curtain energy field.)

LED indicators in top end cap
M12 user cable connections in bottom end cap
Transmitter/Receiver labels on bottom end cap

LED Status Indicators

TX – PWR (Power) - RED LED on = power connected
TX – STAT (Status) - GREEN LED on = status on
TX – MUT (Mute) – YELLOW LED on = Muted
TX – MU1 (Mute1) – BLUE LED on = Mute 1 on
TX – MU2 (Mute2) – BLUE LED on = Mute 2 on

RX – ON - GREEN LED on = Light curtain clear
RX – OFF – RED LED on = Light curtain blocked
RX – LO1 (Lockout) – YELLOW LED on = Lockout condition
RX – LO2 (Lockout) – YELLOW LED on = Lockout condition
RX – EDM (External Device Monitoring) – YELLOW LED on = EDM on

Typical Mounting Arrangement for a Smartscan T4 light curtain

The T4 light curtain is supplied with mounting brackets as standard with the fixing plate in an up position. The bracket may be fixed at 90 degrees, with a +/-15˚ adjustment, before the brackets are fully tightened. The fixing plate may be reversed to the down position where space is a premium. Please ensure the washers are in place to maintain the seal where any adjustment is made.

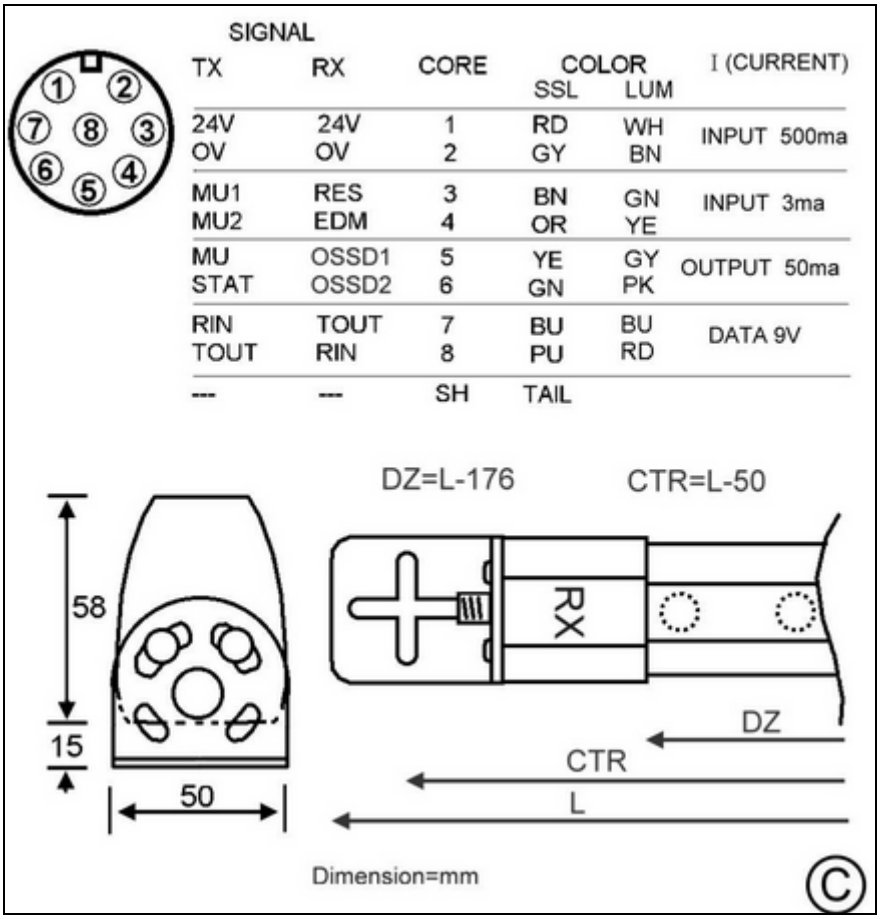
A connection cable is required to the transmitter head and the receiver head which is connected via the M12 socket on the end cap. The M12 socket also forms a locator for the mounting bracket.

Detection zone width - Must be of a suitable height for each application to prevent personnel access to the danger area either over, under or around the light curtains detection zone.

Detection capability - A test piece of appropriate size is provided to test that the light curtain object detection capability is within the parameter specified for the particular model number.

Range - Ensure the light curtain is capable of satisfying the range requirement for the application.

Figure C - **Cable conductors and dimensions**



The T4 light curtain requires a connection cable on the Transmitter (TX) and a connection cable on the Receiver (RX). 5, 10 and 15m cables length options are available. Other manufacturers' cables may have a different color coding. If there is any doubt check the conductors with a meter.

The shield should be connected to ground. The 0V should be connected to ground.

Warning:
RIN and TOUT are communication links at RS232 voltage levels (+/-10V). They MUST NOT be connected to any other voltage source.

Figure D - Model List

Fig. D shows the T4 Series light curtain model list detailing part codes, number of Infra Red beams and overall length for each model. A list of the operating ranges for the different object detection capabilities (ODC) is also provided.

14 mm Range = 0.3 - 4m
30 mm Range = 0.5 - 6m
40 mm Range = 3 - 15m
PERIMETER RG = 2.0-20 m

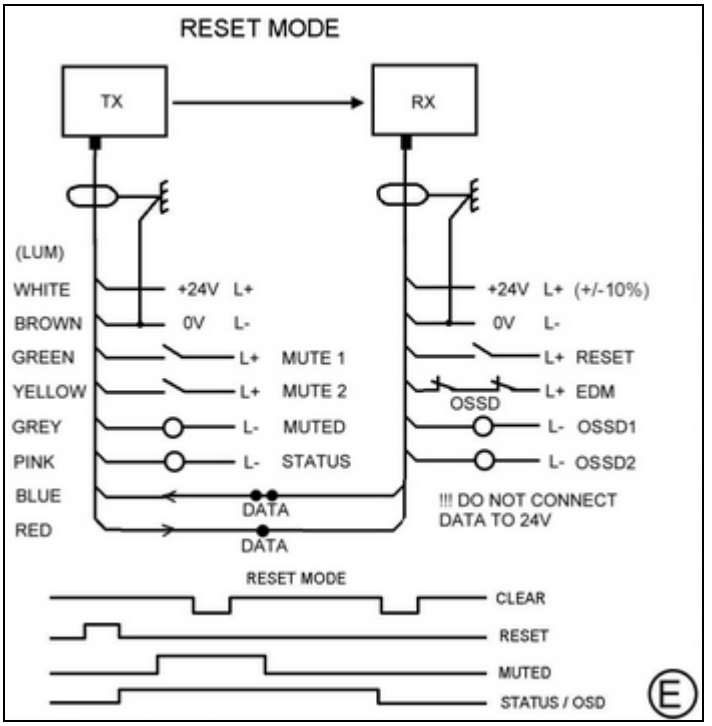
MODEL 30 ODC	MODEL 40 ODC	BEAMS	L	DZ
050-301	050-401	6	317	141
050-302	050-402	12	467	291
050-303	050-403	18	617	441
050-304	050-404	24	767	591
050-305	050-405	30	917	741
050-306	050-406	36	1067	891
050-307	050-407	42	1217	1041
050-308	050-408	48	1367	1191
050-309	050-409	54	1517	1341
050-310	050-410	60	1667	1491
050-311	050-411	66	1817	1641
050-312	050-412	72	1967	1791
050-313	050-413	78	2117	1941
050-314	050-414	84	2267	2091
050-315	050-415	90	2417	2241
050-316	050-416	96	2567	2391

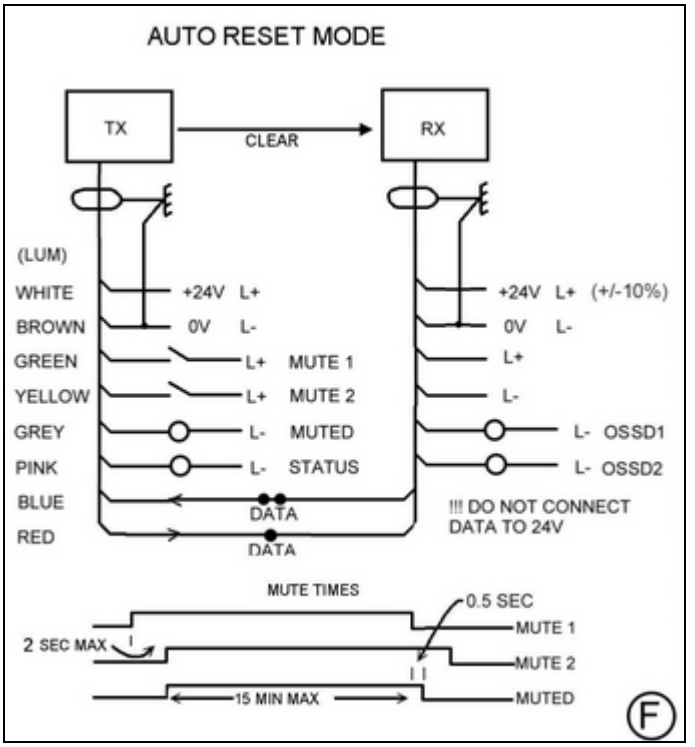
MODEL 14 ODC	BEAMS	L	DZ
050-101	16	317	141
050-102	32	467	291
050-103	48	617	441
050-104	64	767	591
050-105	80	917	741
050-106	96	1067	891
050-107	112	1217	1041
050-108	128	1367	1191
PERIMETER GUARDS			
ANSI MODEL	BEAMS	L	PITCH
050-702	2	780	600
EU MODEL			
050-602	2	680	500
BOTH MODEL			
050-603	3	980	400
050-604	4	1080	300

Dimension=mm

Ⓓ

Figure E and F - Electrical connections





Warning: Do not disconnect cables from the Transmitter (TX) or Receiver (RX) head with the power still connected to the T4 Series light curtain.

Safety Outputs OSSD1 and OSSD2 (F1)
Two independent electronic switches provide the failsafe outputs for connection to the machine control system. Connections are

Connections are Grey (OSSD1) and Pink (OSSD2) wires on the Receiver (RX) head cable. Outputs 'on' = 24V. (Light curtain clear/protecting) Outputs 'off' = 0V (Light curtain blocked) maximum switching current = 50mA.

LED indicators located at the top of the Receiver (RX) head labelled as ON and OFF show the status of the OSSDs.

Green LED's ON = OSSD1 and OSSD2 active ON
Red LED's ON = OSSD1 and OSSD2 inactive OFF

Manual / Auto Reset Mode

Manual Reset - The Green wire on the Receiver (RX) head cable to be connected to a 'Normally Open' Reset switch contact block and the other side of the switch contact block needs to be at 24V DC. The Yellow wire on the Receiver (RX) head is used for the EDM (External Device Monitoring) with a normally closed contact of the external device and the other side of the contact to 24V DC. Note: If EDM is not used the Yellow wire must be connected to 24V DC.

Auto Reset – The Green wire on the Receiver (RX) head cable to be connected to 24V DC but if the EDM is required the Green wire will need to be connected to normally closed contact of the external device and the other side of the contact to 24V DC. The Yellow wire needs to be permanently connected to 0V DC.

Note: Changing the condition of the light curtain from manual to auto reset and visa-versa must be done with the power supply in the off-state.

LED indicators located at the top of the Receiver (RX) head labelled as EDM shows EDM status.

Yellow LED ON = EDM ON Yellow LED OFF = EDM OFF

Note: In auto reset mode the EDM LED is permanently off.

Mute Function

There are 2 wires required to enable the mute function of the light curtain, Green wire (mute 1) and Yellow wire (mute 2) on the Transmitter (TX) head cable. The two mute inputs need to be at 24V DC switching to activate the light curtains mute function. Muting is the condition where the light curtain OSSD outputs will not respond to an interruption to the sensing field of the light curtain.

Both mute inputs are monitored with a disparity of 2 seconds therefore both signals must be supplied to the light curtain within 2 seconds of each other.

When the light curtain is in a mute condition it will activate an internal mute timer with a maximum time period of 15 minutes.

LED indicators located at the top of the Transmitter (TX) head labelled as MU1 (Mute 1), MU2 (Mute 2) and MUT (Light curtain Muted) show the status.

MU1 - Blue LED ON = Mute 1 ON Blue LED OFF = Mute 1 OFF
MU2 - Blue LED ON = Mute 2 ON Blue LED OFF = Mute 2 OFF
MUT - Yellow LED ON = Mute ON Yellow LED OFF = Mute OFF *

*An external electronic mute output signal is also available from the Grey wire on the Transmitter (TX) head cable, mute-on = 24 V DC (rated at 24V DC 50mA) and mute-off = 0 V DC. This can be used to drive an external relay for remote indication via a beacon and/or an input to a PLC.

Status Output
The status output should only be used for non-safety critical application. E.g. connecting an indicator lamp or as feedback to a PLC to conform that the safety outputs have de-energised. The status output, Pink wire on the Transmitter (TX) head cable energises when the safety output OSSDs energise and de-energises when the safety outputs OSSDs de-energises. Status output ON = 24V DC 50mA and OFF = 0V DC

LED indicator located at the top of the Transmitter (TX) head labelled as STAT (Status) shows the condition.

STAT - Green LED ON = STATUS ON Green LED OFF = STATUS

Power supply
Use a regulated supply +24V DC ±10%, 0.5A. The White wire on both the Transmitter (TX) and Receiver (RX) head cables are to be connected to 24V DC (L+) and the Brown wire on both the Transmitter (TX) and Receiver (RX) head cables are to be connected to 0V DC (L-).

PWR - Red LED ON = Power Connected

Warning: 0V (L-) of the power supply must be connected to ground.
No signal should exceed +24V DC ±10% (L+) or be less than 0V (L-)

Note: Any input or output signals not used must be terminated to an individual isolated terminal block.

Communication Link
The Transmitter (TX) and Receiver (RX) heads communicate via RS232. The Blue wire from the Transmitter (TX) head cable must be connected to the Blue wire from the Receiver (RX) head cable.

The Red wire from the Transmitter (TX) head cable must be connected to the Red wire from the Receiver (RX) head cable.

Warning: The Data wires are RS232 levels (+/- 10V) and must not be connected to any source that is not RS232 compatible.
Do not apply 24V DC to the data wires or it will damage the light curtain.

Figure G - Fault finding

Before installation read and understand the Installation Sheet provided paying particular attention to the information provided in Fig. L

- Refer to Fig. J for test and maintenance procedures
- Every 24 hours carry out tests as indicated in Fig. J
- Every 6 months check the entire installation paying particular attention to Fig. L
- If the equipment fails to operate as intended check the electrical connections as shown in Fig. E & F

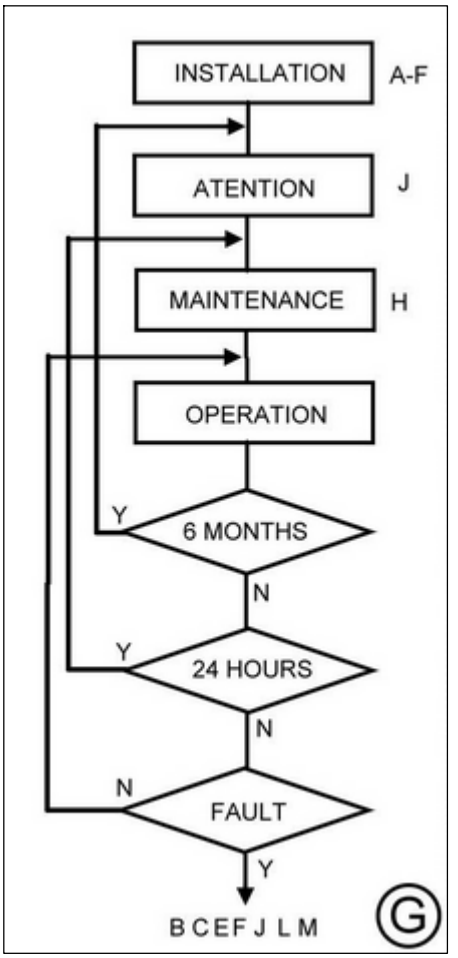


Figure H - Labels

Fig. H shows examples of the identification label that is affixed to the bottom of the transmitter and receiver columns.

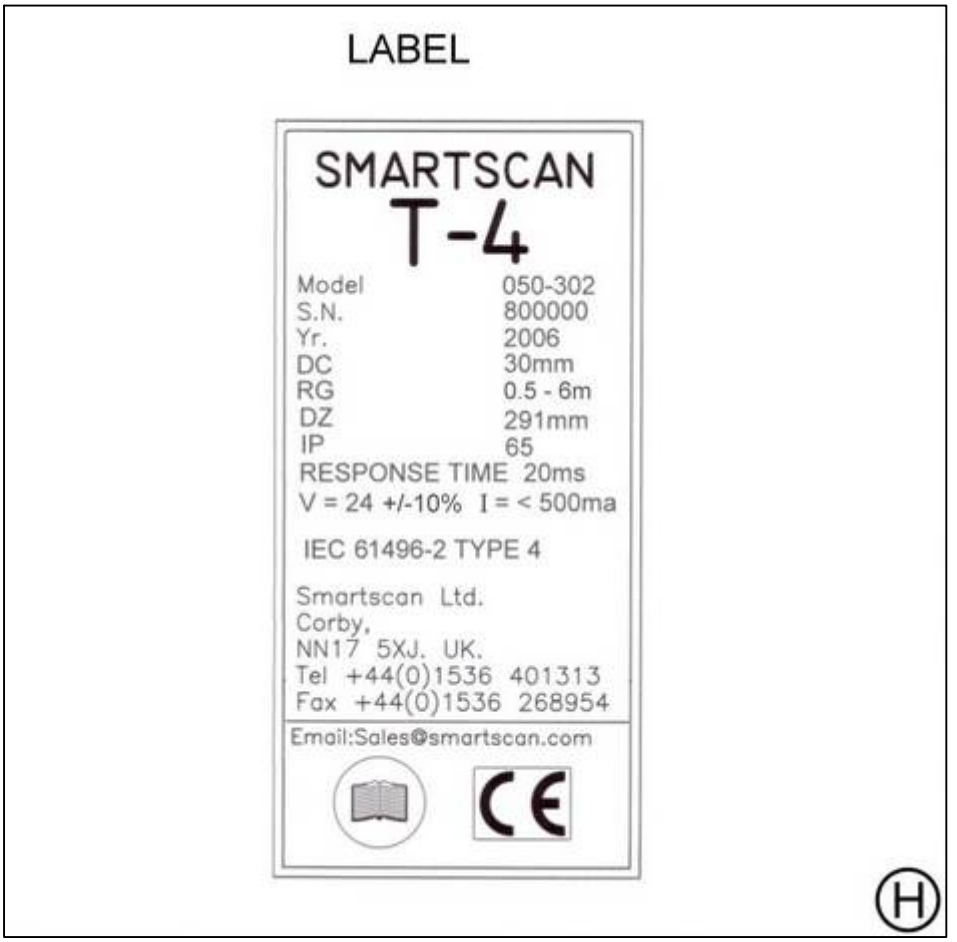
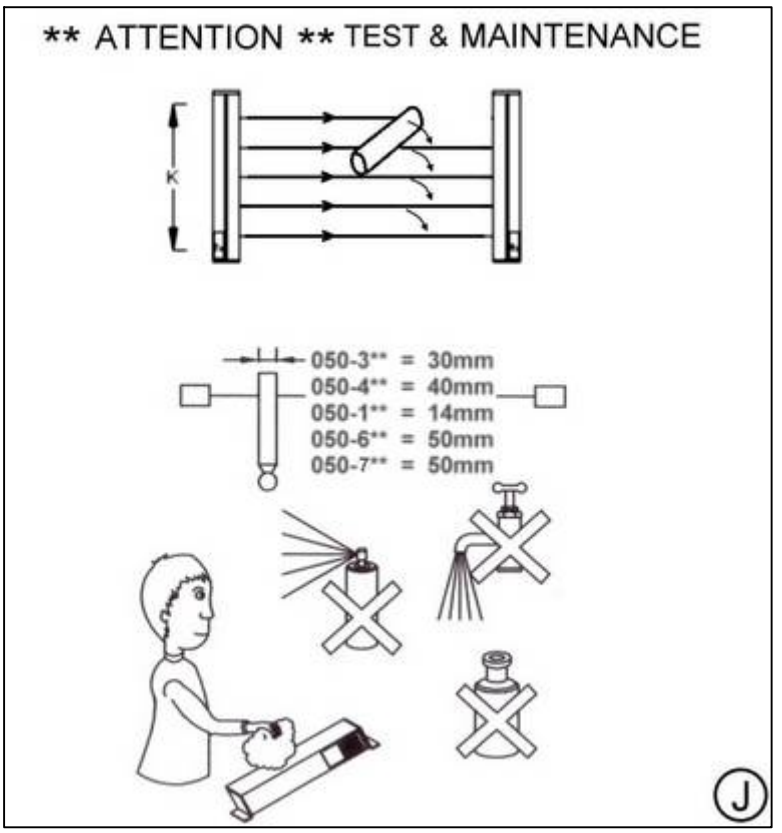


Figure J - Maintenance

Testing the light curtain with the test piece

The test procedure should be carried out frequently as indicated by the risk assessment for the particular installation. Smartscan Ltd recommends the test should be carried out daily.

Power-up the light curtain and activate the output switching circuits to an ON condition.



Insert a test piece of appropriate size into the light curtain detection zone, at the bottom, 150mm from the transmitter unit. At this point the output switches will turn OFF. Sweep the test piece up through the detection zone parallel to the transmitter. Now sweep the test piece down through the detection zone equal distance between the transmitter and receiver. Now sweep the test piece up through the detection zone 150mm and parallel to the receiver unit. At no time during these tests should the output switches turn ON.

Now thrust the test piece anywhere in the light curtain detection zone and ensure the machinery stops without apparent delay.

For light curtain models with an ODC above 40mm undertake the same tests as described. During these tests the output switches should only turn OFF as the test piece totally obscures each beam in the light curtain. Ensure that while the test piece is obscuring each beam the output switches are OFF.

Routine Maintenance

Clean the windows with a clean damp cloth using a mild detergent. Never use abrasive, corrosive cleaners or spray detergents.

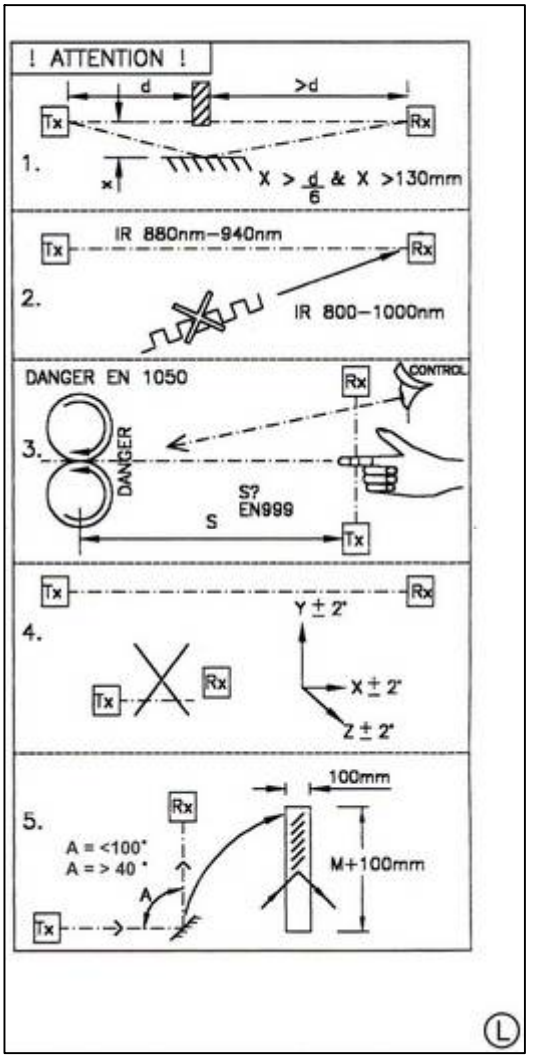
The Transmitter (Tx) and Receiver (Rx) windows should be cleaned regularly as indicated on the Installation Sheet.

Dirt build up on the windows may lead to intermittent tripping or a totally blocked condition of the light curtain. Clear adhesive tape may be applied to the windows of curtains in dirty or abrasive conditions. Renew the clear adhesive tape periodically.

Clean the windows with a clean damp cloth using a mild detergent. Never use abrasive, corrosive cleaners or spray detergents.

Figure L - Caution notes

When installing a Smartscan T4 Series safety light curtain your attention is drawn to the following:
(Fig. L)



1. Consider reflective surfaces that may give rise to optically ‘short circuiting’ the direct path of the light curtains as shown in Fig. L. To ensure the light curtain is mounted far enough away from reflective surfaces use the formulae provided to calculate the minimum dimension between the light curtain and reflective surface.

   X = minimum distance between reflective surface and light curtain.

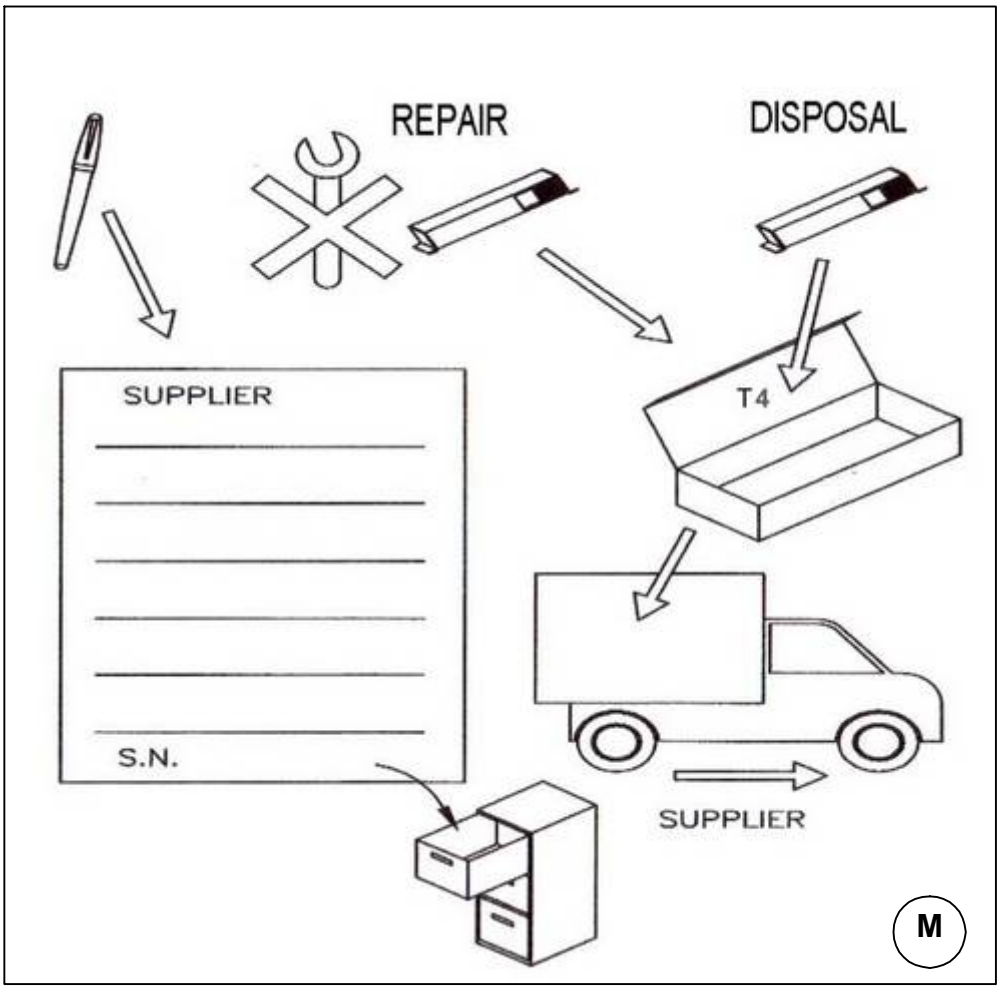
2. To prevent intermittent tripping of the light curtain ensure extraneous infra red energy between 800 and 1000 nanometres is not directed towards the Perspex window of the receiver unit (RX). Extraneous sources would include infra red sensors, infra-red remote controls or scanning systems.

3. Ensure the mounting position of the light curtain in respect to the nearest danger point meets the requirements of European Standard BS EN 999. See Appendix 1.

4. Ensure the light curtain transmitter and receiver units are mounted accurately in line with each other and are both perpendicular and parallel to each other within the parameters shown for each axis.

5. If utilising mirrors to deflect the light curtain ensure the mirror length is 100mm longer than the light curtain detection zone width and mounted centrally to the zone. To ensure reliable operation the light curtain deflection angle from the mirror must not be less than 40 degrees or greater than 100 degrees.

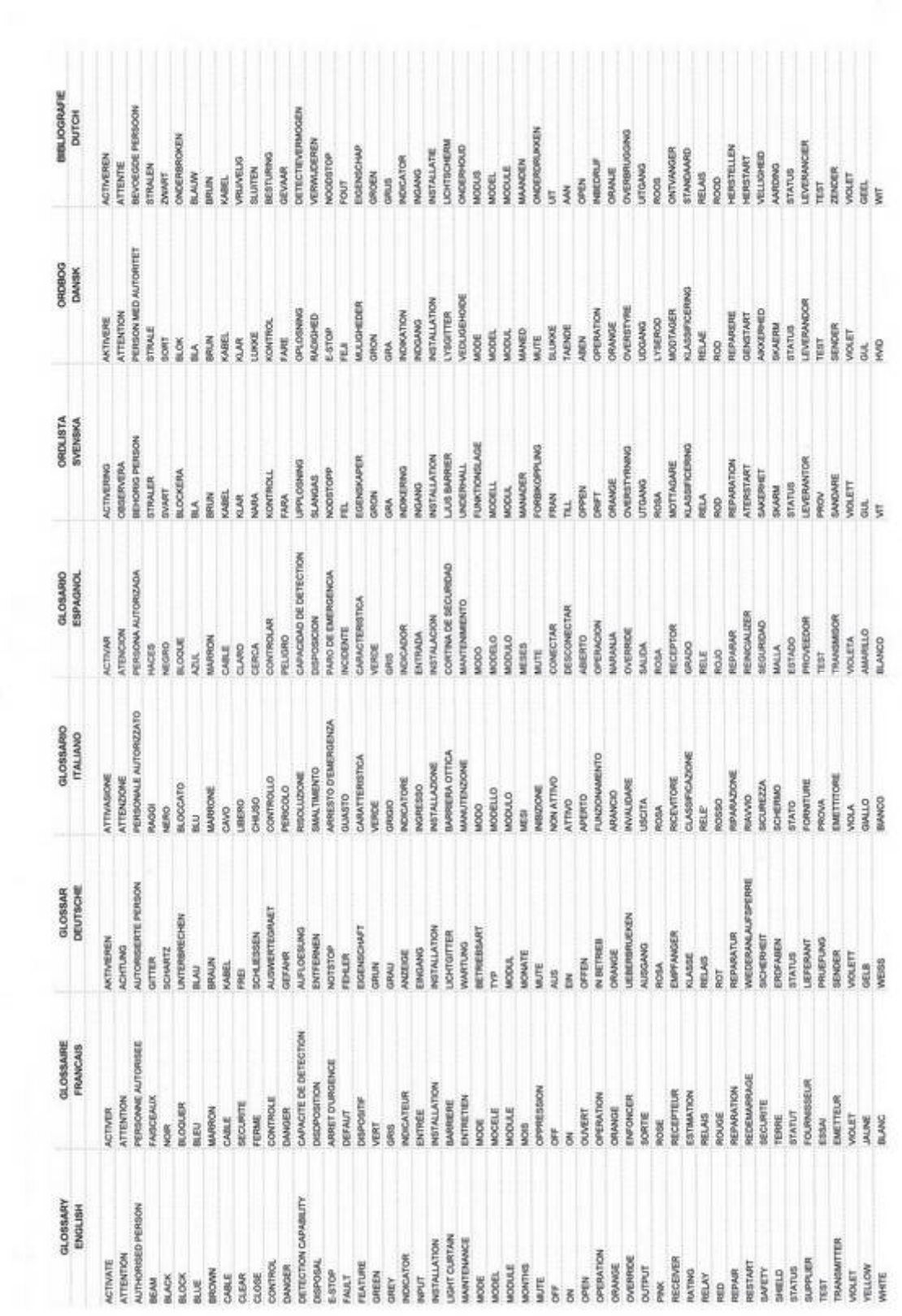
Figure M - Procedure for returning a Smartscan product



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

Note: Please ensure that returned guards are matching serial number pairs.

Glossary



GLOSSARY ENGLISH	GLOSSAIRE FRANCAIS	GLOSSAR DEUTSCHE	GLOSSARIO ITALIANO	GLOSARIO ESPAGNOL	ORDLISTA SVENSKA	ORDBOG DANSK	BIBLIOGRAFIE DUTCH
ACTIVATE	ACTIVER	AKTIVIEREN	ATTIVAZIONE	ACTIVAR	AKTIVERING	AKTIVERE	ACTIVEREN
ATTENTION	ATTENTION	ACHTUNG	ATTENZIONE	ATENCION	OBSERVERA	ATTENTION	ATTENTIE
AUTHORISED PERSON	PERSONNE AUTORISEE	AUTORISIERTE PERSON	PERSONALE AUTORIZZATO	PERSONA AUTORIZADA	BEHORIG PERSON	PERSON MED AUTORITET	BEVOEGDE PERSOON
BEAM	FAISCEAUX	GITTER	RAGGI	HACES	STRALER	STRALE	STRALEN
BLACK	NOIR	SCHWARTZ	NERO	NEGRO	SVART	SORT	ZWART
BLOCK	BLOQUER	UNTERBRECHEN	BLOCCATO	BLOQUE	BLOCKERA	BLOK	ONDERBROKEN
BLUE	BLEU	BLAU	BLU	AZUL	BLA	BLA	BLAUW
BROWN	MARRON	BRAUN	MARRONE	MARRON	BRUN	BRUN	BRUIN
CABLE	CABLE	KABEL	CAVO	CABLE	KABEL	KABEL	KABEL
CLEAR	SECURITE	FREI	LIBERO	CLARO	KLAR	KLAR	VRIJVELIG
CLOSE	FERME	SCHLIESSEN	CHIUSO	CERCA	NARA	LUKKE	SLUITEN
CONTROL	CONTROLE	AUSWERTEGERAET	CONTROLLO	CONTROLAR	KONTROLL	KONTROL	BESTURING
DANGER	DANGER	GEFAHR	PERICOLO	PELIGRO	FARA	FARE	GEVAAR
DETECTION CAPABILITY	CAPACITE DE DETECTION	AUFLOESUNG	RISOLUZIONE	CAPACIDAD DE DETECTION	UPPLOSNING	OPLOSNING	DETECTIEVERMOGEN
DISPOSAL	DISPOSITION	ENTFERNEN	SMALTIMENTO	DISPOSICION	SLANGAS	RADGHED	VERWIJDEREN
E-STOP	ARRET D'URGENCE	NOTSTOP	ARRESTO D'EMERGENZA	PARO DE EMERGENCIA	NODSTOPP	E-STOP	NOODSTOP
FAULT	DEFAUT	FEHLER	GUASTO	INCIDENTE	FEL	FEJL	FOUT
FEATURE	DISPOSITIF	EIGENSCHAFT	CARATTERISTICA	CARACTERISTICA	EGENSKAPER	MULIGHEDER	EIGENSCHAP
GREEN	VERT	GRUN	VERDE	VERDE	GRON	GRON	GROEN
GREY	GRIS	GRAU	GRIGIO	GRIS	GRA	GRA	GRIJS
INDICATOR	INDICATEUR	ANZEIGE	INDICATORE	INDICADOR	INDIKERING	INDIKATION	INDICATOR
INPUT	ENTRÉE	EINGANG	INGRESSO	ENTRADA	INGANG	INDGANG	INGANG
INSTALLATION	INSTALLATION	INSTALLATION	INSTALLAZIONE	INSTALACION	INSTALLATION	INSTALLATION	INSTALLATIE
LIGHT CURTAIN	BARRIERE	LICHTGITTER	BARRIERA OTTICA	CORTINA DE SEGURIDAD	LJUS BARRIER	LYSGITTER	LICHTSCHERM
MAINTENANCE	ENTRETIEN	WARTUNG	MANUTENZIONE	MANTENIMIENTO	UNDERHALL	VEDLIGEHOLDE	ONDERHOUD
MODE	MODE	BETRIEBSART	MODO	MODO	FUNKTIONSLAGE	MODE	MODUS
MODEL	MODELE	TYP	MODELLO	MODELO	MODELL	MODEL	MODEL
MODULE	MODULE	MODUL	MODULO	MODULO	MODUL	MODUL	MODULE
MONTHS	MOIS	MONATE	MESI	MESES	MANADER	MANED	MAANDEN
MUTE	MUTE	MUTE	INIBIZIONE	MUTE	FORBIKOPPLING	MUTE	ONDERDRUKKEN
OFF	OFF	AUS	NON ATTIVO	CONECTAR	FRAN	SLUKKE	UIT
ON	ON	EIN	ATTIVO	DESCONECTAR	TILL	TAENDE	AAN
OPEN	OUVERT	OFFEN	APERTO	ABIERTO	OPPEN	ABEN	OPEN
OPERATION	OPERATION	IN BETRIEB	FUNZIONAMENTO	OPERACION	DRIFT	OPERATION	INBEDRIJF
ORANGE	ORANGE	ORANGE	ARANCIO	NARANJA	ORANGE	ORANGE	ORANJE
OVERRIDE	ENFONCER	UEBERBRUECKEN	INVALIDARE	OVERRIDE	OVERSTYRNING	OVERSTYRE	OVERBRUGGING
OUTPUT	SORTIE	AUSGANG	USCITA	SALIDA	UTGANG	UDGANG	UITGANG
PINK	ROSE	ROSA	ROSA	ROSA	ROSA	LYSEROD	ROOS
RECEIVER	RECEPTEUR	EMPFANGER	RICEVITORE	RECEPTOR	MOTTAGARE	MODTAGER	ONTVANGER
RATING	ESTIMATION	KLASSE	CLASSIFICAZIONE	GRADO	KLASSIFICERING	KLASSIFICERING	STANDAARD
RELAY	RELAIS	RELAIS	RELE'	RELE	RELA	RELAE	RELAIS
RED	ROUGE	ROT	ROSSO	ROJO	ROD	ROD	ROOD
REPAIR	REPARATION	REPARATUR	RIPARAZIONE	REPARAR	REPARATION	REPARERE	HERSTELLEN
RESTART	REDEMARRAGE	WIEDERANLAUFSPERRE	RIAVVIO	REINICIALIZER	ATERSTART	GENSTART	HERSTART
SAFETY	SECURITE	SICHERHEIT	SICUREZZA	SEGURIDAD	SAKERHET	AKKERHED	VEILIGHEID
SHIELD	ESTIMATION	EROFAHEN	SCHERMO	MALLA	SKARM	SKAERM	AARDING
STATUS	STATUT	STATUS	STATO	ESTADO	STATUS	STATUS	STATUS
SUPPLIER	FOURNISSEUR	LIEFERANT	FORNITURE	PROVEEDOR	LEVERANTOR	LEVERANDOR	LEVERANCIER
TEST	ESSAI	PRUEFUNG	PROVA	TEST	PROV	TEST	TEST
TRANSMITTER	EMETTEUR	SENDER	EMETTITORE	TRANSMISOR	SANDARE	SENDER	ZENDER
VIOLET	VIOLET	VIOLETT	VIOLA	VIOLETA	VIOLETT	VIOLET	VIOLET
YELLOW	JAUNE	GELB	GIALLO	AMARILLO	GUL	GUL	GEEL
WHITE	BLANC	WEISS	BIANCO	BLANCO	VIT	HVID	WIT

APPENDIX 1

Positioning the light curtain

The following points should be considered before final selection of a light curtain.

- The position of the light curtain in relation to the danger point, particularly the separation distance (S).
- The stopping performance of the machine together with the response time of the safety system (t1 + t2)

To assist with the selection of a Smartscan light curtain for a specific application refer to the following information which has been taken from European Standard BS EN 999.

Detection capability - the dimension representing the minimum diameter of an opaque cylinder which, when placed into the light curtain, at any angle to the detection plane, is guaranteed to actuate the light curtain.

Separation distance (S) - The distance along the direction of approach, between the outermost position at which an appropriate opaque object is detected and the nearest hazardous part.

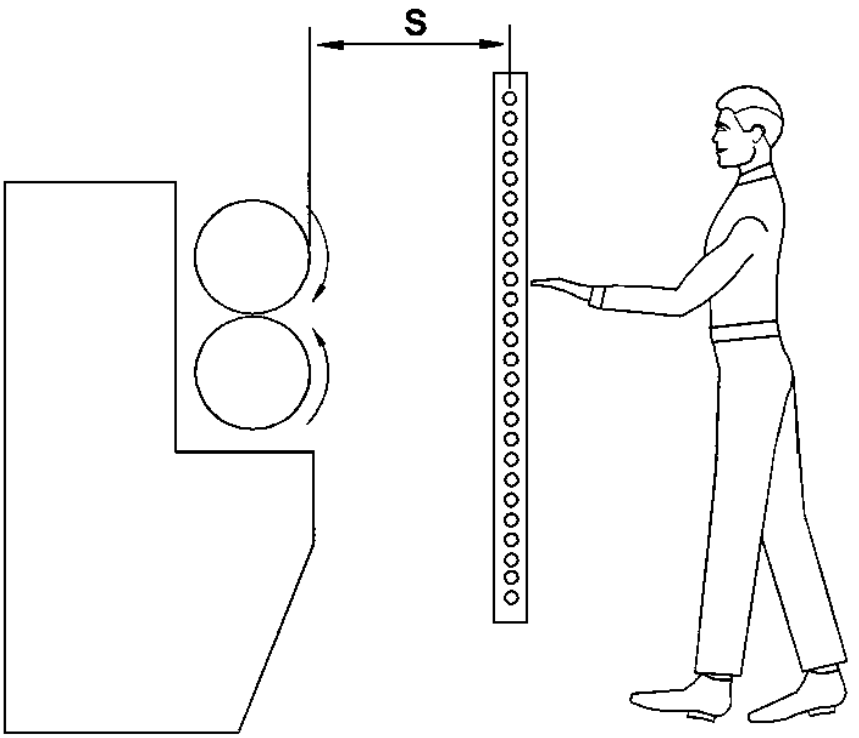
Abbreviations:

S = separation distance (mm)
H = height of the light curtain above the reference plane (mm) e.g. floor
t1 = response time of light curtain and control unit (secs)
t2 = stop time of machine (secs)

The detection zone of the selected light curtains must be of a length to prevent access to the hazard from either over or underneath the light curtain. If necessary install additional mechanical guarding to prevent access into the hazardous area.

APPENDIX 1

Normal Approach



To calculate separation distance (S)		
Detection Capability (mm)	**Use formula below when (t1+ t2) is less than 0.185 secs**	**Use formula below when (t1+ t2) is greater than 0.185 secs**
30	**2000(t1+t2)+128**	**1600(t1+t2)+128**
40	**2000(t1+t2)+208**	**1600(t1+t2)+208**
2 or 3 beam light curtains	**1600(t1+t2)+850**	**1600(t1+t2)+850**

Example for normal approach

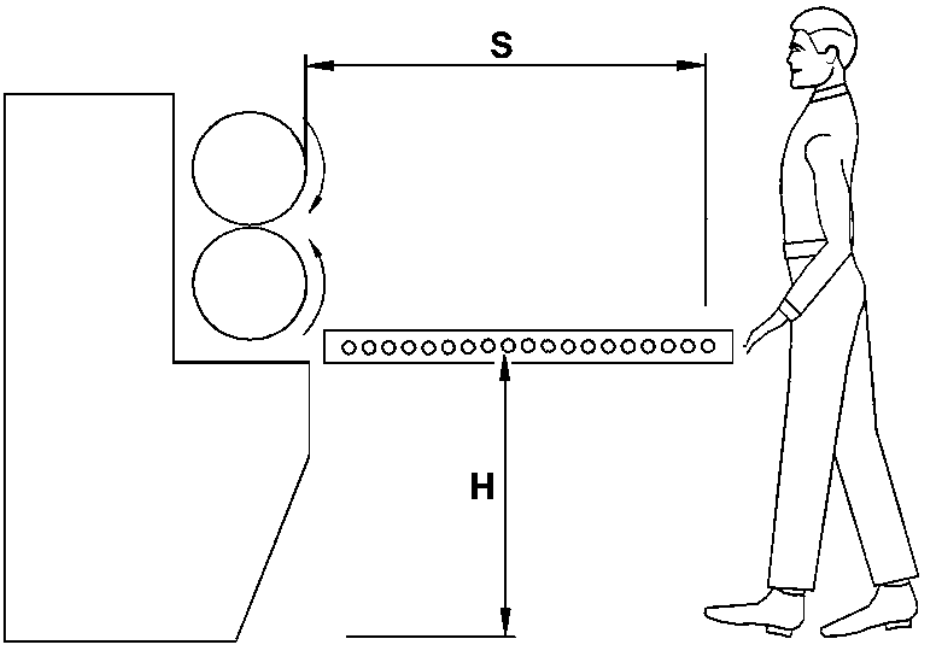
Using a light curtain with a 30mm detection capability
Where the response time of the safety system (t1) = 0.025 secs
Where the stopping time of the machine (t2) = 0.05 secs
Therefore (t1+t2) = 0.075 secs
S = 2000 x 0.075 + 128
S = 278mm

APPENDIX 1 - Normal Approach

Total response time of machine and safety system (t1 + t2)		**Separation distance (S) in mm**		
		Detection capability of the light curtain		
ms	secs	(30) mm	(40) mm	2, 3 & 4 beam systems
50	0.050	228	308	930
55	0.055	238	318	938
60	0.060	248	328	946
65	0.065	258	338	954
70	0.070	268	348	962
75	0.075	278	358	970
80	0.080	288	368	978
85	0.085	298	378	986
90	0.090	308	388	994
95	0.095	318	398	1002
100	0.100	328	408	1010
105	0.105	338	418	1018
110	0.110	348	428	1026
115	0.115	358	438	1034
120	0.120	368	448	1042
125	0.125	378	458	1050
130	0.130	388	468	1058
135	0.135	398	478	1066
140	0.140	408	488	1074
145	0.145	418	498	1082
150	0.150	428	500	1090
155	0.155	438	500	1098
160	0.160	448	500	1106
165	0.165	458	500	1114
170	0.170	468	500	1122
175	0.175	478	500	1130
180	0.180	488	500	1138
185	0.185	498	500	1146
190	0.190	500	512	1154
195	0.195	500	520	1162
200	0.200	500	528	1170
205	0.205	500	536	1178
210	0.210	500	544	1186
215	0.215	500	552	1194
220	0.220	500	560	1202
225	0.225	500	568	1210
230	0.230	500	576	1218
235	0.235	504	584	1226
240	0.240	512	592	1234
245	0.245	520	600	1242
250	0.250	528	608	1250
255	0.255	536	616	1258
260	0.260	544	624	1266
265	0.265	552	632	1274
270	0.270	560	640	1282
275	0.275	568	648	1290
280	0.280	576	656	1298
285	0.285	584	664	1306
295	0.295	600	680	1322
300	0.300	608	688	1330

APPENDIX 1

Parallel Approach



To calculate separation distance (S) **S = 1600(t1+ t2) + (1200 - (0.4 x H))**	
The detection capability of a parallel approach light curtain determines the lowest permissible mounting height between the curtain and reference plane (H) e.g. floor. Refer to the guidance below	
Detection capability (mm)	**Lowest allowable height of the light curtain above the reference plane (H) e.g. floor**
30	**(H) = Any height above the reference plane providing safety can be maintained**
40	**(H) = Any height above the reference plane providing safety can be maintained**

Example for parallel approach

The light curtain to be mounted 750mm from the floor (H)
Using a light curtain with a 40mm detection capability
Where the response time of the safety system (t1) = 0.025 secs
Where the stop time of the machine (t2) = 0.08 secs
Therefore (t1 + t2) = 0.105 secs
S = 1600 x 0.105 + (1200 - (0.4 x 750))
S = 168 + 1200 - 300
S = 1068mm

APPENDIX 1 – Parallel Approach

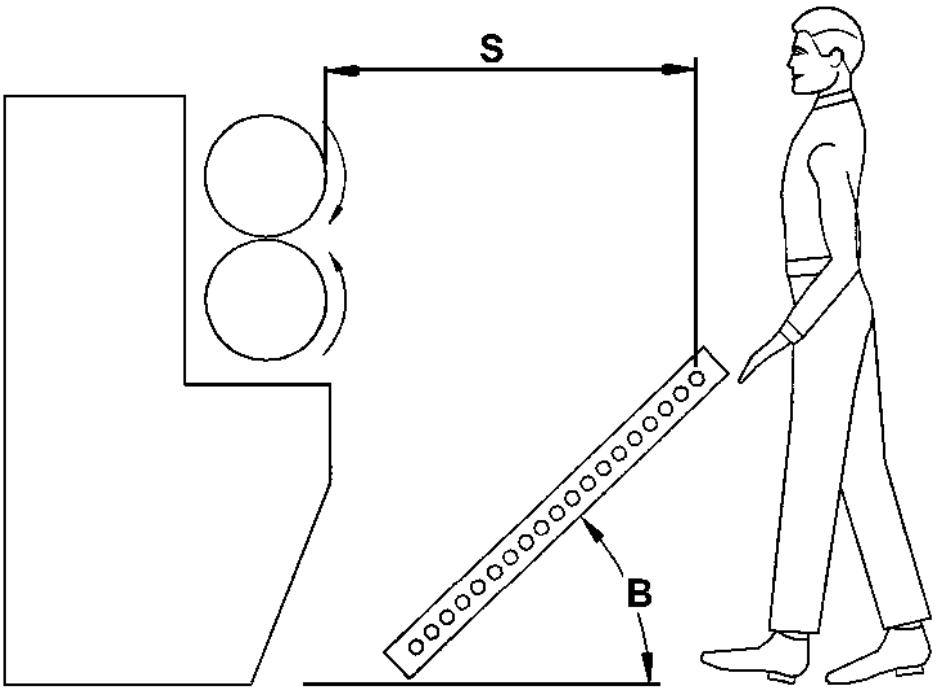
Total response time of machine and safety systems (t1 + t2)		**Separation distance where (H) = 750mm**
ms	secs	(S) in mm
50	0.050	980
55	0.055	988
60	0.060	996
65	0.065	1004
70	0.070	1012
75	0.075	1020
80	0.080	1028
85	0.085	1036
90	0.090	1044
95	0.095	1052
100	0.100	1060
105	0.105	1068
110	0.110	1076
115	0.115	1084
120	0.120	1092
125	0.125	1100
130	0.130	1108
135	0.135	1116
140	0.140	1124
145	0.145	1132
150	0.150	1140
155	0.155	1148
160	0.160	1156
165	0.165	1164
170	0.170	1172
175	0.175	1180
180	0.180	1188
185	0.185	1196
190	0.190	1204
195	0.195	1212
200	0.200	1220
205	0.205	1228
210	0.210	1236
215	0.215	1244
220	0.220	1252
225	0.225	1260
230	0.230	1268
235	0.235	1276
240	0.240	1284
245	0.245	1292
250	0.250	1300
255	0.255	1308
260	0.260	1316
265	0.265	1324
270	0.270	1332
275	0.275	1340
280	0.280	1348
285	0.285	1356
290	0.290	1364
295	0.295	1372
300	0.300	1380

Note: The chart shows light curtain Separation Distance (S) in relation to the systems response time (t1 + t2).

In the chart 750mm has been chosen as a value for (H).

APPENDIX 1

Angled Approach



To calculate separation distance (S)
If B >30 degrees calculate S as for Normal approach
If B <30 degrees calculate S as for Parallel approach

More detailed information on the application of safety light curtains is provided in the International Technical Specification TS62046.

APPENDIX 2

Mirrors

Reflector mirrors can be provided enabling two or three sides of a machine to be safeguarded with, what is effectively a single light curtain.

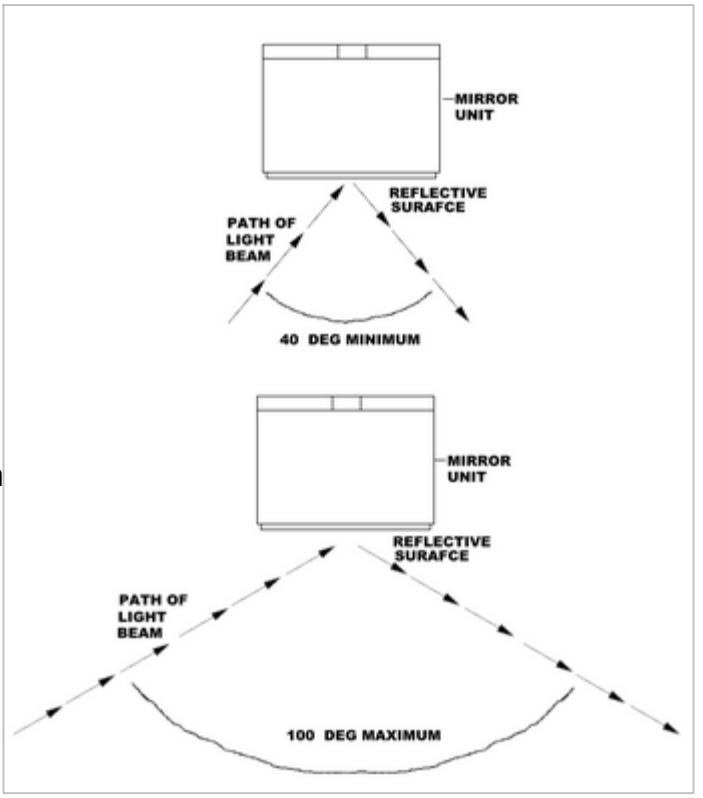
When mirrors are employed it is essential that the mounting of the transmitter unit, receiver unit and mirrors themselves are sufficiently rigid. Alignment becomes increasingly critical as the range and number of mirrors increase. Mirrors cause a reduction in optical efficiency, reducing the effective range. A guide to the practicality of using mirrors is given below.

Range of the light curtain	Maximum range through 1 mirror	Maximum range through 2 mirrors
3m - 15m	9m	6m

Total Light Path	1 Mirror	2 Mirror
3m	Easy	Easy
5m	Easy	Medium
6m	Medium	Hard
9m	Hard	Not Feasible

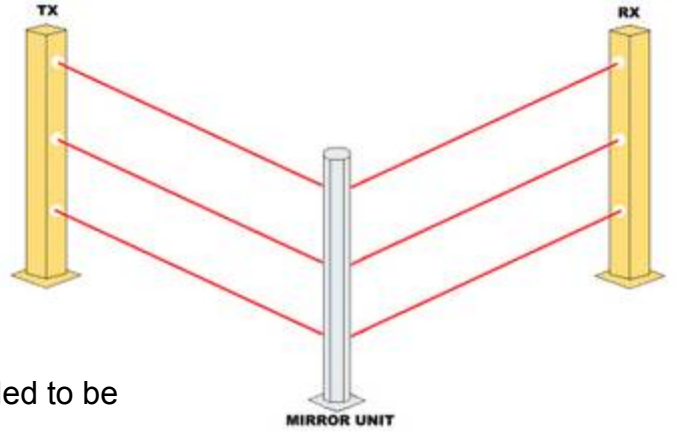
Note: Perimeter curtains will be easy to align, curtains over 900mm may be more difficult to align. Check with Smartscan technical department prior to ordering for a particular application, support@smartscan.com, Tel: +44 (0) 1536 401313, Fax: +44 (0) 1536 268354

Note: The angle of the light curtain striking the reflective surface must be within defined limits.



APPENDIX 2

Alignment though one mirror



1. Secure the transmitter, receiver and mirror units in the position in which they are intended to be used.

2. Ensure all units are perfectly upright in all planes by using a sprit level.

3. If the units are floor mounted on stands ensure the floor is even. Shim the floor mounts if necessary to ensure the units are all upright.

4. With one eye looking over the top of the receiver unit in line with the centre of the extrusion look towards the reflective surface of the mirror, in a similar manner to looking through a gun sight.

5. A second person must adjust the mirror to the left and right until the Perspex window of the transmitter unit can be seen reflected in the mirror.

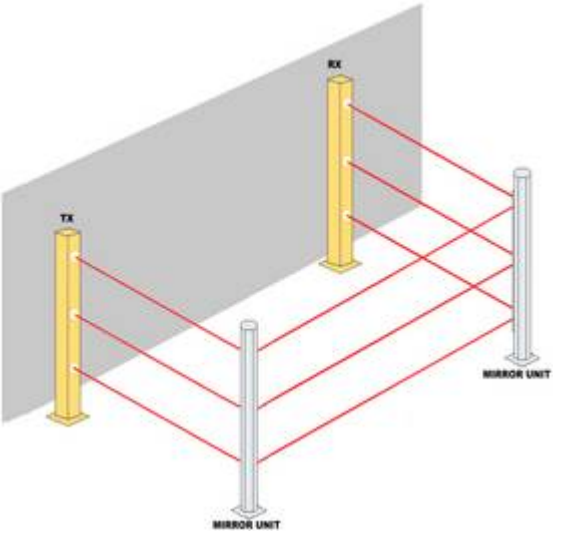
6. If the light curtain is scanning over a long range it may be difficult to see the reflection of the transmitter units Perspex window in the mirror. If so, cut a piece of white paper to the size of the Perspex window and mount directly in front of the window. Now repeat step 5.

7. If the reflection of the white paper is difficult to see in the mirror then employ a third person to hold a flashlight in front of the transmitter unit with the light beam pointing directly in line with the Perspex window towards the mirror. Now repeat step 5.

8. Use shims to ensure the mirror is accurately aligned to enable the infra red beams in the light curtain to reach the receiver.
   Alternatively, fabricate mirror mountings to include some form of adjustment to enable movement both left and right and also forward and backwards from the central axis of the mirror.

APPENDIX 2

Alignment though two mirrors



9. Follow instruction 1-4

10. A second person must adjust the position of the first mirror to the left and to the right until the entire length of the second mirror is reflected in the first mirror. If difficulties are experienced in seeing the reflection on the second mirror in the first mirror then use a piece of white paper cut to size and position in front of the second mirror.

11. If the reflection of the white paper is difficult to see in the first mirror then employ a third person to hold a flashlight in front of the second mirror with the light beam pointing directly in line with its mirror housing towards the first mirror. Secure the first mirror.

12. Again follow instructions 1 to 4.

13. The second person must adjust the position of the second mirror to the left and to the right until the entire length of the transmitter unit is reflected through both the first mirror and the second mirror. If difficulties are experienced in seeing the reflection of the transmitter unit through both the first then the second mirrors then use a piece of white paper cut to size and position in front of the transmitter unit.

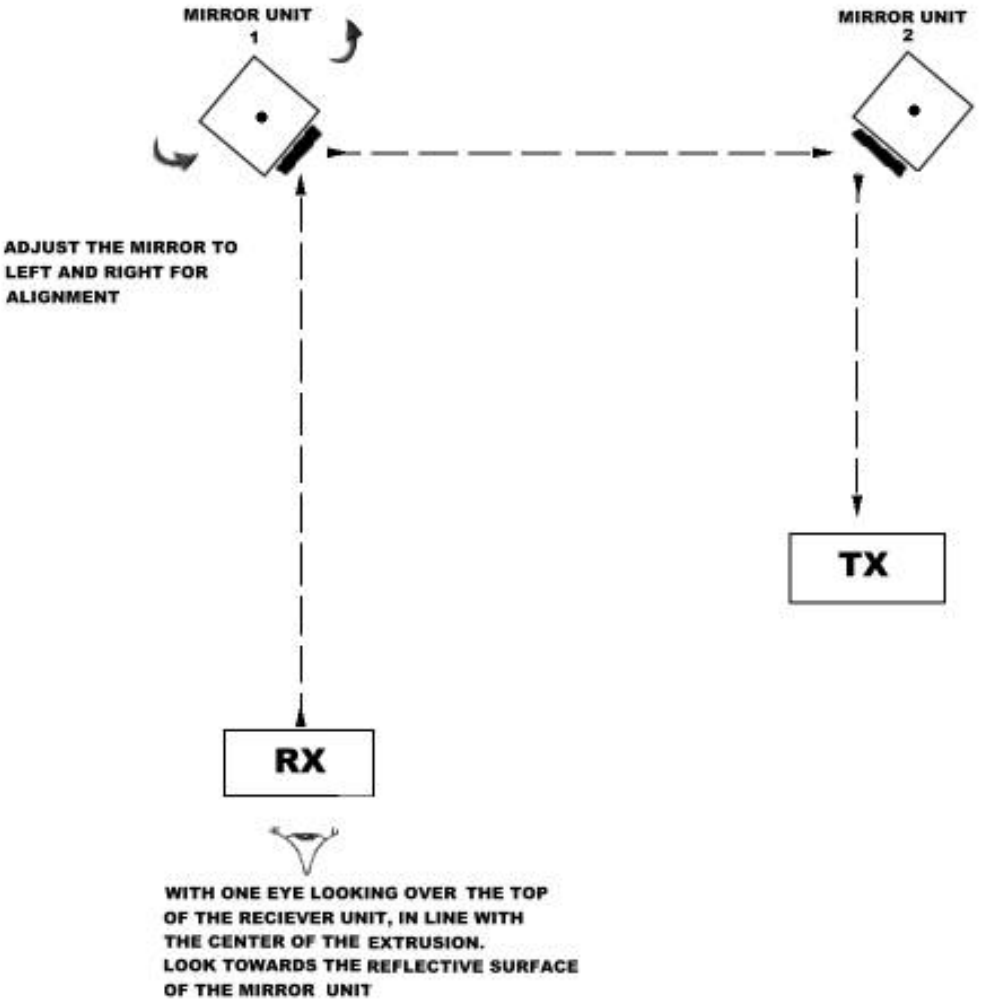
14. If the reflection of the white paper is still difficult to see through the first and second mirrors then employ a third person to hold a flashlight in front of the transmitter unit with the light beam pointing directly towards the second mirror. Secure the second mirror.

15. Ensure the mirrors are directly aligned thus enabling the infra red beams of the transmitter to reach the receiver. Alternatively, fabricate mirror mountings to include some form of adjustment to enable movement both left and right and also forwards and backwards from the central axis of each mirror.

APPENDIX 2

16. Now turn on the power to the light curtain and check that the green LED beam indicator, mounted on the receiver unit is ‘on’. If not, it may be necessary to finely adjust each mirror in turn to ensure the infra-red energy from the transmitter unit is being reflected through the mirror(s) to the corresponding receiver unit.

Alignment of the light curtain using mirrors



Note: The mirror length must be a minimum of 100mm longer than the overall length of the light curtain to be installed e.g. 50mm above and 50mm below either end of the light curtain.