



Installation Instruction for
MLG-Series Type 4 Light Curtains



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Machine Safety for People and Productivity

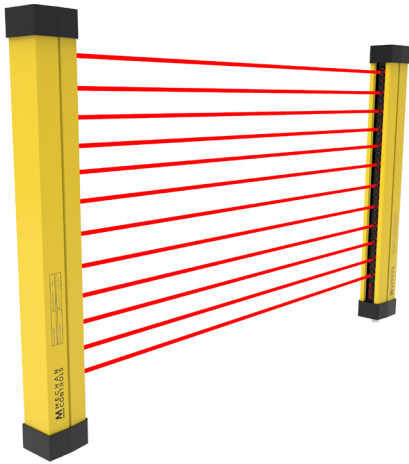
WARNING

MLG-Series systems are designed to protect operators working at or near dangerous machinery. They can only perform this function if they are correctly fitted and interfaced to a suitable machine. Those persons responsible for the machine must ensure that all persons involved in the installation of the photo-electric safety system have the necessary knowledge, training and experience and that they are fully aware of all laws, rules, regulations and codes of practice pertaining to their task.

EN999 gives guidance on the dimensions and positioning of photo-electric safety devices fitted to industrial machines. The main considerations are described below. The attention of the installer is drawn to following general requirements for the installation of a MLG-Series system:

- (a) The dangerous motion of the machine must be electrically controllable.
- (b) The machine response/stopping performance must be adequate and consistent.
- (c) It must be possible to stop the dangerous motion of the machine at any point in its operation, in any operating mode.
- (d) The control system as a whole must be designed and constructed to provide the appropriate safety integrity level (SIL) as defined in EN62061-1:2005 'Safety of machinery-Functional safety of safety-related electrical, electronic and programmable electronic control systems'. The appropriate SIL should be as prescribed in the relevant C type EN standard for the type of machine concerned. In the absence of such a standard the appropriate SIL should be determined by performing a risk assessment as described in ISO EN14121-1:2007 'Safety of machinery: Risk assessment principles'.
- (e) At power on, or after a power interruption, it must not be possible for the machine to start until a manual control has been operated. This is known as 'start interlock'. The basic MLG does not provide this function. The function of the basic MLG system is 'GUARD ONLY' i.e. when the curtain is clear the outputs are ON and when the curtain is broken the outputs are OFF.
- (f) After the curtain has been actuated it must not be possible for the machine to restart until a manual control has been operated. This is known as 'start/restart interlock'. The basic MLG does not provide this function. The function of the basic MLG system is 'GUARD ONLY' i.e. when the curtain is clear the outputs are ON and when the curtain is broken the outputs are OFF.
- (g) Steps must be taken to prevent access to the dangerous parts of the machine from any direction not covered by the photo-electric curtain. Such steps could include fixed or interlocking fences or screens, additional photo-electric devices or pressure sensitive mats. Similar steps should be taken to prevent a person standing between the curtain and the dangerous parts.
- (h) The correct minimum separation distance must be observed. The curtain must be mounted in the correct position in relation to the dangerous parts of the machine to take account of the stopping performance of the machine, the curtain format used and the detection capability of the curtain.
- (i) The curtain must be of sufficient height such that access to the dangerous parts, from the direction of approach of the operator, is only possible by obstructing the curtain taking into account all possible operator positions.
- (j) No devices other than those specified in this manual should be connected to the internally generated power supply of the system.
- (k) After installation the machine/guard system must be commissioned in accordance with the requirements of this manual.
- (l) Any covers removed during installation must be replaced as soon as possible.

MLG-Series Features and Benefits



Description

MLG-Series light curtains and grids are through-beam photo-electric machine guarding devices, designed to protect operators working at or near dangerous machinery, suitable for use in SIL3 IEC/EN61508:2010, EN62061: 2005 & PLe ISO13849-1:2015 installations.

The MLG light curtain system has been independently certified to EN 61496-1:2012.

When correctly installed on a suitable machine, the system will detect a person (or part of a person) entering a dangerous area in the vicinity of the machine and will cause dangerous motion to cease before that person can reach a position where injury could occur.

MLG-Series light curtains and grids use infra-red technology. A curtain of infra-red light is projected across the dangerous area. Intrusion into this curtain by a person, or part of a person, will be detected by the system. This will cause safety output signals to be generated which will stop the dangerous motion of the machine.

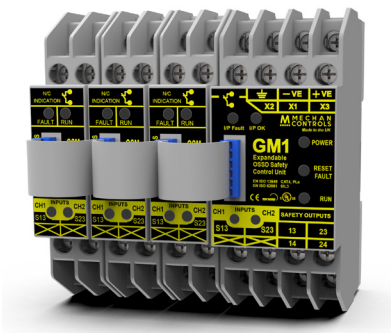
MLG systems are fully self-monitoring and meet worldwide requirements for safeguarding devices used on industrial machines.

Curtain

A MLG-Series system consists of an arrangement of infra-red emitting devices, which send out pulses of infra-red light (emitter), and an arrangement of infra-red receiving devices, which detect the pulses (receiver). Both arrangements are identical in shape and size, and are enclosed in a robust extruded aluminium section with aluminium end covers.

The emitter and receiver units together generate a curtain of infra-red light between them. This curtain is mounted in such a position in relation to the dangerous parts of a machine that a person or part of a person approaching those dangerous parts must first penetrate the curtain. This penetration is detected by the light curtain system and, by means of its output switching devices, the light curtain system causes the dangerous parts to go to a safe state.

Recommended Safety Controller



Description

The GM1/GSM is an expandable safety controls unit designed to monitor multiple Mechan Controls Lightcurtains (MLG-Series) on a single system (zone). The master control unit (GM1) can monitor one pair of MLG-Series Lightcurtain (transmitter & receiver) and each additional Light curtain set can be monitored by adding an additional GSM extender module.

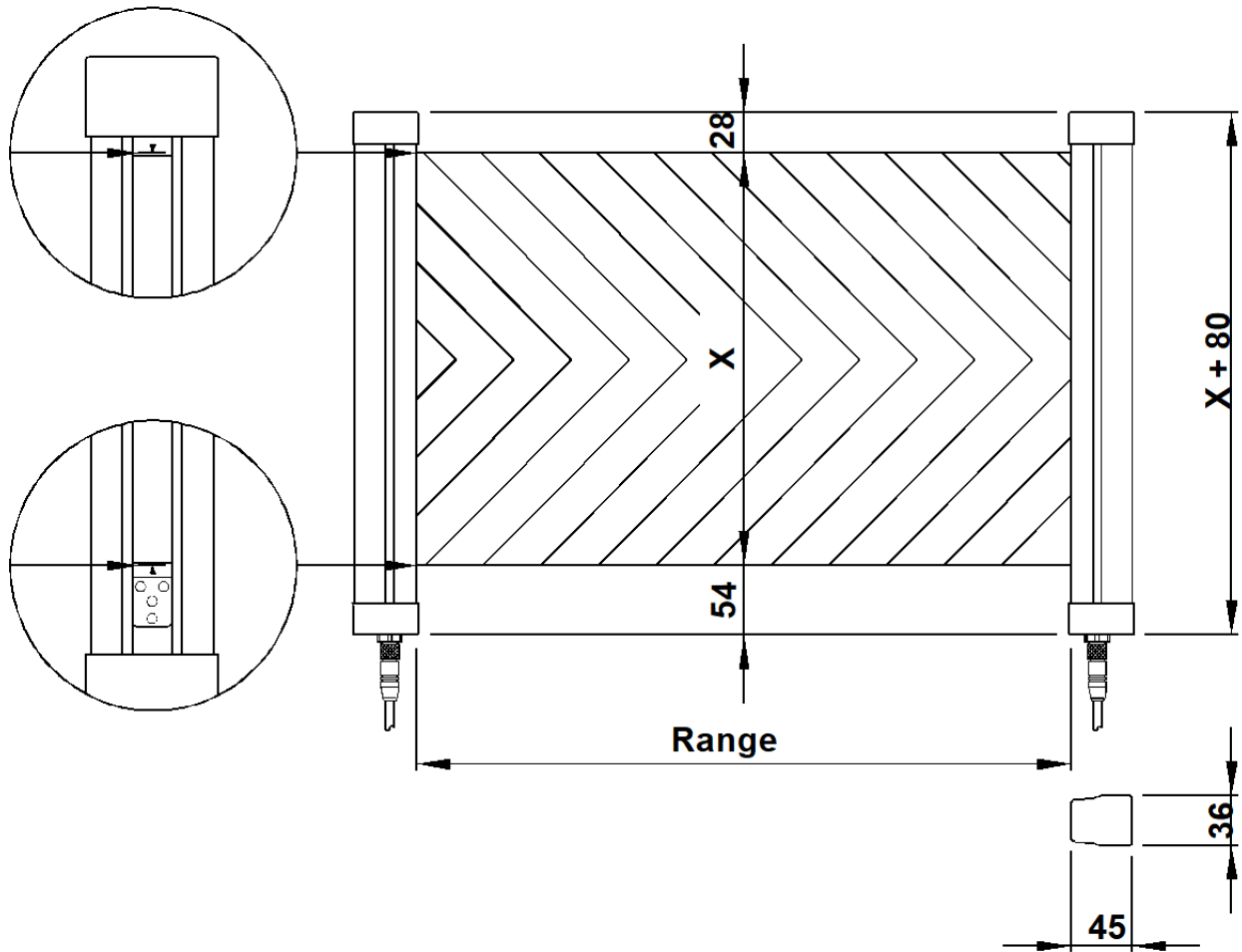
See page 5 for connection examples

Basic System

The curtain dimensions are defined by the detection zone height and the range (i.e. the distance between the sender and receiver units). The detection zone height must be selected to suit the application.

The detection zone of a light curtain (or Electrosensitive Protective Equipment) is defined in EN61496 as: "The zone within which the specified test piece will be detected by the Electrosensitive Protective Equipment".

All the dimensions relating to the curtain, for each detection characteristic of a basic MLG system, (or basic slave) are shown in Figure 1. The upper and lower boundaries of the curtain are indicated by arrows on the front window labels of each unit.



X = Nominal curtain length (e.g. 200, 400, 600 etc.)

Figure 1

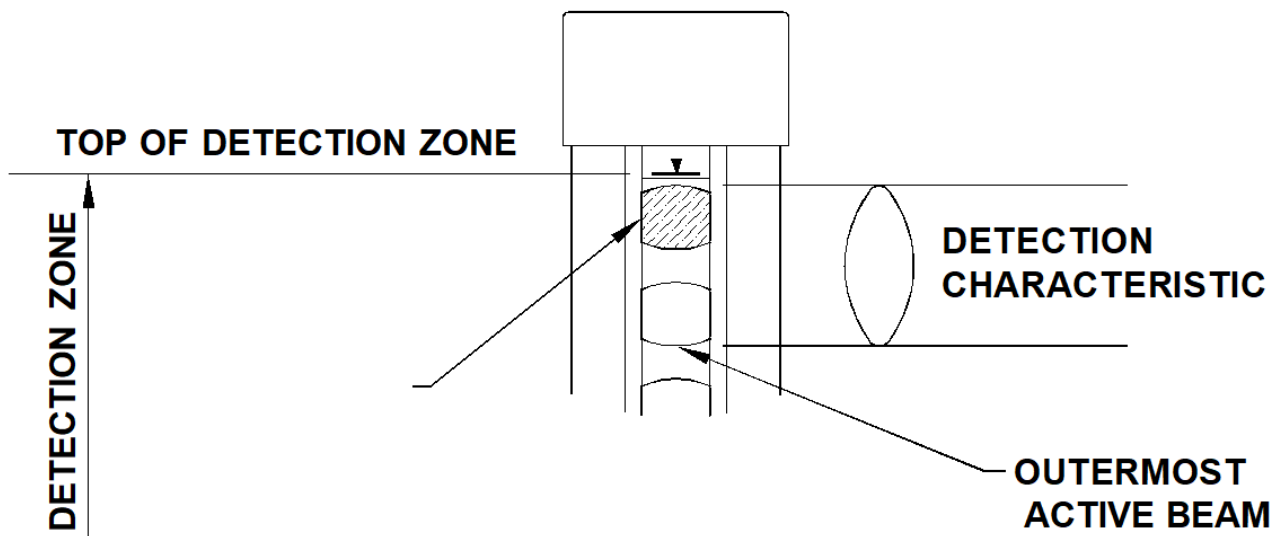


Figure 2

Multi-Beam System

All the dimensions relating to the curtain, for each of the Multi-beam systems are shown in Figure 3. **For full body access applications only.**

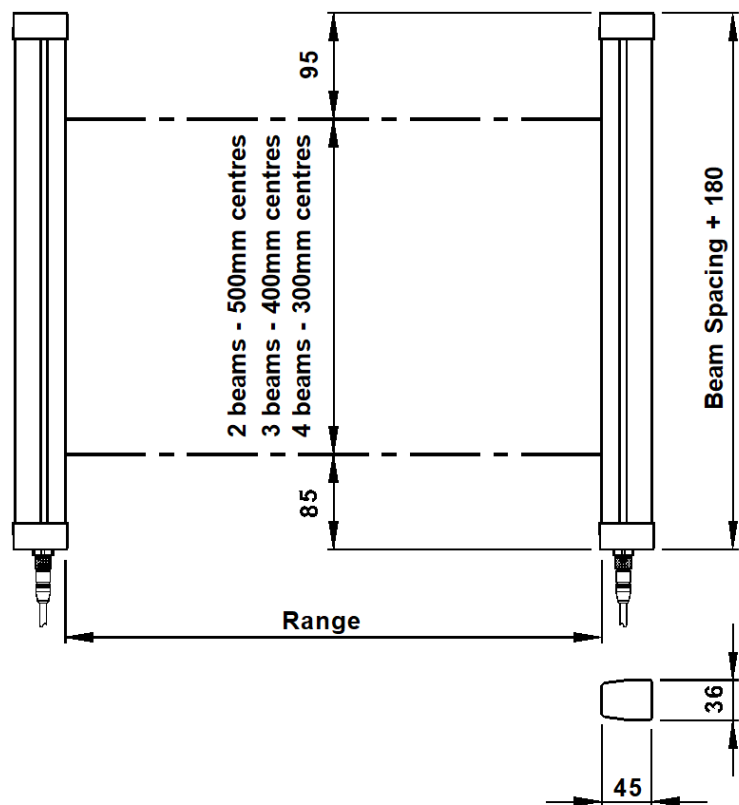
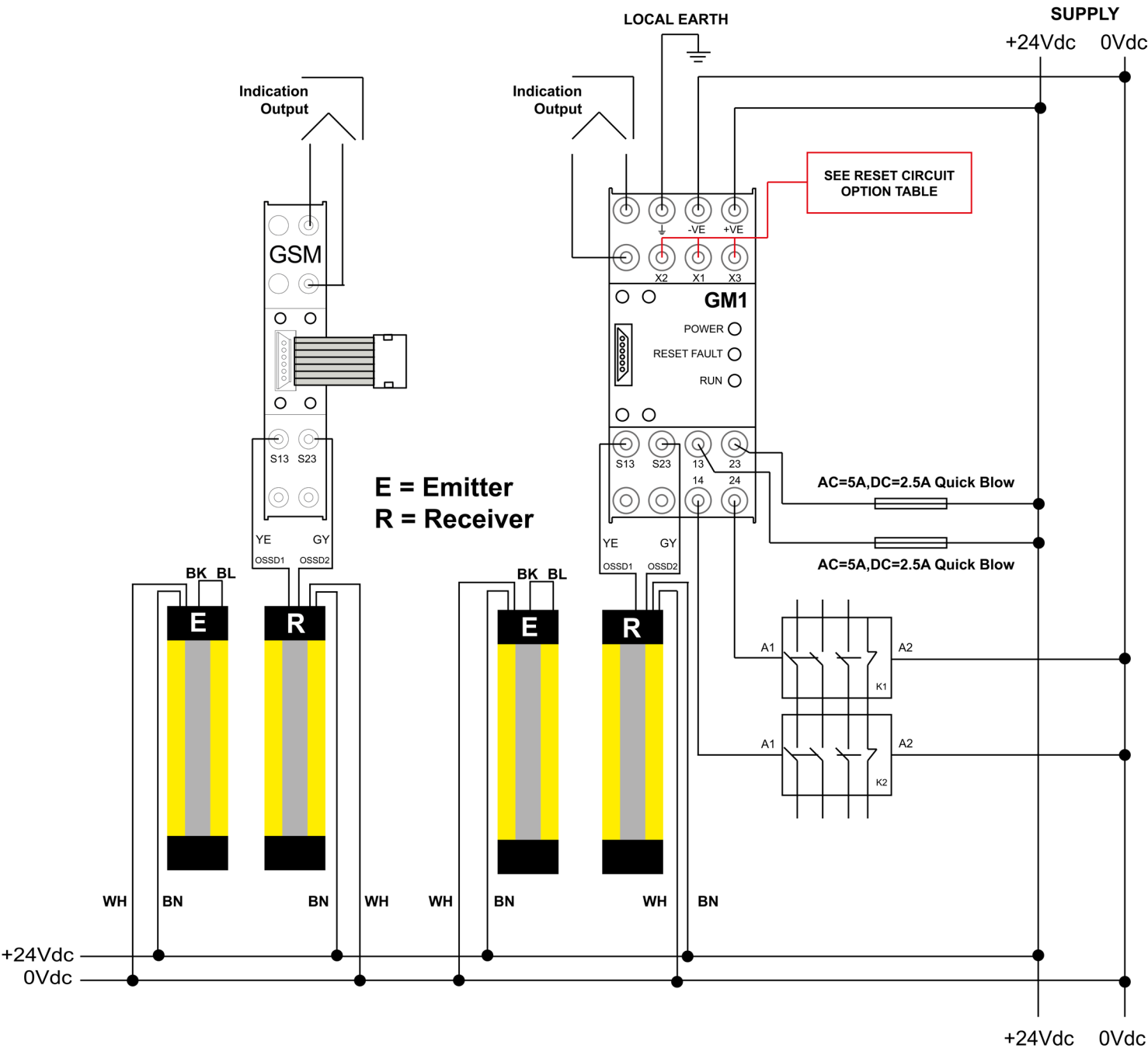
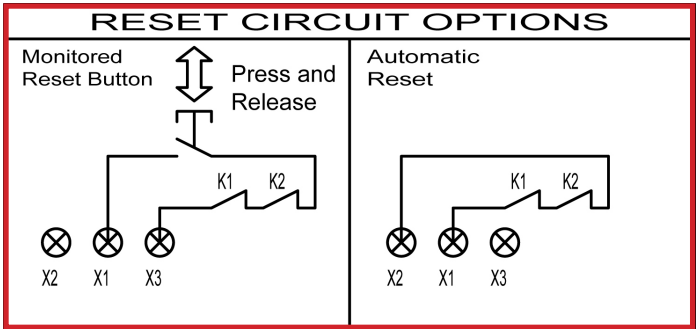


Figure 3

Connection Examples for MLG Light Curtain Systems

Additional flexibility to facilitate guarding in more than one plane is provided, by the capability to connect multiple units to a GM1 and GSM control unit. The GM1 acts as the master control unit and will accept one light curtain pair (emitter and receiver) and each additional light curtain pair will require a GSM extender module.

This system will function as a single zone and allow you to use multiple light curtain systems with a single pair of safety outputs.



GSM Extender module monitoring one pair of light curtains.

GM1 master control unit monitoring one pair of light curtains and two safety outputs

Diagnostic Display

The LED indicators on the standard/master emitter unit and all slave units are the same as for the previous section. The receiver unit contains a scrolling 4-digit alphanumeric display for diagnostic purposes as shown in Figure 4.

The various displays and their meanings are shown in Table 1 below.

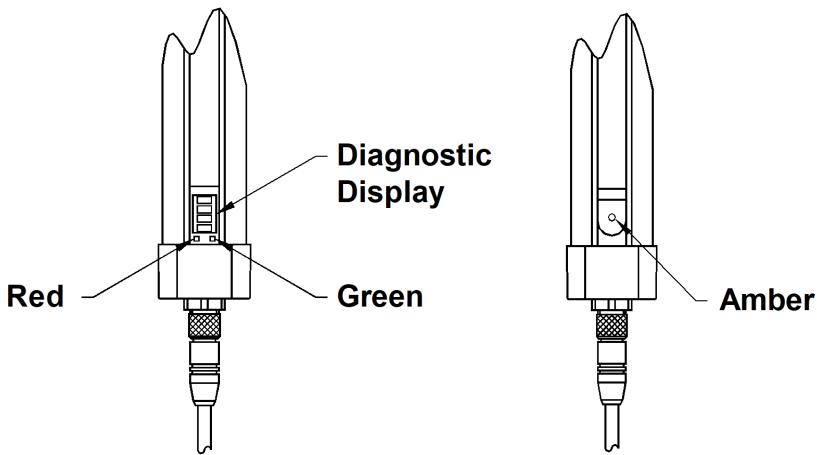


Figure 4

Displays in normal operation		
Display	Mode	Description
Scrolls CURTAIN OK	No Blanking	The curtain is clear and operating correctly
Scrolls "Mode" OK	Blanking	
Bxxxx	No Blanking	The curtain is obstructed and beam number xxx is the first beam in an incorrect state
Scrolls "Mode" Bxxx	Blanking	

Displays with faults with external causes		
Display	Mode	Description
SYNC	No Blanking	Unable to synchronise with the Emitter column
Scrolls "Mode" SYNC	Blanking	
LOCKOUT CHANNEL A O/P HIGH		A short circuit from Output A to +24Vdc
LOCKOUT CHANNEL A O/PLOW		A short circuit from Output A to 0Vdc
LOCKOUT CHANNEL B O/P HIGH		A short circuit from Output B to +24Vdc
LOCKOUT CHANNEL B O/P LOW		A short circuit from Output B to 0Vdc

Internal Faults	
Display	Description
LOCKOUT CHANNEL X FAULT	Fault not serviceable in the field. Return to vendor for repair.

Table 1

MOUNTING BRACKET OPTIONS

There are 3 types of mounting bracket options available for the MLG Systems:

MOUNTING BRACKET TYPE AB

The adjustable mounting bracket - Type AB combines a robust design with quick release facility, the adjustable bracket promotes speedy installation and also allows for easy interchange of a light curtain unit without the need for re-alignment. This option is specified as 'AB' in the order code.

MOUNTING BRACKET TYPE CB

The Clamp Bracket - Type CB offers a neat and compact design to provide versatile installation. In addition, the Clamp Bracket Mounting Plate has been specially designed to allow angular adjustment of the light curtain. This option is specified as 'CB' in the order code.

MOUNTING BRACKET TYPE EB

The Endcap Bracket - Type EB is designed to be used in situations where space is limited, the slimline nature of the Endcap Bracket allows the light curtain to be easily mounted in a confined space such as on the external edge of a fixed structure or adjacent to a floor post. This option is specified as 'EB' in the order code.

For installation instructions regarding these mounting bracket options please see the installation sheets supplied with each kit.

Optical Alignment

The emitter and receiver units should be mounted facing each other at the same height with their axes aligned. Misalignments as illustrated in Figure 5 should be avoided.

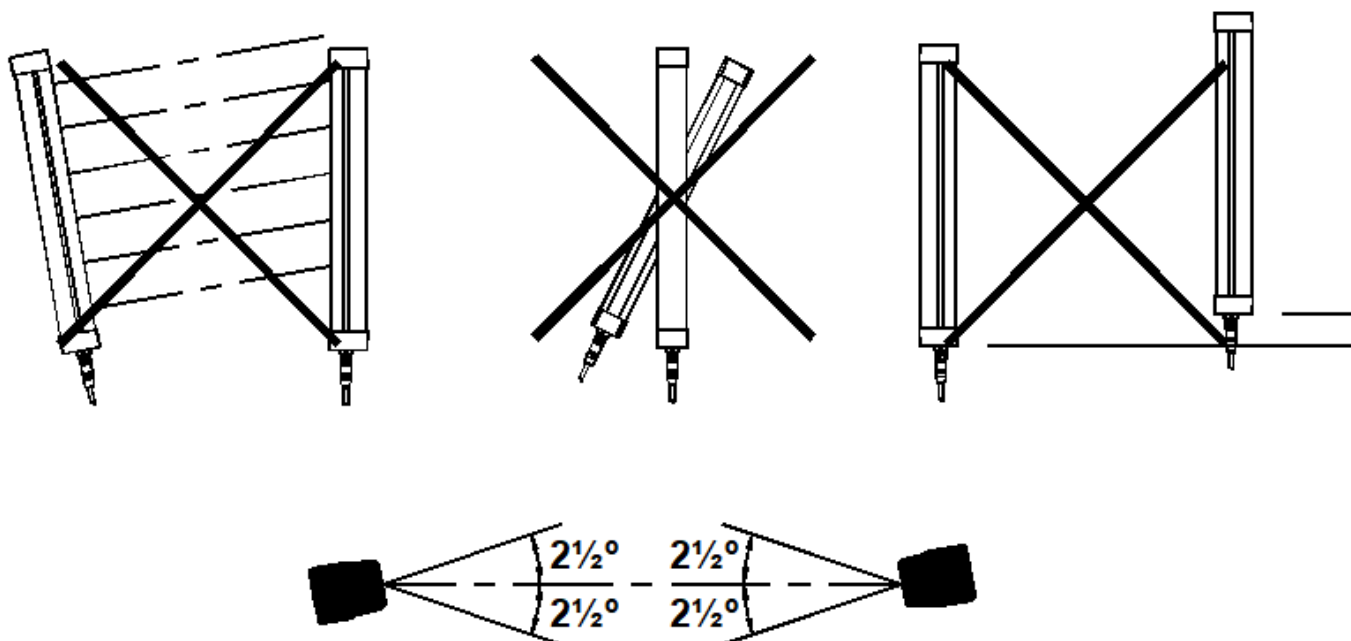


Figure 5

ADJUSTABLE MOUNTING BRACKET KIT - TYPE AB

1. INTRODUCTION

This mounting bracket kit is for securing a light curtain to a wall, mounting surface or floor post in the vertical axis and has angular adjustment if required.

Each adjustable mounting bracket kit comprises:

- 4 x Mounting Bracket Main Body
- 4 x Clamp Plate
- 4 x M4 x 16mm Cap Allen Screw (Clamp plate screw)
- 8 x M6 x 16mm Cap Allen Screw (Adjustment screw)
- 1 x Installation Instruction Sheet

Owing to the tight acceptance angles specified by current standards, it is important that the emitter and receiver units are mounted so that they are as optically aligned as possible.

Assemble the mounting brackets as follows:

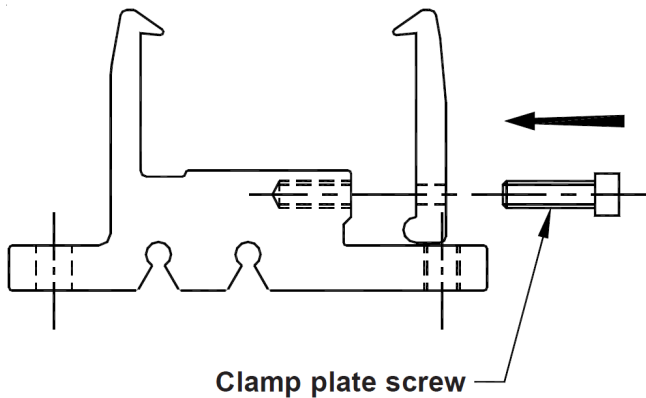


Figure 1

2. INSTALLATION TO A WALL OR MOUNTING SURFACE

2.1. Mark the positions where the guard is to be located ensuring that the mounting surfaces are flat and even.

2.2. The greater the care taken in positioning and securing the guard, the easier it will be to align the system.

2.3. Secure the brackets to the wall / mounting surface, ensuring that they are vertically aligned. Locate the columns in the mounting brackets and tighten clamp plates.

2.4. Any vertical adjustment required may be obtained by slackening the clamp plates and raising / lowering one column until the beams are optically aligned.

2.5. Once in alignment the clamp plate securing screw may then be fully tightened.

2.6. Any rotational / lateral adjustment may be achieved via the M6 jacking screws, adjacent to the securing screws on the mounting bracket body. See figure 2 and 3

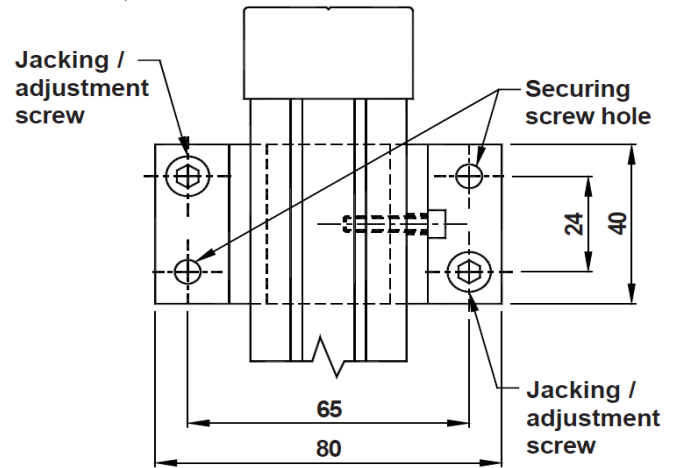


Figure 2

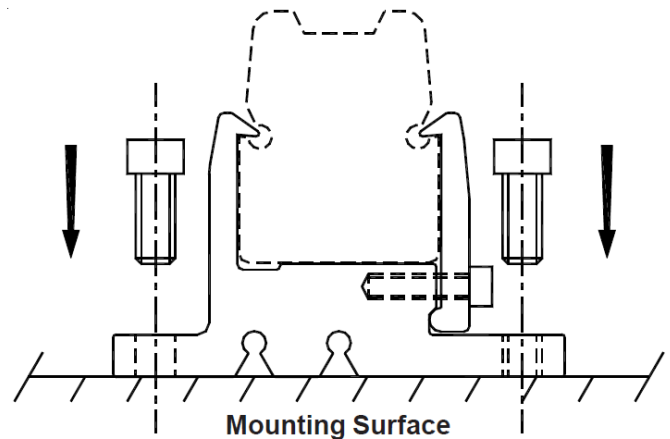


Figure 3

Care must be taken to ensure that the amount of adjustment for both top and bottom mounting brackets is equal, to prevent the column from twisting and therefore distorting the optical beam alignment.

2.7. Once the two columns are optically aligned, tighten the mounting bracket body securing screws.

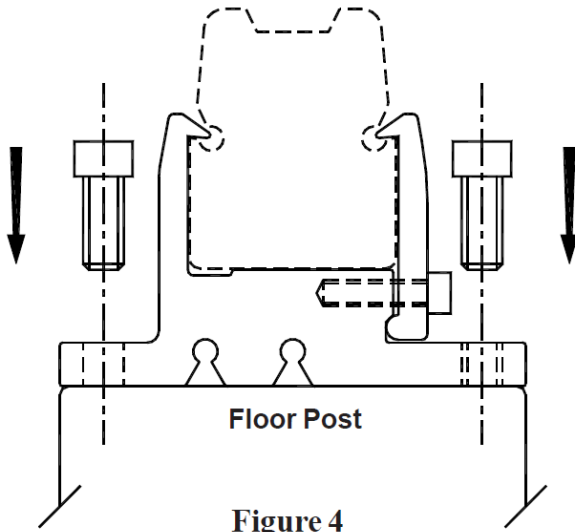
ADJUSTABLE MOUNTING BRACKET KIT - TYPE AB

3. INSTALLATION TO A FLOOR POST

3.1. Mark the position on the front face of the floor post where the light curtain is to be located. Ensure that the mounting brackets are positioned at the same height on both emitter and receiver floor posts. It is important that the brackets are positioned centrally on the floor post.

3.2. Secure mounting brackets to the floor post in one of two ways:

- Drill clearance holes (M5) right through the floor post and secure brackets in place with M5 x 100mm long bolts, nuts and washers.
- Drill holes 4.2mm diameter through the front face only of the floor post and tap M5. Secure brackets in place with M5 x 20mm cap allen screws. See figure 4.



3.3. Locate columns in the mounting brackets and adjust to correct height and tighten clamp plates. See figure 5.

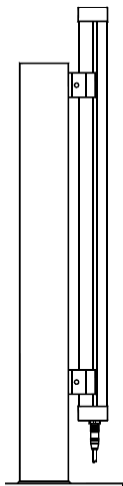


Figure 5

3.4. Place floor posts in required position ensuring that the emitter and receiver columns are both level horizontally and vertically and then visually align.

3.5. Any rotational / lateral adjustment may be achieved via the M6 jacking screws, adjacent to the securing screws on the mounting bracket body. See figure 2 and 4.

Care must be taken to ensure that the amount of adjustment for both top and bottom mounting brackets is equal, to prevent the column from twisting and therefore distorting the optical beam alignment.

3.6. Secure the floor posts in this position via the central front mounting hole (A) see figure 6. Once both floor posts have been secured, check guards are still in alignment. If so secure via the two rear adjustable mounting slots (B) see figure 6. If any adjustment is required to bring the guard back into alignment this may be achieved by either:

- Rotating the floor post via slots (B) see figure 6.
- Adjusting the jacking screws (C) for tilt see figure 6.

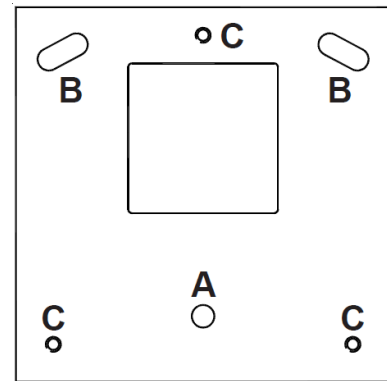


Figure 6

3.7. Any vertical adjustment required may be obtained by slackening the clamp plates and raising / lowering one column until the beams are optically aligned.

3.8. Once in alignment the floor post mounting screws and clamp plate securing screw may be fully tightened.

REFLECTIVE SURFACES

There should be no reflective surfaces within the 'field of view' of the curtain units. Reflective surfaces within the field of view can lead to non-detection of an obstruction. The field of view of each of the emitter and receiver units is approximately 2½ degrees either side of the optical axis.

A minimum distance from the optical axis to any reflective surface must be observed. This distance depends on the actual operating distance and must take into account possible misalignment. This is illustrated in Figure 6. The distance should be determined as follows:

Operating distance $L < 3\text{m}$: $X > 130\text{mm}$

Operating distance $L > 3\text{m}$: $X > 0.0437L\text{mm}$

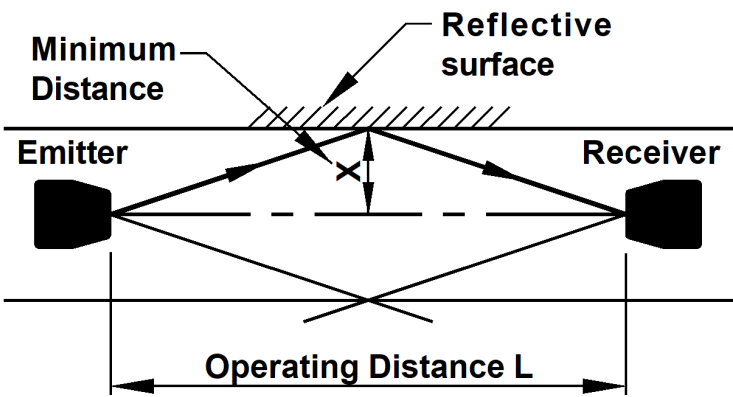


Figure 6

SYSTEMS IN CLOSE PROXIMITY

In order to avoid nuisance interference between adjacent systems, whenever two sensing units are used within each other's sensing range, ensure that the front window of any unit is not within the field of view of units of the opposite type from other systems.

This can be achieved by ensuring that units of the same type are mounted facing in opposite directions. See Figure 7.

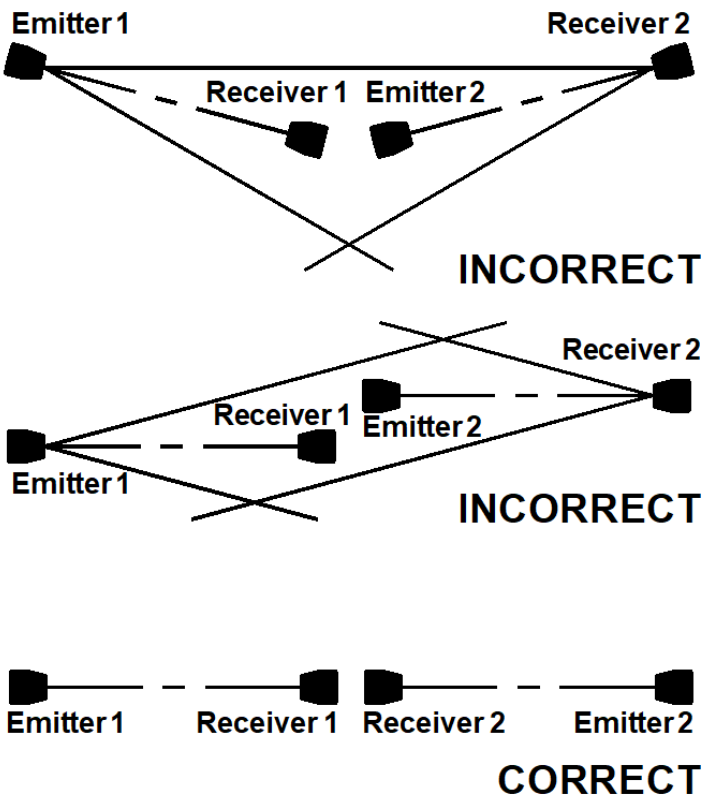


Figure 7

SEPERATION DISTANCE

Any machine, regardless of the efficiency of its braking system, will take a certain time to come to rest after a stop signal is generated.

The time from the instant that the curtain is broken to the instant that dangerous motion actually ceases is called the overall system response time. The dangerous parts will obviously continue to move during this time. The curtain must therefore be positioned at a certain minimum distance from the dangerous parts to prevent a person who has obstructed the curtain from reaching the dangerous parts before they have stopped.

This distance is the minimum separation distance and is defined as the distance, in the direction of approach, between the physical point at which the curtain detects an obstruction and the nearest dangerous parts.

EN13855:2010 provides guidelines on how to determine the minimum separation distance for a given application.

Figure 8 provides a methodology for determining the separation distance of a MLG system, which is as follows:

- (a) Identify the hazards and assess the risks (see ISO EN12100-1:2010 and ISO EN14121-1:2007).
- (b) If a type C standard exists for the machine, use the distance specified by that standard.
- (c) If there is no type C standard, or if the C standard does not specify a minimum distance, then use the formulae in EN13855:2010 (reproduced in the following sections) to calculate the separation distance.
- (d) Incorporate the distance in the machine design.
- (e) Ensure that the device has been installed in such a manner that access to the danger zone is not possible without detection.
- (f) If the positioning of the curtain allows persons to be in a position between the curtain and the danger zone, supplementary measures may be required depending on the risk.

See page 11 for calculating the seperation distance

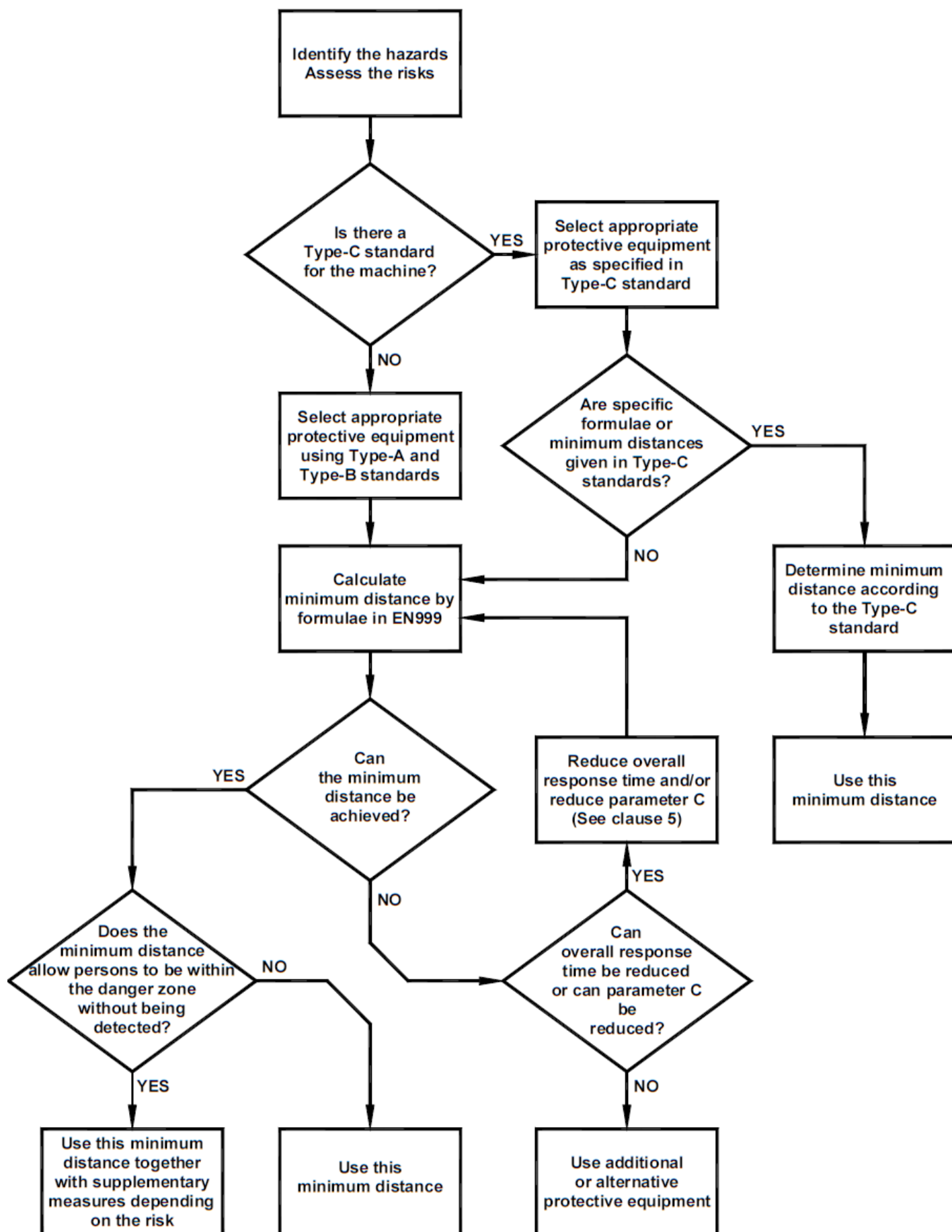


Figure 8

SEPERATION DISTANCE

The separation distance depends on the application and the following factors:

- the curtain format used.
- the detection capability, d.
- the overall system response time, T.
- the curtain penetration figure, C.
- the derived body part speed, K.

The overall system response time, T, is a period, in seconds, given by the sum of the response times of the safety device and the machine control system. The response time of the MLG system is between 20ms and 56ms (see section 5.1 for specific data). The response time of the machine control system should be measured using a suitable device and the highest value recorded, plus a suitable allowance for brake deterioration, should be used in the calculation of the minimum separation distance. It is recommended that the overall system response time is recorded on the machine information label or plate.

The curtain penetration figure, C, is a distance, in millimetres, representing the distance by which part of a person penetrates the plane of detection of the safety device before actuation of the sensing unit occurs. This figure is a function of the detection capability.

The derived body part speed, K, is a speed, in millimetres per second, derived from measurement data of speeds of movement of various parts of the human body. This figure represents the derived speed of that part of the body which will obstruct the sensing unit.

The minimum separation distance should be recorded on the machine information label or plate.

The general formula for calculating the minimum separation distance, S, in millimetres, for MLG light curtains used is as follows:

$$S = K \times T + C$$

NORMAL APPROACH

Normal approach format is shown in Figure 9. For normal approach format the inner edge of the front window of each unit (i.e. the edge which is nearest to the machine) should be considered to be the point at which an obstruction is detected. See plane X in Figure 9.

(a) For a normal approach application where the curtain has a detection capability, d, of $\leq 40\text{mm}$:

$$S = K \times T + C$$

where $K=2000$ and
 $C=8(d-14)$, but not less than 0;

If this formula gives S greater than 500mm then S can be recalculated $K = 1600$ but in this case S must not be less than 500mm.

If it is foreseeable that the guard will be used in a non-industrial environment, eg, in the presence of children, the minimum distance shall be increased by at least 75mm and a body part speed of 2000mm/s must be used.

b) For detection capability, d, of 30mm:

$$S = K \times T + C$$

where $K=2000$ and
 $C=8(d-14)$

i.e. $S = (2000 \times T) + 128$

(c) For detection capability, d, of 70mm (when d is greater than 40, $C=850$):

$$S = K \times T + C$$

where $K=1600$ and
 $C= 850$

i.e. $S = (1600 \times T) + 850$

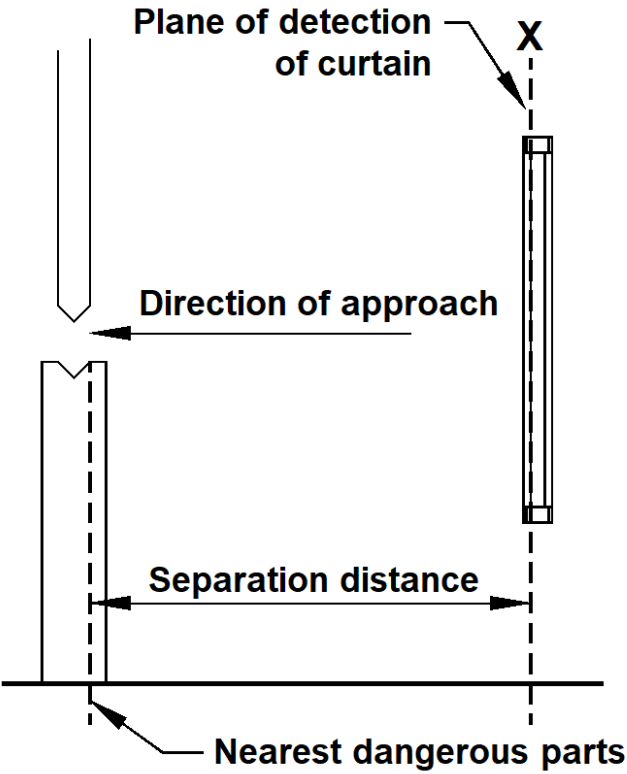


Figure 9

PARALLEL APPROACH

Parallel approach format is shown in Figure 10. For parallel approach format the outer curtain detection limit (as shown on the front window of each unit) minus the detection capability, should be considered to be the point at which an obstruction is detected.

See Plane X in Figure 10.

$$S = K \times T + C$$

where

$$K = 1600 \text{ mm/s}$$

$C = 1200\text{mm} - 0.4H$, but not less than 850mm, where H is the height of the detection zone above the reference plane, in mm.

i.e.

$$S = (1600 \times T) + 1200 - 0.4 \times H$$

For this type of protective equipment, the height H of the detection zone shall not exceed 1000mm. If H is greater than 300mm (200mm for non-industrial applications), the risk of undetected access beneath the detection zone shall be considered.

The lowest allowable height of the detection zone shall be calculated using the formula:

$$H = 15(d - 50\text{mm}).$$

Therefore, for a given height of the detection zone, the detection capability, d , is:

$$d = H/15 + 50\text{mm}$$

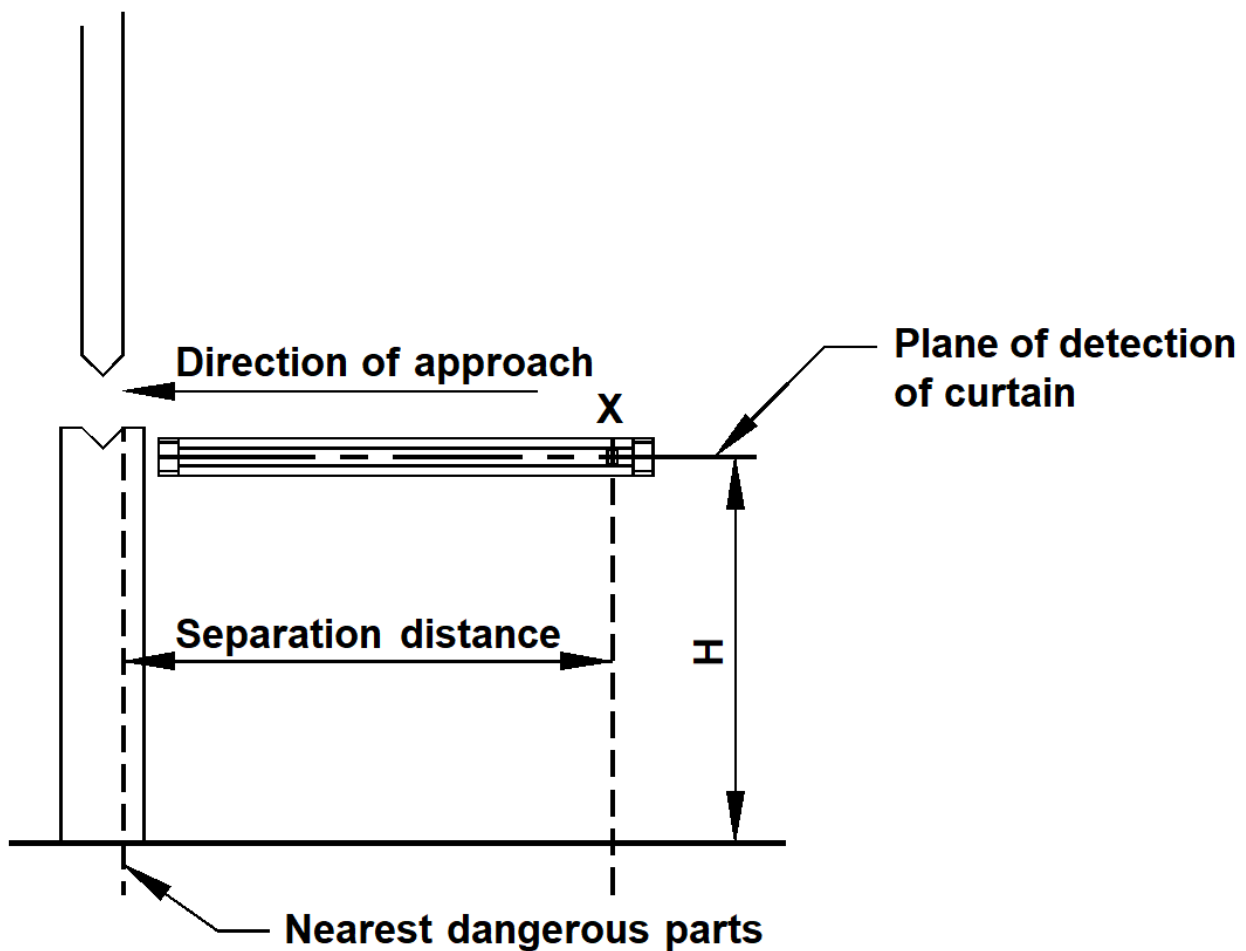


Figure 10

ANGLED APPROACH

If it is necessary to install the curtain, at an angle to the direction of approach as shown in Figure 11, then the following requirements apply:

An angle within $\pm 5^\circ$ of normal or horizontal, need not be considered to be angled, and the relevant formula used.

For detection zones which are positioned at angles greater than $\pm 5^\circ$, to the direction of approach, account shall be taken of the risks associated with the direction of approach, and the most appropriate formula used.

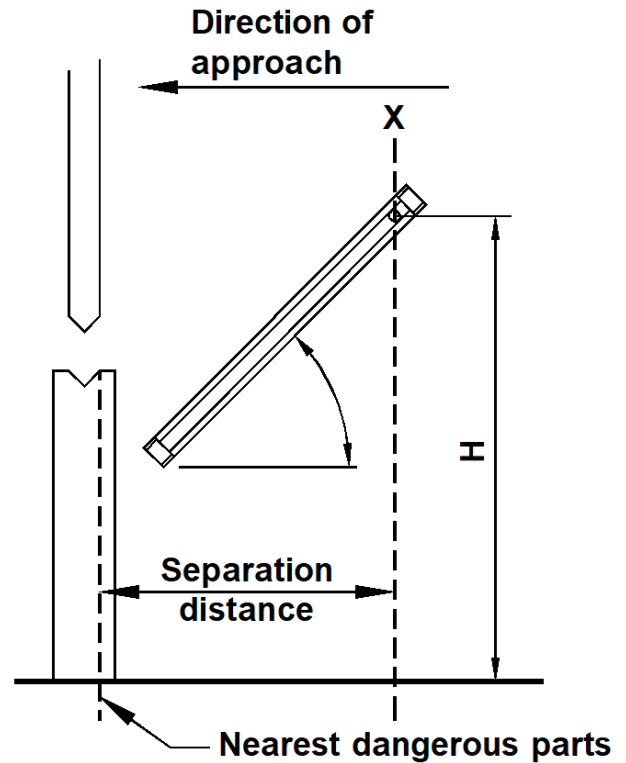


Figure 11

APPROACH TO 'L' INSTALLATION

The MLG system using a master - slave combination as shown in Figure 12, can provide dual axis guarding, giving both trip and presence sensing capability.

The two formulae for normal and parallel approach must be used together.

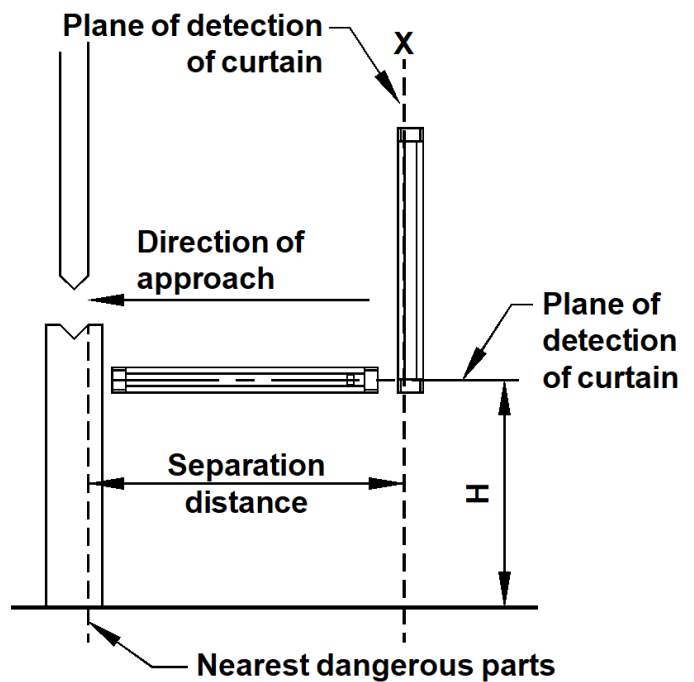


Figure 12

POSITIONING OF MLG-SERIES

EN13855:2010 gives guidance on the dimensions and positioning of photo-electric safety devices fitted to industrial machines. The main considerations are described below and are illustrated in figure 13.

(a) The appropriate detection zone height must be selected. The curtain must be of sufficient height such that access to the dangerous parts, from the direction of approach of the operator, is only possible by obstructing the curtain taking into account all possible operator positions.

(b) The correct minimum separation distance must be observed. The curtain must be mounted in the correct position in relation to the dangerous parts of the machine to take account of the stopping performance of the machine, the curtain format used and the detection capability of the curtain.

(c) Steps must be taken to prevent access to the dangerous parts from any direction not covered by the curtain and prevent an operator from standing between the curtain and the dangerous parts without obstructing the curtain. Additional mechanical guarding will usually be necessary to achieve this.

The physical parameters affecting the positioning are the dimensions of the detection zone of the light curtain (i.e. the detection zone height and the range) and the minimum separation distance. These are described in the following sections.

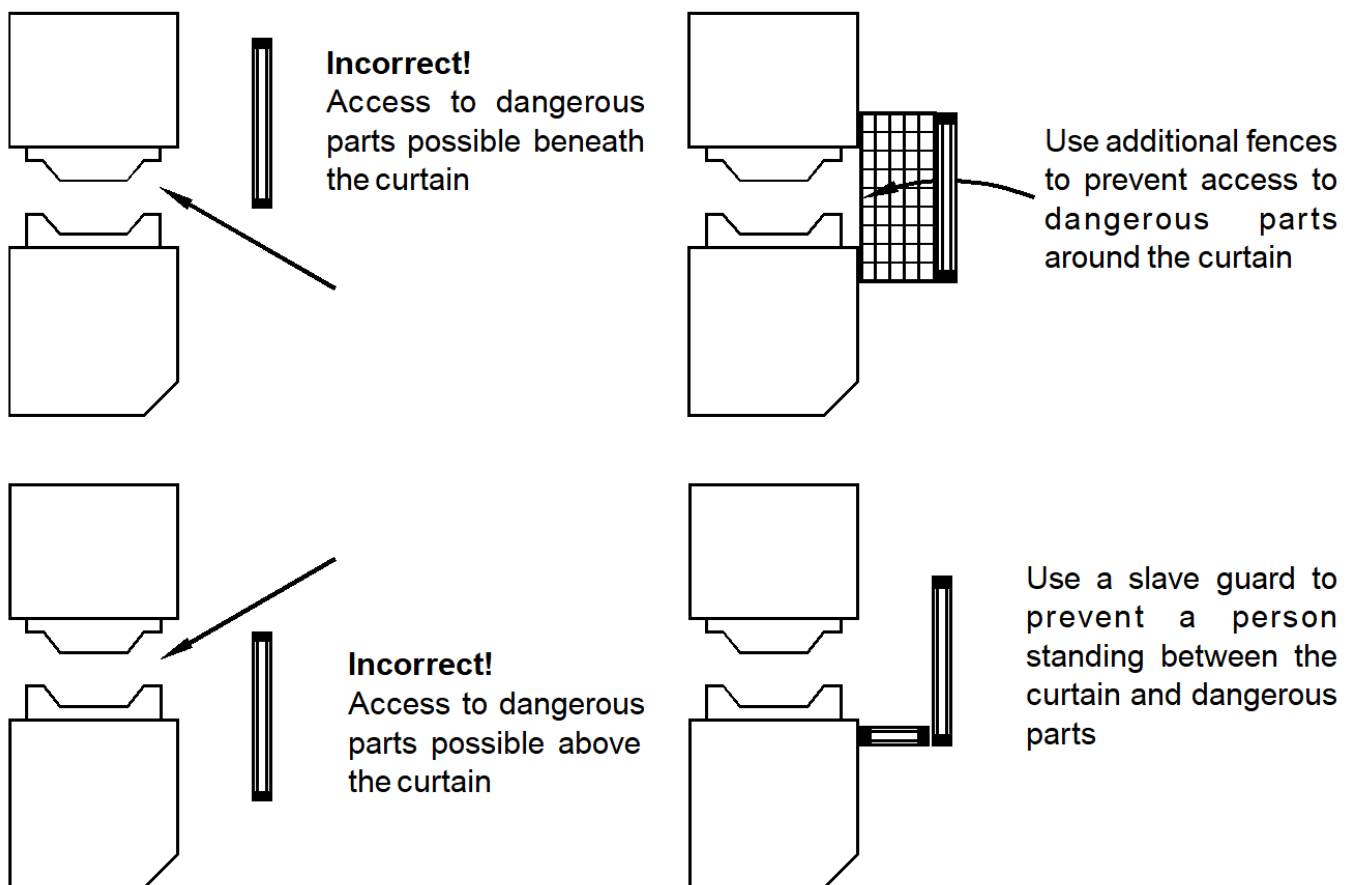


Figure 13

MLG-SERIES MULTI-BEAM SYSTEM

The separation distance depends on the application and the following factors:

- the curtain format used.
- the overall system response time, T.

The overall system response time, T, is a period, in seconds, given by the sum of the response times of the safety device and the machine control system. The response time of the MLG Multi-beam system is 20ms in all cases. The response time of the machine control system should be measured using a suitable device and the highest value recorded, plus a suitable allowance for brake deterioration, should be used in the calculation of the minimum separation distance. It is recommended that the overall system response time is recorded on the machine information label or plate.

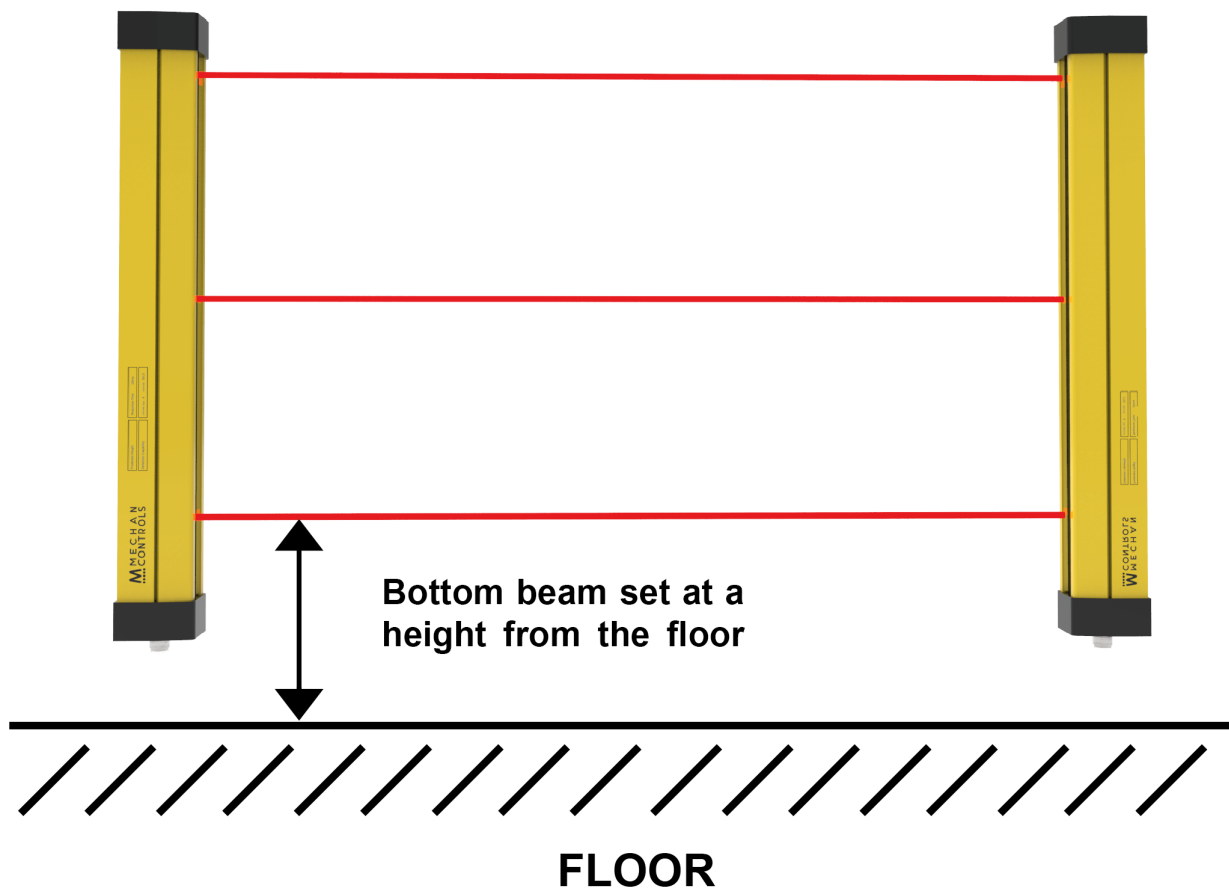
The minimum separation distance should be recorded on the machine information label or plate.

The calculations for minimum separation distance, S, in millimetres, for MLG Multi-beam light curtains used in normal format are as follows:

$$S = (1600\text{mm/s} \times T) + 850\text{mm}$$

the system has to be mounted with the bottom beam set at a height from the floor as shown:

MLG/02:	400mm
MLG/03:	300mm
MLG/04:	300mm



ELECTRICAL INSTALLATION

Both units must be supplied with 24V d.c. $\pm 20\%$. This d.c. supply must be an isolated supply from a safety transformer which meets the requirements of IEC60742 and which can maintain a minimum of 18V d.c. output during a 20ms dip in the mains supply. The -ve side of this supply should be earthed, and the cables should be routed separate from power/motor drives.

IMPORTANT

Power should be applied to both units at the same time. If power is removed from the emitter unit, power must also be removed from the receiver unit at source. Failure to do so may result in the units failing to communicate and appearing to be faulty. The screen is to be connected to the system PE in the control cabinet.

If the moulded connection cable is to be extended, screened cable is to be used with a minimum wire cross sectional area of 0,5mm². Care must be taken to ensure that the continuity and protection provided by the screen is maintained.

The power consumption is dependant on the detection zone height of the system but is less than 12VA.

The emitter unit uses five terminals, two for the d.c. supply, two for the test input and one for the protective earth, as shown in Figure 14.

EMITTER CONNECTION / TEST INPUT

On some machines a test input is used to check the interface between the photo-electric safety device and the machine. The input simulates the obstruction of the curtain in order to cycle the output relays and thereby expose any fault before the next machine cycle. This input is applied during a safe part of the machine cycle or at the end of the cycle.

If this function is used a normally closed contact should be connected as shown in Figure 14.

This contact must open for a minimum of 35ms. When this contact is opened the light curtain safety outputs will be switched off and will remain off until the test contact closes again and the curtain self-tests have been successfully performed (assuming that the curtain is not obstructed).

From re-closing of the test contact, the safety outputs will switch on again after 100ms. The continuous current through the test contact is 11mA.

If test input is not used then these terminals should be linked together.

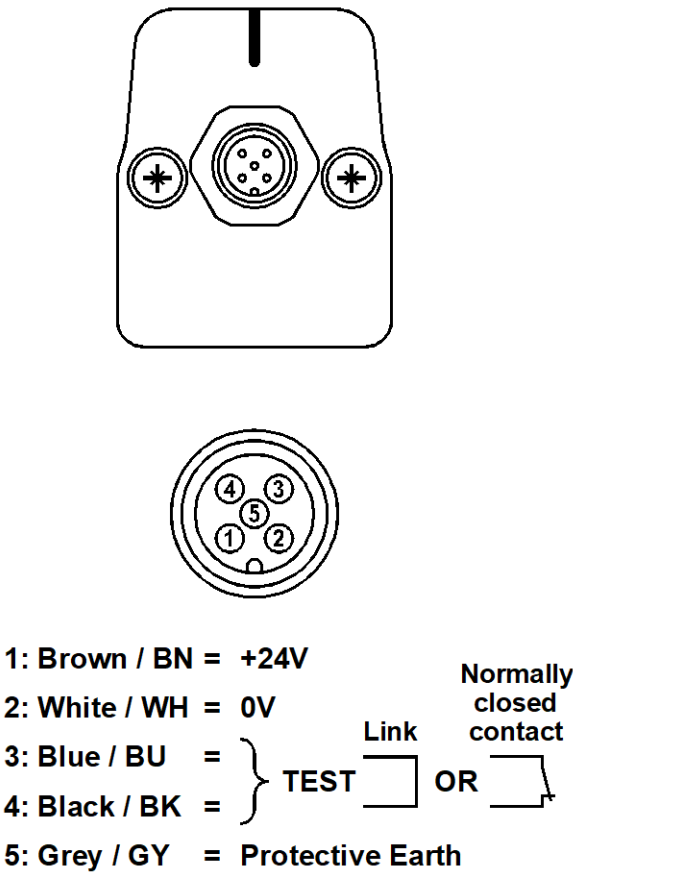


Figure 14
Emitter Unit Connection

RECEIVER UNIT

The receiver unit uses eight terminals, two for the d.c. supply, two for safety outputs, and one for protective earth, as shown in Figure 15.

The 24Vdc supply must have a 2A quick blow in-line fuse fitted.

SAFETY OUTPUTS

The two output signal switching devices (OSSDs) should be wired to independent switching devices in the machine control circuit. The OSSDs are solid state devices and are actively monitored and short circuit protected. **The maximum output current is 0.2A.**

The output voltage, U_A , of each OSSD is dependent on the supply, U_V , and the load which is given by the following expression:

$$U_A > U_V - 2V$$

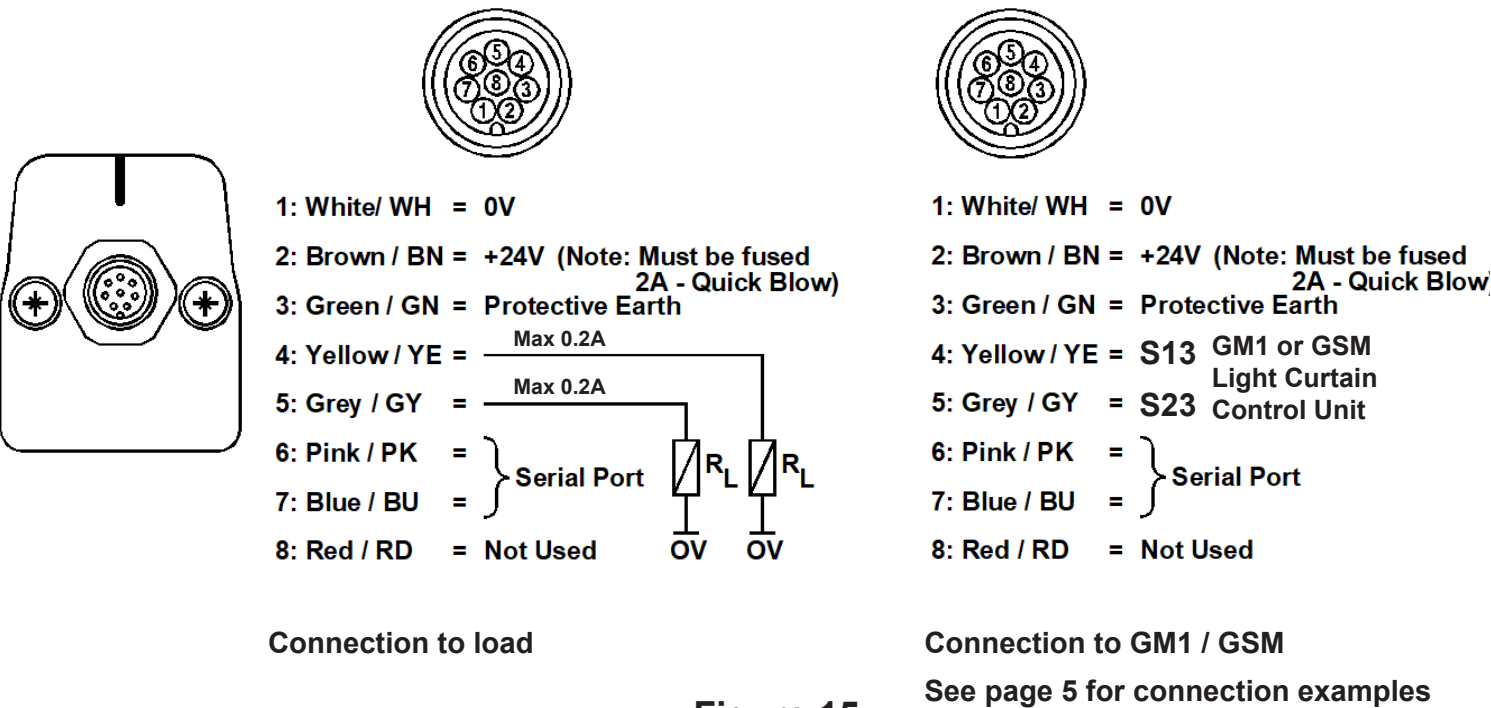


Figure 15

Receiver Unit Connection

INTERFACING TO A MACHINE

The interfacing of a light curtain to a machine can be achieved using discrete components but usually it is achieved by means of an interface unit or GM1 / GSM.

All the relays shown are safety relays with positively guided contacts. If this circuit is implemented using discrete components it is essential that this type of relay is used.

IMPORTANT

A number of manufacturers produce units containing circuits of this type. Care should be taken to ensure that the inputs of these units can accept the PNP outputs of the light curtain. The MLG system checks that its outputs are functioning correctly by switching them off for 100 microseconds every scan.

The procedure for alignment is described below.

Apply power to the MLG system.

IMPORTANT

Power should be applied to both units at the same time. If power is removed from the emitter unit, power must also be removed from the receiver unit at source. Failure to do so may result in the units failing to communicate and appearing to be faulty. The screen is to be connected to the system PE in the control cabinet.

The amber indicators on the emitter and the receiver units should be lit. If either of the indicators are not lit, check the wiring.

The yellow indicators on the emitter and the receiver units should be in the off state. If either of these two indicators are flashing there is a fault, contact your Mechan Controls distributor. If the yellow indicator on the emitter unit is on constantly, check the wiring.

The green indicator on the receiver unit should be lit, if not, adjust the units into general alignment until the green indicator comes on.

Adjust the units to optimum alignment as follows:

1. Slowly turn the emitter unit clockwise until the green indicator on the receiver unit goes off and the red indicator comes on. Note this position.
2. Then turn the emitter unit anti-clockwise, again until the green indicator goes off and the red indicator comes on. Note this position.
3. Fix the emitter unit at the centre of the two noted positions.
4. Repeat steps 1, 2 and 3 but this time turning the receiver unit.

Using the test piece provided, obstruct the curtain. On the receiver unit the green indicator should go off and the red indicator come on. Move the test piece in and out of the curtain several times and check that the indicators change state appropriately each time.

The installation of the machine can now be completed. Before putting the machine into use the complete system (i.e. the machine and all its safeguarding devices) should be commissioned by qualified personnel and as a minimum the commissioning checks described in this manual should be performed.

Periodic checks should be carried out at the prescribed intervals. Daily checks to be performed on the MLG system. In some cases there are specific statutory requirements concerning the examination, inspection and test of a machine and its safety devices. It is for the user to determine if such requirements exist for the machine in question and to ensure that those requirements are met.

PERIODIC CHECKING

COMMISSIONING CHECKS

The commissioning examination should be carried out by persons who are competent and who possess all the information supplied with the machine and its safety equipment. The results of the examination should be recorded and copies of this record should be kept by the user and the employer of the person performing the examination. The person carrying out the examination should ensure that the following general standard of performance is met:

- (a) It should not be possible for the dangerous parts of the machine to be set in motion while the light curtain is penetrated.
- (b) Penetration of the light curtain during a dangerous phase of the operation of the machine should result in the dangerous parts being arrested or, where appropriate, assuming an otherwise safe condition, before any part of a person can reach them. It should not be possible for the dangerous parts to be set in motion until the curtain has been cleared, the safety system has been restored to its normal condition and the machine controls have been re-operated.

The person performing the examination should also:

- (c) Inspect the position of the light curtain to ensure that it is set at the correct distance from the dangerous parts of the machine as recorded on the machine information label or plate.
- (d) Ensure that additional safeguarding measures have been provided where necessary to prevent access to the dangerous parts of the machine not protected by the sensing unit.
- (e) Where appropriate, test the overall system response time using a suitable device and ensure that it is the same or less than that recorded on the machine information label or plate.
- (f) Test the detection capability of the sensing unit as described in this manual.
- (g) Examine the machine controls and connections to the MLG system to ensure that the requirements described in this manual and in the machine manual have been met.
- (h) Examine the stopping performance monitor (if fitted) to ensure that it is fitted and functioning correctly. Ensure that the means whereby the stopping performance can be assessed by the operator is indicating correctly.
- (i) Test the muting arrangements (if fitted).
- (j) Examine brakes or clutches (if fitted) as recommended.

NOTE: No stopping performance monitor or muting facility is provided with the basic MLG system and there is no means provided for the connection of such devices to the system. These devices may however have been provided elsewhere in the machine control system.

6 OR 12 MONTHLY CHECKS

These examinations should be carried out by competent persons. The results should be recorded and a copy kept by the user.

The person should ensure that the general standard of performance.

The person should perform the commissioning inspections and tests. When checking the stopping performance monitor, item (e), any equally effective means of determining that the overall system response time, as recorded on the machine information label or plate, is not exceeded, is acceptable.

In addition the person should:

- (a) Examine all switching elements in the switching paths controlled by the light curtain outputs to ensure that they are functioning correctly and are not in need of maintenance and/or replacement.
- (b) Inspect the machine to ensure that there are no mechanical or structural aspects which could prevent the machine from stopping or assuming an otherwise safe condition when called upon to do so.
- (c) Examine and inspect the machine controls and the connections to the MLG system to ensure that no modifications have been made which could adversely affect the system and that suitable modifications have been correctly performed and properly recorded.

DAILY/SETTING EXAMINATION

The following tests should be carried out daily and after setting by a designated person appointed by the machine user. The results should be recorded and a copy should be kept on or near the machine. Specific statutory requirements may apply to certain types of machine. The designated person should:

- (a) Check that access to the dangerous parts of the machine is not possible from any direction not protected by the sensing unit and that side and rear guards are in order.
- (b) Check that the minimum distance from the dangerous parts of the machinery to the sensing unit is not less than the distance stated on the machine information label or plate.
- (c) Check that it is not possible for a person to stand between the dangerous parts of the machine and the sensing unit.
- (d) Check that when the muting facility (if fitted) is operative the moving parts are no longer dangerous.
- (e) Check that the stopping performance monitor (if fitted) is in use and is set up and functioning correctly.
- (f) Check that electrical enclosures are closed and locked and that any keys have been removed for retention by a designated person.
- (g) Check for external signs of damage to equipment or to electrical wiring.
- (h) Check the detection capability of the MLG series.

CHECKING DETECTION CAPABILITY

The detection capability of the light curtain should be checked as required in the previous sections using the method described below and as shown in Figure 16.

(a) With power applied to the MLG system and with the machine at rest, check that the light curtain is functioning by observing the state of the appropriate indicators. The green indicator should be on, the red indicator should be off.

(b) Insert the test piece provided into the curtain with the axis of the test piece perpendicular to the plane of the curtain. Starting at the top of the emitter unit with the test piece less than 150 millimetres from the front of the emitter unit, pass the test piece slowly down the front of the emitter unit. While the full diameter of the test piece is within the area defined by the two arrow markers on the front window, the green indicator should GO OFF AND REMAIN OFF and the red indicator should BE LIT AND REMAIN LIT.

(c) Repeat the above test with the test piece inserted close to the front of the receiver unit and with the test piece inserted at the midpoint between the emitter and receiver units. The indicators should behave as described previously whenever the test piece is between the arrow markers.

WARNING

At no time while the test piece is obstructing the curtain should the green indicator come on. If it does the machine must be isolated and must not be used until the cause has been investigated.

(d) If the system passes the above tests proceed as follows. Initiate a cycle of the machine and then insert the test piece into the curtain. Upon insertion of the test piece during dangerous motion, the dangerous parts should come to rest without apparent delay.

WARNING

If the machine does not stop or there is any delay in its response the machine must be isolated and must not be used until the fault has been rectified.

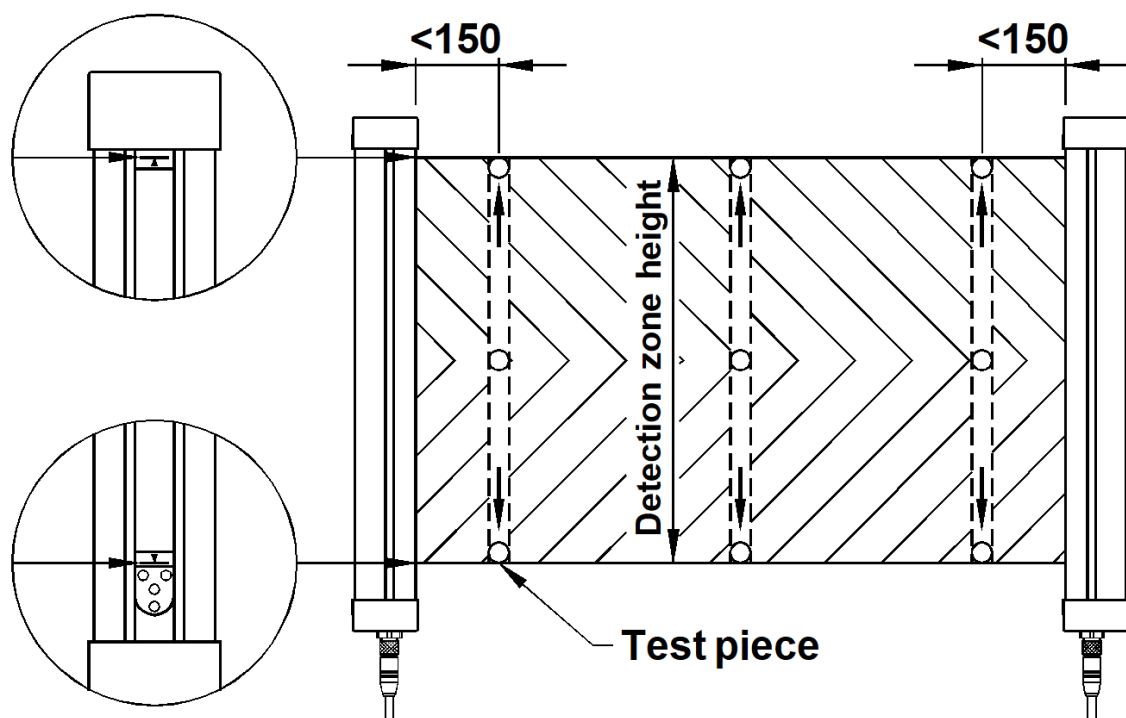


Figure 16

MLG MULTI-BEAM SYSTEM

The operation of the light curtain should be checked as required in the previous sections using the method described below and as shown in Figure 17.

- (a) With power applied to the MLG system and with the machine at rest, check that the light curtain is functioning by observing the state of the appropriate indicators. The green indicator should be on, the red indicator should be off.
- (b) To test the curtain is operating correctly, insert your hand in between the emitter and receiver units and obstruct one of the beams, see Figure 17. While the beam is obstructed, the green indicator should GO OFF AND REMAIN OFF and the red indicator should BE LIT AND REMAIN LIT. Move your hand in and out of the beam several times and check that the indicators change state each time as appropriate.
- (c) Repeat the above test for each of the beams. The indicators should behave as described above whenever the beams are obstructed.

WARNING

At no time while a beam is obstructed should the green indicator come on. If it does the machine must be isolated and must not be used until the cause has been investigated.

- (d) If the system passes the above tests proceed as follows. Initiate a cycle of the machine and then insert your hand into the curtain. Upon insertion of your hand during dangerous motion, the dangerous parts should come to rest without apparent delay.

WARNING

If the machine does not stop or there is any delay in its response the machine must be isolated and must not be used until the fault has been rectified.

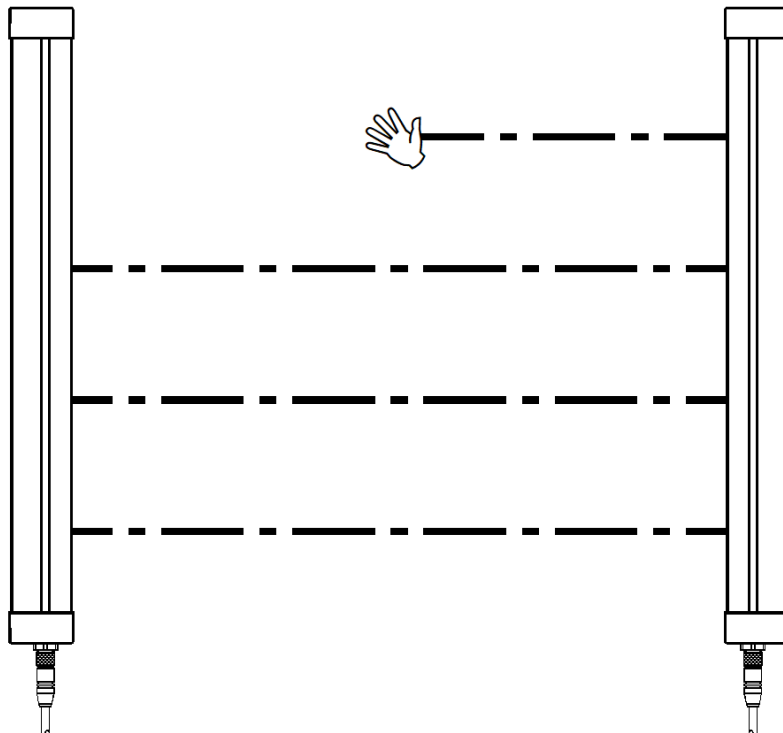


Figure 17

Light Curtain Order Code

MLG / X / XX / XXXX / XX

Emitter or Receiver Only: _____

- E = Emitter
- R = Receiver

Detection Capability (mm): _____

- 14 = 14mm (Finger)
- 30 = 30mm (Hand)
- 70 = 70mm (Body)
- 02 = 2 Beams (Body)
- 03 = 3 Beams (Body)
- 04 = 4 Beams (Body)

Protection Type (mm): _____

- Up to 1200mm (14mm) (Finger)
- Up to 1800mm (30mm + 70mm) (Hand + Body)
- Up to 1800mm (02 + 03 + 04) (Body)

Bracket Options: _____

- CB = Clamp Bracket
- AB = Adjustable Bracket
- EB = End Cap Bracket

MLG CONNECTOR CABLE OPTIONS

MLG connector cable options are available as listed below:

Emitter cable connector (5 way)	QD - 5m
Emitter cable connector (5 way)	QD - 10m
Emitter cable connector (5 way)	QD - 20m
Receiver cable connector (8 way)	QD - 5m
Receiver cable connector (8 way)	QD - 10m
Receiver cable connector (8 way)	QD - 20m

Recommended Safety Control Unit

GM1 24VDC Safety Control Unit	Master Control Unit
GSM Extender Module	Expandable Module

Technical Specification

Light curtain & Multi-beam systems Operating range	Detection	Range
	14mm	0.5m to 6m
	30mm	0.5m to 15m
	70mm	0.5m to 15m
	2 beam	0.5m to 30m
	3 beam	0.5m to 30m
	4 beam	0.5m to 30m
Light curtain systems Nominal Curtain Length	14mm	200 to 1200mm
	30mm	200 to 1800mm
	70mm	600 to 1800mm
Multi-beam systems Beam spacing	2 beam	500mm
	3 beam	400mm
	4 beam	300mm
Detection capability of light curtains		14mm, 30mm or 70mm
Number of beams in multi-beam systems		2, 3 or 4
Effective aperture angle		$\pm 2\frac{1}{2}^\circ$
Response time	14mm detection	20ms upto 300mm curtain. Additional 4ms for each 100mm of curtain
	30mm detection	20ms upto 600mm curtain. Additional 4ms for each 200mm of curtain
	70mm detection	20ms upto 1800mm curtain. Additional 4ms for each 600mm of curtain
	Multi-beam	20ms
Supply voltage		24V d.c. $\pm 20\%$, 5% maximum residual ripple
Power consumption		< 12VA
Enclosure rating		IP65
Radiation wavelength	Wavelength	880nm
	Intensity	Class 1 LED product (IEC60825-1)
Safety output type	Type	Solid state PNP
	Capacity	0,2A
	Voltage	Supply voltage minus 2V
	Max load resistance	<4K ohms
	Max load capacitance	<2.2uF
Standards Applied		EN 61496 4 (self-monitoring) EN 61508-1: 2002 Sil 3 EN 62061:2005 Sil 3 EN 13849-1:2006 PLE
Operating temperature		0°...50° C
Storage temperature		-20°...70° C
Humidity		15% to 95% non-condensing
Weight (each unit)		0,3kg plus 0,2kg per 100mm of curtain
Dimensions - cross section		36 x 45 mm

14mm - Finger Protection, 30mm - Hand Protection, 70mm Body Protection



The information in this manual relates to the use of the MLG-Series light curtain, to provide a basic safety switching device.

In such cases, some installation parameters, notably the mounting position of the light curtain in relation to the dangerous parts of the machine, can be affected and close attention must be paid to all the information supplied with all equipment.

Important Information

MLG-Series photo-electric safety systems are intended to protect operators working at or near dangerous machinery. They can only perform this function if they are correctly fitted to a suitable machine. It is essential that the full contents of this manual and all the authoritative documents referred to herein are fully understood before any attempt at installation is made. If in doubt, please contact Mechan Controls or one of their authorised distributors.

This manual must accompany the product throughout its working life. Those persons responsible for the product must ensure that all persons involved in the installation, commissioning, operation, maintenance and servicing of the product have access to all the information supplied by the manufacturers of the machine and its safety system.

Safety Assessment

A risk assessment should take place to establish that the specifications of these products are suitable for the application required. See Technical Specifications below or contact Mechan Controls for further information.

The products may only be installed, commissioned, operated, maintained by competent persons.

A competent person is a qualified and knowledgeable person who, because of their training, experience and current professional activity, has the specialist knowledge required. An understanding of European and International laws, directives and standards is recommended.

Maintenance

It is recommended to check the safe operation of the MLG Light Curtain and look for signs of damage or excessive wear on a weekly basis. Damaged units should be replaced or returned to the manufacturer for repair where practical.

Disclaimer

In the interest of product development specifications are subject to change without notice. It is the responsibility of the user to ensure compliance with any acts or by-laws in place. All information regarding Mechan equipment is believed to be accurate at the time of printing. Responsibility cannot be accepted for errors or omissions.

Warranty

Warranty will be void if the following points are true:

- The product was not used for its intended purpose
- Damage was caused by usage not stated in the manual
- Modifications have been made to the products (e.g. exchanging components)
- Operating personnel are not suitably qualified

Mechan Controls designs and manufactures a wide range of machine guard safety products for hazardous machinery. The range includes: Non-contact safety switches, Solenoid Interlocks, light Curtains and safety relays / control units.



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