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BLG 4A **Safety Light Curtain**



User's guide



English

www.balluff.com

Original user's manual

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About This Manual

This manual contains all the information you need for operating the following safety light curtains:

Model	Applications
BLG 4A-...-600-014-001-SX	 Finger protection
BLG 4A-...-19x-030-001-SX	 Hand protection
BLG 4A-050-50X-B02-001-SX	 Body protection
BLG 4A-080-50X-B03-001-SX	
BLG 4A-090-50X-B04-001-SX	
BLG 4A-120-50X-B04-001-SX	

Special safety-relevant knowledge is required for correct integration of a safety light curtain in a machine.

For questions that go beyond the scope of this manual, our Technical Customer Service is available for any information pertaining to the functionality of the series BLG 4A safety light curtains and safety regulations related to proper installation (see „Regular inspections“ on page 44).

1. Read this manual completely and follow the instructions contained in it. In particular, follow the safety and warning instructions.
2. Retain this manual and ensure that it is always available directly at the location of the light barrier.
3. Make this manual available to third parties as necessary.



Note

In the interest of continual product improvements the technical data for this product and the contents of this manual are subject to change without notice.
 The latest status of this manual is available on Balluff website www.balluff.com.

1.1 Typographical Conventions

Actions

Individual action instructions are indicated by a preceding triangle:

- ▶ Action instruction 1
 ⇒ Result of action
- ▶ Action instruction 2

Action sequences are numbered in order:

1. Step 1
2. Step 2

1

About This Manual

Symbols



The symbol and the word Notes indicate information which is helpful or important for use of the product.



Finger protection



Hand protection



Body protection

1.2 Abbreviations

AOPD	Active opto-electronic protective device
ESPE	Electro-sensitive protective equipment
Light curtain	Safety light curtain
MPCE	Machine primary control element
OSSD	Output signal switching device
TX	Emitter
RX	Receiver

1.3 Warnings

Warning notes are especially safety-relevant and are used for accident avoidance. This information must be read thoroughly and followed exactly. The warning notes are constructed as follows:



SIGNAL WORD

Type and source of the hazard

Consequences of non-observance

► Measures for hazard avoidance

The signal words used have the following meaning:

CAUTION

The warning word CAUTION indicates a risk which can result in **damage to or destruction of the product** .

CAUTION

The general warning symbol combined with the signal word CAUTION indicates a risk which can result in **slight or moderate injuries**.

WARNING

The general warning symbol combined with the signal word WARNING indicates a risk which can result in **serious injury or death** .

DANGER

The general warning symbol combined with the signal word DANGER indicates a risk which can result **directly in serious injury or death** .

2

About This Product

2.1 Product Description

The BLG 4A series of safety light curtains are electro-sensitive protective equipment (ESPE) for detecting fingers, hands or a body, with a maximum protection field range of 6 meters, 19 meters or 50 meters and a protection field height of 15 cm – 180 cm. These safety light curtains are used in work areas where machines or equipment could inflict bodily injury to the operator. The primary purpose of light curtains is to stop hazardous movements of mechanical parts.

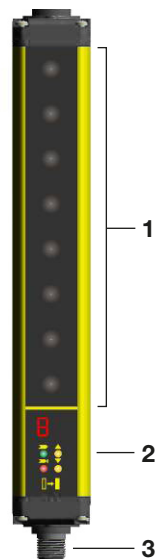
The light curtain uses infrared field to detect non-transparent objects located in the detection range of the curtain. The curtain consists of emitter and receiver pair for infrared light.

The control and monitoring functions are located internally in both units. The electrical connection is made via an M12 connector which is located on the underside of the rugged aluminum profile. The emitter and receiver automatically synchronize with each other.

Control and monitoring of the sent and received infrared beams are accomplished by means of a microprocessor which provides the user with information about the operating status of the light curtain and any possible error condition by means of LEDs and two 7-segment displays.

In the installation phase the display helps to align the two units (see „Commissioning“ on page 35).

As soon as the beams sent by the emitter unit are interrupted by an object or the body of the operator, both switching outputs (OSSD) on the receiver are turned off. This controls stopping of the machine connected to the OSSD.



BLG 4A

- 1 Protection field height
- 2 Display
- 3 Connection



2.2 Scope of delivery

The following parts are included:

- Receiver (RX)
- Emitter (TX)
- Short guide (printed)
- DVD containing the following:
 - This manual for the BLG 4A series
 - Checklist for semi-annual inspection and regular maintenance
- Mounting bracket for fingers/hand: BAM MB-LG-023-B13-3... (incl. 12 M3 screws),
Body: BAM MC-LG-036-T01-3

2 About This Product

2.3 Product overview, finger protection, hand protection

Model	Resolution (mm)	Applications
BLG 4A-...-600-014-001-SX	14	
BLG 4A-...-19X-030-001-SX	30	


Type code **BLG 4A- - - - - 001 - SX**

Protection field height _____
Sample values: 015 = 150 mm, 030 = 300 mm

Range _____
600 = 6 m
19X = 19m

Resolution _____
014 = 14 mm
030 = 30 mm

2.4 Product overview, body protection

Model	Resolution (mm)	Applications
BLG 4A-050-50X-B02-001-SX	515	
BLG 4A-080-50X-B03-001-SX	415	
BLG 4A-090-50X-B04-001-SX	315	
BLG 4A-120-50X-B04-001-SX	415	

Type code **BLG 4A- - - - - 50X = up to max. 50 m - - - - - 001 - SX**

Protection field height _____
Sample values: 015 = 150 mm, 030 = 300 mm

Resolution _____
B02 = 515 mm
B03 = 415 mm
B04 = 315 mm (for protection field height = 915 mm)
B04 = 415 mm (for protection field height = 1215 mm)

2

About This Product

2.5 Relevant standards

The series BLG 4A safety light curtains are designed as intrinsically safe systems Type 4 for accident prevention in accordance with the prevailing international safety regulations and in particular the following standards:

EN 61496-1: 2013

Safety of machinery. Electro-sensitive protective equipment - Part 1: General requirements and tests

EN 61496-2: 2013

Safety of machinery. Electro-sensitive protective equipment - Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)

EN ISO 13849-1: 2008

Safety of machinery -- Safety-related parts of control systems - Part 1: General principles for design

EN 61508-1: 2010

Functional safety of electrical/electronic/ programmable electronic safety-related systems - Part 1: General requirements

EN 61508-2: 2010

Functional safety of electrical/electronic/ programmable electronic safety-related systems - Part 2: Requirements for electrical/electronic/ programmable electronic safety-related systems

EN 61508-3: 2010

Functional safety of electrical/electronic/ programmable electronic safety-related systems - Part 3: Software requirements

EN 61508-4: 2010

Functional safety of electrical/electronic/ programmable electronic safety related systems - Part 4: Definitions and abbreviations

EN 62061: 2005/A1: 2013

Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems

3

General Safety Notes

- 3.1 Approved use** The series BLG 4A safety light curtains may be used only for the purpose for which they were designed. They are used for detecting fingers, hands or bodies in work areas where the operator is continually subject to high accident risk. This is especially applicable in connection with the usual hazards caused by machines. The smallest object to be detected must not be smaller than the detection capability of the selected light curtain.
The devices are classified as ESPE Type 4 per IEC 61496-1 and IEC 61496-2 and may therefore be used in applications with PLe/SIL 3.
The hazard location must be reachable only through the protection field and going around or reaching over must be prevented (mechanically if necessary). As long as a person is occupied in the hazard area, it must not be possible to start the equipment (see „5 Installation Requirements“ on page 13).
- 3.2 Non-approved use** The light curtains series BLG 4A act indirectly on the hazard source. They offer no protection against parts which are flung out or around or from radiation or gases. Light-transparent objects are not detected by the light curtains. These circumstances must absolutely be taken into account for the risk assessment of the hazard location.
Intense light beaming on the receiver, high electromagnetic noise and air impurities (e.g. dust or condensed water) may affect the effectiveness of the light curtain.
The units must never used as stepping aids.
- 3.3 Personnel requirements** **Installation and startup are to be performed only by skilled professionals. The specifications contained in this manual as well as the prevailing standards and directives must be followed. Skilled specialists are people who are familiar with the work such as installation and the operation of the product and have the necessary qualifications for these tasks.**
The personnel working in the hazardous area must be trained on how the light curtain functions.
- 3.4 Obligations of the operating company** The operating company is responsible for adhering to the prevailing safety and accident prevention regulations in any specific individual case.
- 3.5 Correct and safe use of the safety light curtains** The system for stopping the machine must be capable of being electrically controlled.
This controller must be capable of stopping the hazardous machine movement within the determined run-on time T as explained in „Minimum safety distance“ on page 14 in every phase of the process cycle.
The light curtain must be arranged so that no access to the hazard area is possible without interrupting the light beams (see „Installation Requirements“ on page 13).
The safety equipment is only useful if it has been correctly installed under observance of the regulations prescribed by the guidelines.

4

Properties of the Safety Light Curtain

The following properties must be considered:

- Detection capability
- Protection field height
- Minimum safety distance

4.1 Detection capability

Detection capability of the equipment means the minimum size of a non-transparent object that can with certainty darken at least one of the beams forming the detection area (for resolutions and models see „About This Manual“ on page 5).

As shown in Figure 1, the detection capability depends on the geometric properties, the diameter (d) and the center point distance (l) of the light beam.

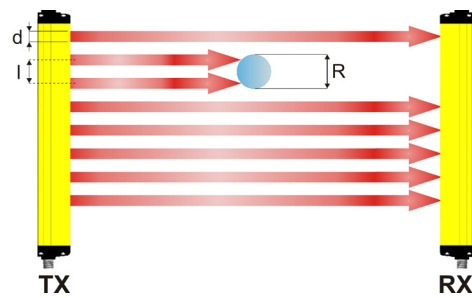


Figure 1: Detection capability as a function of the geometric properties of the lenses (TX = Emitter, RX = Receiver)

4.2 Protection field height

The protection field height H_p is the height of the area protected by the light curtain.

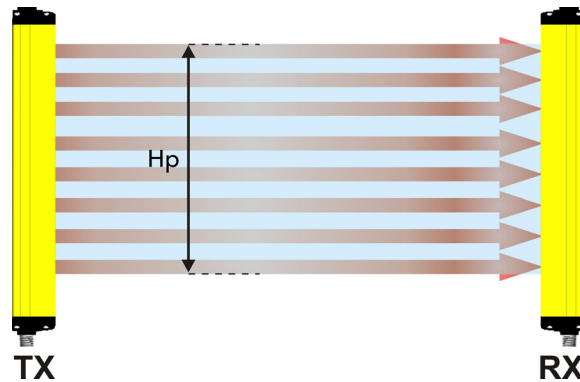
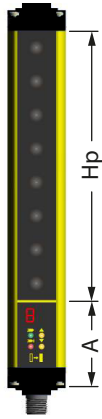





Figure 2: Protection field height H_p (TX = Emitter, RX = Receiver)

4 Properties of the Safety Light Curtain

For the BLG 4A the protection field height is bordered by the yellow line applied to the front disc and on the dimensions given in the table:



Applications	Model	Protection field height Hp (mm)	Distance A (mm)		
 	BLG 4A-015-600-014-001-SX BLG 4A-015-19X-030-001-SX	150	50.5		
	BLG 4A-030-600-014-001-SX BLG 4A-030-19X-030-001-SX	300			
	BLG 4A-045-600-014-001-SX BLG 4A-045-19X-030-001-SX	450			
	BLG 4A-060-600-014-001-SX BLG 4A-060-19X-030-001-SX	600			
	BLG 4A-075-600-014-001-SX BLG 4A-075-19X-030-001-SX	750			
	BLG 4A-090-600-014-001-SX BLG 4A-090-19X-030-001-SX	900			
	BLG 4A-105-600-014-001-SX BLG 4A-105-19X-030-001-SX	1050			
	BLG 4A-120-600-014-001-SX BLG 4A-120-19X-030-001-SX	1200			
	BLG 4A-135-600-014-001-SX BLG 4A-135-19X-030-001-SX	1350			
	BLG 4A-150-600-014-001-SX BLG 4A-150-19X-030-001-SX	1500			
	BLG 4A-165-600-014-001-SX BLG 4A-165-19X-030-001-SX	1650			
	BLG 4A-180-600-014-001-SX BLG 4A-180-19X-030-001-SX	1800			
		BLG 4A-050-50X-B02-001-SX		515	96.6
		BLG 4A-080-50X-B03-001-SX		815	
BLG 4A-090-50X-B04-001-SX		915			
BLG 4A-120-50X-B04-001-SX		1215			

5

Installation Requirements

Ensure that the safety level (Type 4) guaranteed by the BLG 4A safety light curtain agrees with the risk assessment of the monitored machine and with EN 13849-1.

- ▶ The switching outputs (OSSD) of the AOPD must be used as a device for stopping the machine and may not be used for control purposes (the machine must have its own START controller).
- ▶ The smallest object to be detected must not be less than the detection capability of the equipment.
- ▶ The area in which the AOPD is installed must correspond to the technical properties of the light curtains given in the section „Technical Data“ on page 46.
- ▶ Installations near high-intensity radiating and/or flashing light sources, especially near the front surface of the receiver, must be avoided.
- ▶ Any electromagnetic fields present must not exceed the limits of the EMC Directive.
- ▶ Smoke, mist or dust in the work surroundings can significantly reduce the range of the protection device.
- ▶ Sudden and significant temperature fluctuations with especially low peak values can result in formation of a thin layer of condensation on the front surface of the equipment and compromise its proper functioning.

5.1 Instructions for positioning the equipment

For truly efficient protection the light curtain must be arranged with particular care. The device must be installed so that access to the hazardous area is possible only through the protection field and results in an interruption of the field.



WARNING

Improper installation

Improper installation can result in serious injury or death.

- ▶ Measure the length of the light curtain such that the protection area fully covers access to the hazardous area.
- ▶ Eliminate possible situations where reaching above or below the safety light curtain into the hazardous area by selecting the right model and correctly positioning it.

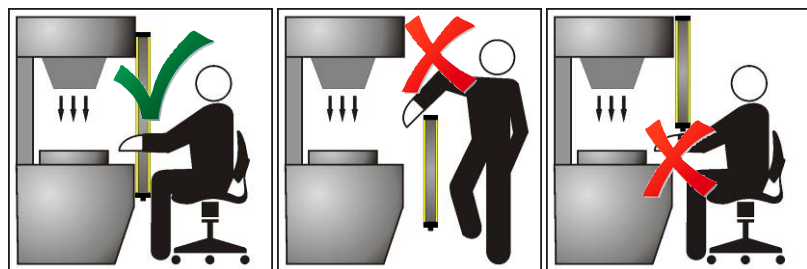


Figure 3: Correct and incorrect positioning

5 Installation Requirements

5.2 Secured by step-behind protection

If it is not possible to install the light curtain directly in front of the hazardous area, the possibility of access from the side must be precluded by additional measures (e.g. a second, horizontal light curtain or a mechanical guard).



WARNING

Unsecured step-behind protection

Unprotected side access to the hazardous area can result in serious injury or death.

► Provide an additional mechanical guard to prevent access from the side.

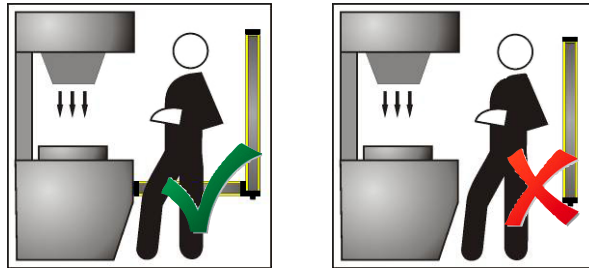


Figure 4: Secured by step-behind protection

5.3 Minimum safety distance

There must be a sufficiently large safety distance between the hazardous location and the light curtain. This must ensure that after activating the AOPD the hazardous location can only be reached if the hazard-causing machine function has been fully stopped.

The distance is covered in EN 999 and EN 294 and depends on the following factors:

- **Response time of the AOPD:** Maximum time elapsed between interruption of the protection field and turning off of the OSSD switching outputs.
- **run-on time of the machine:** Time that elapses between turning off of the AOPD and actual stopping of the hazardous machine movement.
- **Detection capability of the AOPD**
- **Approach speed of the object to be detected**

5

Installation Requirements





Note

The installation must be performed in accordance with EN ISO 13855!

Protection field at right-angle (orthogonal) to the approach direction		Protection field parallel to the approach direction	
S = (K × T) + C			
S	Calculated minimum safety distance between the protection measure and the hazardous area in mm. A minimum distance of 100 mm is always required regardless of the calculated value!		
K	Parameter for the speed of approach in mm/s at which the object or body part to be detected is moving (see EN ISO 13855).		
T	Run-on time of the overall system in seconds (T = t1 + t2). t1 = Response time of the AOPD in seconds (see Technical Data). t2 = run-on time of the machine in seconds after the OSSD switching signals have attained the off state (application-dependent).		
C	Reach through distance based on the possibility of ingress of a body part (e.g. a hand) into the hazardous area before the ESPE responds.		
H	Height of the protection field above the reference level (e.g. machine base) < 1000 mm. If H > 300 mm, a possible undetected access beneath the protection field must be figured into the risk assessment and additional measures taken if necessary.		
	For human body protection applications	Least permissible height	
H1	Lowest light beam: ≤ 300 mm	H = 15 (d - 50)	
H2	Highest light beam: ≥ 900 mm	H may not be < 0!	
Detection capability (d) ≤40 mm		Depends on detection capability	
K = 2000 mm/s C = 8 mm (d - 14)		K = 1600 mm/s C = 1200 mm - (0.4 × H) (but not < 850 mm)	
If S > 500 mm when K = 2000 mm/s, S may be recalculated using K = 1600 mm/s S < 500 mm may not be under-exceeded			
Detection capability (d) >40 mm			
K = 1600 mm/s C = 850 mm (normal arm reach)			
In all cases an incorrect positioning which permits reaching over or under must be prevented! (see 5.1 and 5.2)			
If the protection field is aligned at an angle to the approach direction, the following rule applies: If the angle is greater than ±30°, the approach must be viewed as right-angle (orthogonal). If the angle is less than ±30°, the approach must be viewed as parallel.			

5 Installation Requirements

Calculation example for a vertically installed light curtain

	BLG 4A-060-600-014-001-SX 	BLG 4A-060-19X-030-001-SX 
Protection field height	600 mm	
t_1	22 ms...0.022 s	14 ms...0.014 s
t_2	Depends on the application. Assumed here: 0.371 s	
K	2000 mm	
d	14 mm	30 mm
$T = t_1 + t_2$	0.393 s	0.385 s
$C = 8(d - 14)$	0 mm	128 mm
$S = K \times T + C$	786 mm	898 mm
	If $S > 500$ mm for the calculation where $K = 2000$ mm/s, S can be recalculated where $K = 1600$ mm/s. However $S < 500$ mm may not be under-exceeded.	
K	1600 mm	
$S = K \times T + C$	628.8 mm	744 mm



Note

The reference guideline here is **EN ISO 13855, Safety of machinery -- Positioning of safeguards with respect to the approach speeds of parts of the human body.**

For the information provided here these are summarized reference points. For correct calculation of the safety distance reference to EN ISO 13855 must be applied in its full scope.

5 Installation Requirements

5.4 Minimum distance from reflecting surfaces

Reflecting surfaces near the light curtain (above, below or to the side of it) may cause passive reflections which affect the detection of the object within the protection field area. In this case the object may not be detected, since the receiver (RX) could detect a secondary beam (reflection from the reflecting surface to the side), even if the main beam is interrupted by the actual object.

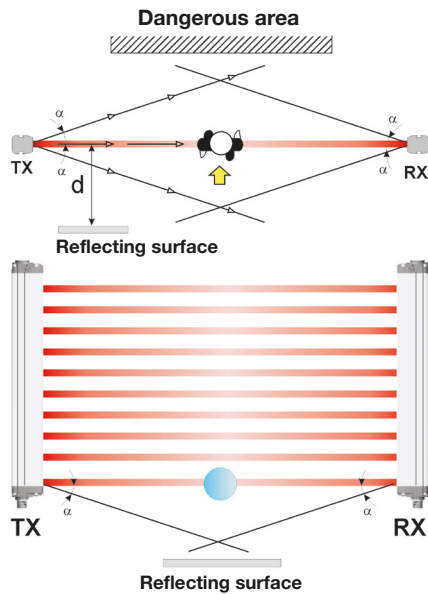


Figure 5: Minimum distance from reflecting surfaces (TX = Emitter, RX = Receiver)

For this reason it is necessary that a minimum distance from the light curtain to a reflecting surface not be under-exceeded.

This minimum distance depends on the following factors:

- The distance between the emitter (TX) and receiver (RX) = range
- The effective aperture angle (EAA) of the AOPD, especially for AOPD Type 4, EAA = 5° ($\alpha = \pm 2.5^\circ$ with respect to the optical axis)

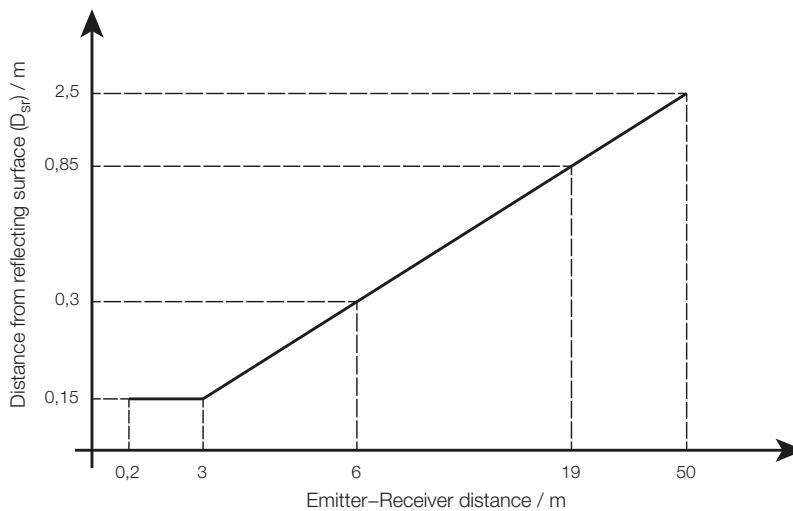


Figure 6: Minimum distance (D_{sr}) to the reflecting surface as a function of distance between emitter and receiver

Formula for calculating the minimum distance (D_{sr}):

$$D_{sr} \text{ (m)} = 0.15 \quad \text{for ranges} < 3 \text{ m}$$

$$D_{sr} \text{ (m)} = 0.5 \times \text{range (m)} \times \tan 2\alpha \quad \text{for ranges} \geq 3 \text{ m}$$

5 Installation Requirements

5.5 Installing multiple adjacent curtains

If installation of multiple protection measures for adjacent protection areas is necessary, the emitter in one system must not interfere with the emitter in another system. The emitter (TX_B) must lie outside the safety distance (D_{do}) of the emitter/receiver axis ($TX_A - RX_A$) (see Figure 7).

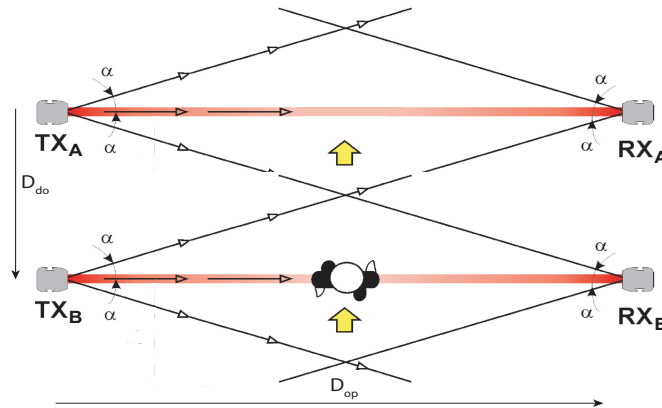


Figure 7: Installation of multiple light curtains adjacent to each other

This minimum distance (D_{do}) depends on:

- The range between (TX_A) and receiver (RX_A);
- The effective aperture angle (EAA) of the AOPD.

In the following illustration the distance from the additional emitter (D_{do}) as a function of the range (D_{op}) of the first emitter/receiver pair ($TX_A - RX_A$) is shown.

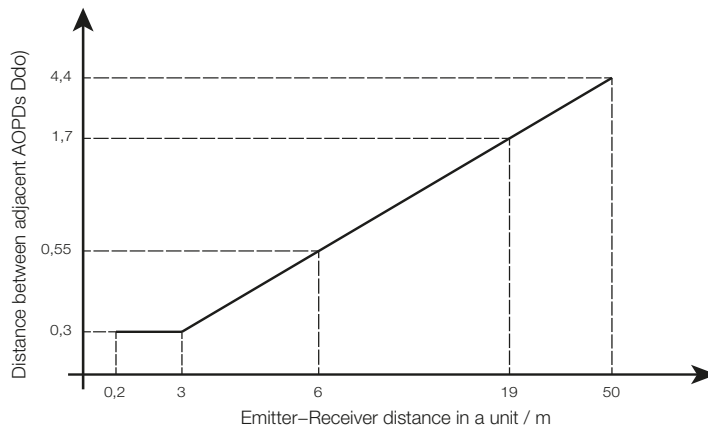


Figure 8: Distance between adjacent AOPDs as a function of the distance between emitter and receiver of the first unit.

For purposes of simplification the following table shows the minimum required safety distances in the installation with respect to several ranges.

Range (m)	Minimum distance of the installation (m)
3	0.3
6	0.55
10	0.9
19	1.7
50	4.4



Note

The additional unit (TX_B) must be positioned at least at the distance D_{do} calculated above. Even if its own protection field range is less than between TX_A and RX_A .

5 Installation Requirements

To prevent interference between same AOPDs, preventive measures must be taken at the time of installation. A typical case is multiple protection units within an area which are aligned the same and close to each other, e.g. transfer lines with different machine modules.

In Figure 9 an installation example is shown where interference can take place. Two possible remedies are suggested.

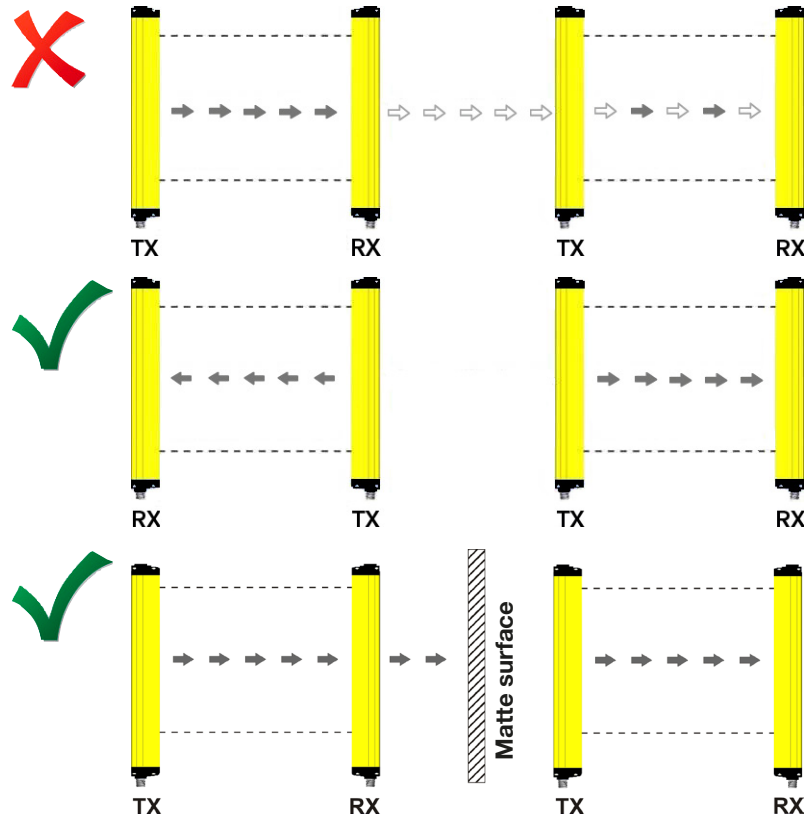


Figure 9: Example configurations

6

Assembly

**6.1 Required tools/
 materials**

The following tools/materials are required for installation:

- 4 screws for installing the bracket on the mounting surface (when installing using vibration dampers 2 screws are sufficient)
- For installing the rotating mounting bracket: M5 screws (included in the scope of delivery)
- For installing the fixed mounting bracket: M6 screws (not included in the scope of delivery)

**6.2 Aligning the
 emitter and
 receiver**

For installing the emitter (TX) and receiver (RX) the following are required:

- The optical surfaces must be aligned parallel to each other.
- The beams must be at a right angle to the emitter and receiver surface.
- The connectors point in the same direction.
- The distance from each other is within the maximum range of the AOPD.

► The following alignments must therefore be avoided:

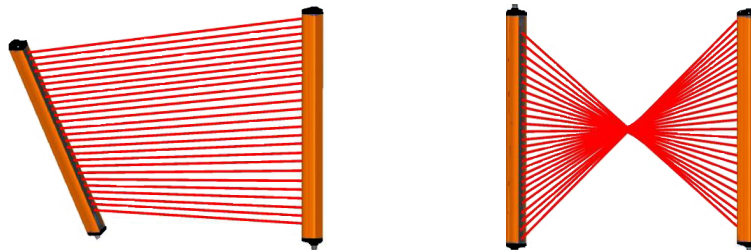


Figure 10: Non-permissible alignments

► After installing the two units (as parallel as possible and aligned) perform the fine-tuning (see „Commissioning“ on page 35).



Note

Two different mounting kits may be used to fasten the two units.

**6.3 Attaching rota-
 ting mounting
 brackets**

The rotating mounting brackets are included in the scope of delivery of all BLG 4A models. These enable turning of the light curtain by 360° around its own axis.

Rotating mounting brackets BAM MB-LG-023-B13-3 (for BLG 4A-...-014/030-...)

► For dimensions see „Rotating mounting bracket for BLG 4A-...-014/030-...“ on page 51.

Installation:

1. Place the brackets on both sides of the light curtain on the end cap and attach bracket to the mounting surface.
2. Roughly align the light curtain at the desired angle (make sure the threads in the cover caps are not covered) and use the three screws on each end to hold it in place (tighten only slightly).
3. Fine adjust the angle of the light curtain and thread screws in tight.

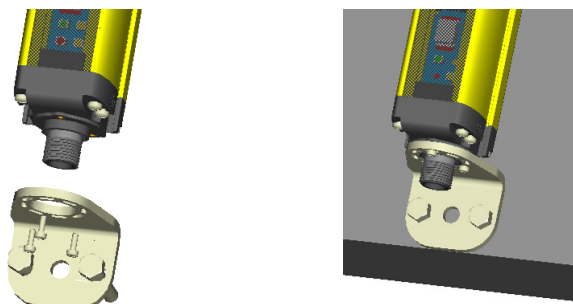


Figure 11: Rotating mounting brackets BAM MB-LG-023-B13-3

6

Assembly

Rotating mounting brackets BAM MC-LG-036-T01-3 (for BLG 4A-...-B..-...)

► For dimensions see „Rotating mounting bracket for 4A-...-B..-...“ on page 52.

Installation:

1. Place the brackets on both sides of the light curtain on the end cap and attach bracket to the mounting surface (M5).
2. Roughly align the light curtain at the desired angle and slightly tighten the screw on each end (hex M3 x 16).
3. Fine adjust the angle of the light curtain and thread screws in hand-tight.

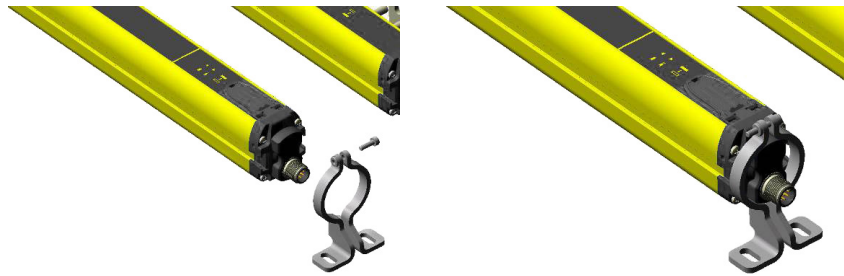


Figure 12: Rotating mounting brackets BAM MC-LG-036-T01-3

6.4 Attaching fixed mounting brackets (optional)

Fixed mounting brackets can also be requested which can be used either as an alternative or in addition to the rotating mounting brackets.

Adjustable holders are available with allow correction of the tilt of the unit on its axes (see „Accessories“ on page 51).

► For dimensions see „Mounting bracket (optional)“ on page 53.

Installation:

1. Pre-install the brackets (see Figure 13). Loosely tighten the nuts
2. Slide the bracket into the side slot and attach to the mounting surface (M5). For the recommended attachment positions see „Attaching fixed mounting brackets (optional)“ on page 21.
3. Tighten the M5 nuts by hand.

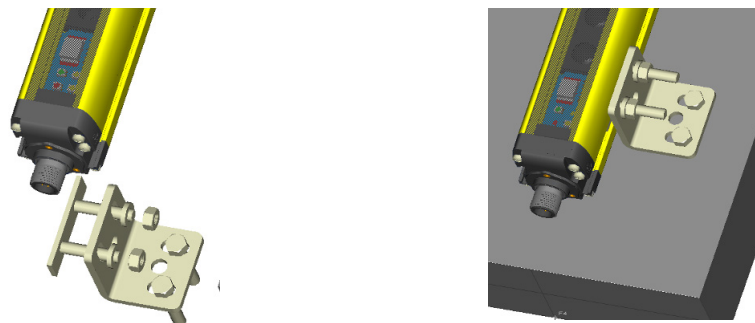


Figure 13: Fixed mounting brackets

6

Assembly

For the recommended positions for attaching the fixed mounting brackets depending on the length of the curtain, see the following illustrations and tables.

Attachment positions for series BLG 4A-...-014/030-...

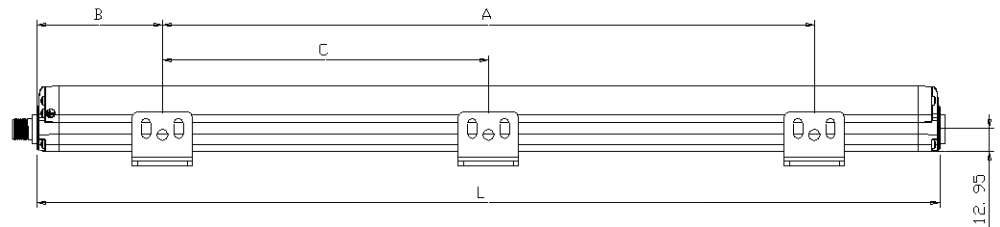


Figure 14: Positions for fastening depending on the length of the light curtain



Model	L (mm)	A (mm)	B (mm)	C (mm)
BLG 4A-015-...	216.3	108	54	-
BLG 4A-030-...	366.2	216	75	-
BLG 4A-045-...	516.3	316	100	-
BLG 4A-060-...	666.2	366	150	-
BLG 4A-075-...	816.3	466	175	-
BLG 4A-090-...	966.2	566	200	-
BLG 4A-105-...	1116.2	666	225	-
BLG 4A-120-...	1266.3	966	150	483
BLG 4A-135-...	1416.2	1066	175	533
BLG 4A-150-...	1566.3	1166	200	583
BLG 4A-165-...	1716.3	1266	225	633
BLG 4A-180-...	1866.3	1366	250	683

Attachment positions for series BLG 4A-...-B-...

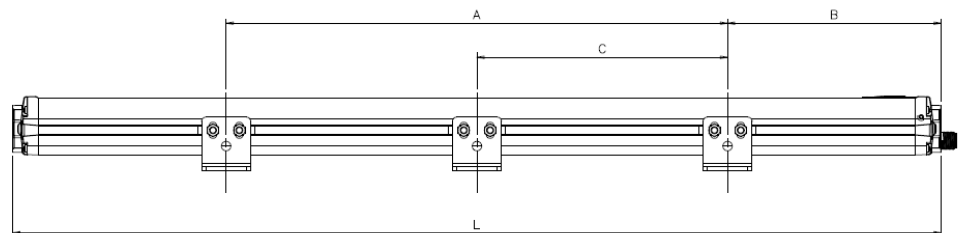


Figure 15: Positions for fastening depending on the length of the light curtain



Model	L (mm)	A (mm)	B (mm)	C (mm)
BLG 4A-050-50X-B02-O01-SX	653	342	150	-
BLG 4A-080-50X-B03-O01-SX	953	542	200	-
BLG 4A-090-50X-B04-O01-SX	1053	602	220	-
BLG 4A-120-50X-B04-O01-SX	1353	942	200	472

6

Assembly

6.5 Attaching mounting brackets with vibration damper (optional)

For applications, where strong vibrations are present, Balluff recommends the use of vibration dampers. In combination with the threaded pins, the bend-resistant mounting bracket and/or adjustable holders, these are able to reduce the effects of vibration.

- ▶ For dimensions see „Rotating mounting bracket for 4A-...-B..-...“ on page 52.
- ▶ For attaching the rotating mounting brackets with vibration dampers, see „Attaching rotating mounting brackets“ on page 20.
- ▶ For attaching the fixed mounting brackets with vibration dampers, see „Attaching fixed mounting brackets (optional)“ on page 21.

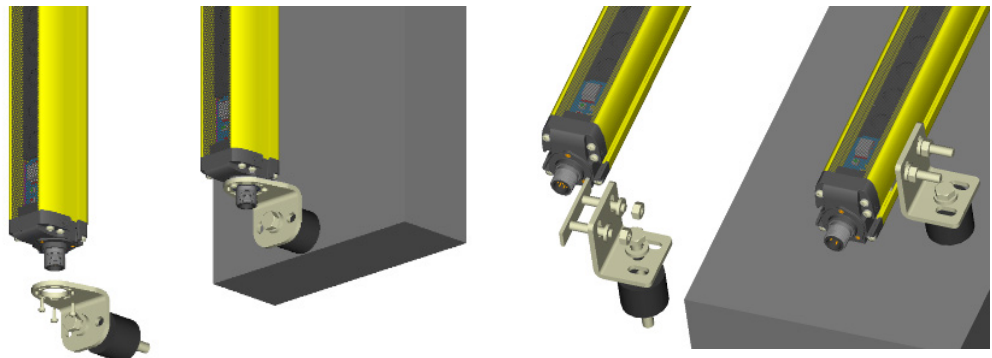


Figure 16: Mounting bracket with vibration damper

6.6 Floor stand (optional)

The floor stand (BAM MB-LG-024-...-1) is available as an accessory (see „Floor stand“ on page 55). It protects the light curtain mounted inside it from bumps and collisions. The protective housing has the following characteristics:

- One-piece aluminum, painted extrusion with various lengths suitable for all heights of series BLG 4A (150 – 1800 mm).
- Rugged steel base consisting of 2 base plates with angle reference notches, pins for adjusting level, and oblong holes for angle setting.
- Bubble level for easier leveling.
- Double rear slot for mounting holding systems for external muting sensors.



Figure 17: Protective housing



Note

If a product is being used for bodily protection, the specifications of EN ISO 13855 "Safety of machinery -- Positioning of safeguards with respect to the approach speeds of parts of the human body" must be adhered to.

6

Assembly

The BAM MB-LG floor stand can support the light curtains themselves or the also available deflector mirrors. The following kits with mounting brackets are available:

- **BAM MC-LG-041-B07-3-S (4 pcs.):** Kit for mounting the light curtains from 150 mm to 1050 mm protection field height
- **BAM MC-LG-041-B07-3-L (6 pcs.):** Kit for mounting the light curtains from 1200 mm to 1800 mm protection field height
- **BAM MC-LG-040-B08-3:** Kit for mounting the BAM BD-LG-003-... deflector mirror (please order separately).

6.7 Installing the BLG 4A... light curtain in the floor stand

1. The mounting bracket kits (BAM MC-LG-041-B07-3-) are installed on the light curtain as shown in Fig. 19.

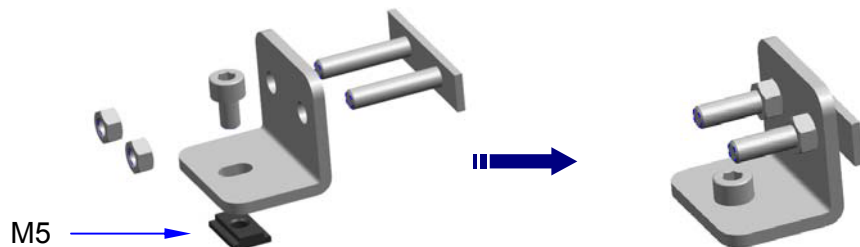


Figure 18: Installing the kits

2. Insert the mounting brackets into the light curtain slots and tighten. Hand tighten the M5 nuts for preventing the bracket from sliding.

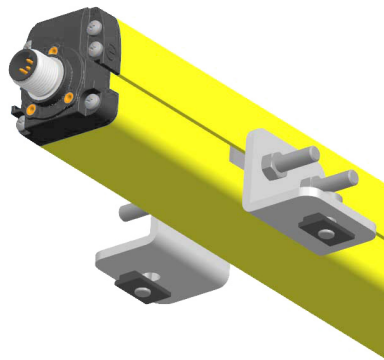


Figure 19: Installation – screwing on

3. After assembly of all brackets is complete, remove the column cover after loosening the two M8x20 ISO 7380 screws (Figure 20), and insert the assembled unit into the internal guides.

6

Assembly

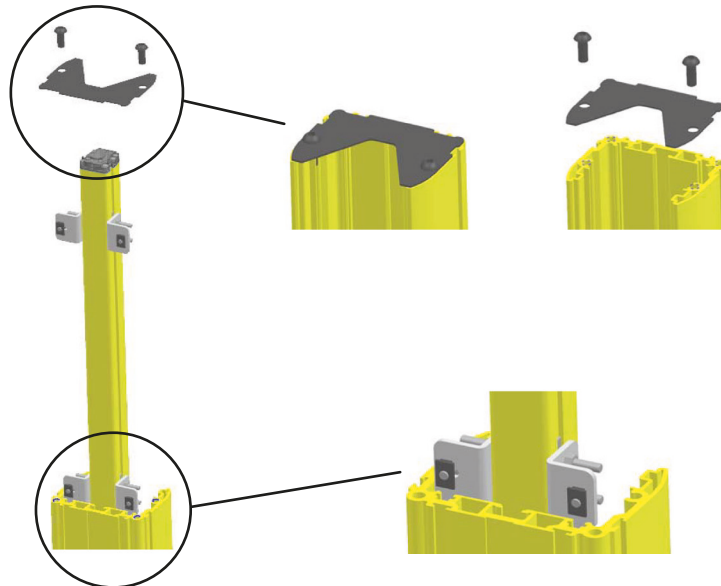


Figure 20: Installation – inserting the unit

4. Once the unit has been fully inserted and its height set in the columns, screw the cover (Figure 20) back on.



Figure 21: Installation – height adjustment

5. To adjust the height, loosen the ISO 4762 M5x8 screws slightly using a hex key. The screws are accessible from the outside.
CAUTION: The product could suddenly slide down if the column is in a vertical position.

6

Assembly

6.8 Installing the deflector mirror for the BLG 4A-...-B.-...

1. Use the MC-LG-040-B08-3 kit and install the deflector mirror in the guides provided in the floor stand (Figure 22):
 - Thread the M8 slot nut on to the screw so that the nut can be guided into the center slot of the floor stand.
 - Insert the mirror into the side guides of the floor stand (Figure 23).
 - Guide the M8 screw through the upper eye of the deflector mirror and thread on the M8 nut (do not tighten fully yet!)
2. To adjust the height of the mirror to the slot nut, tighten or loosen the ISO 4762 M8x50 screw.
3. To prevent unintended loosening of the connection, tighten the ISO 4032 M8 nuts below the eyes of the mirror against the eye.

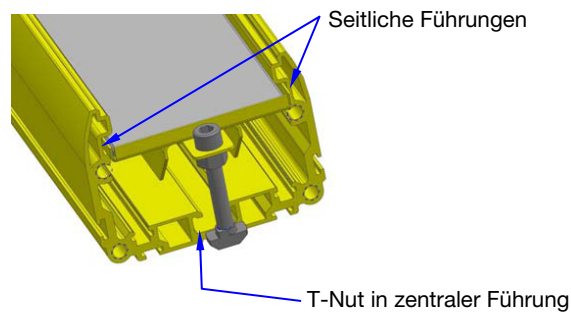


Figure 22: Installing the deflector mirror BAM BD-LG-003-...

6

Assembly

6.9 Installing and setting the base plates for the floor stand

1. Slightly tighten the roughly aligned base plate to the floor with the three oblong holes provided (M10). The reference notches cut into the base plate at 0°-45°-90° may be helpful here.
2. Loosen the locknuts on the pins. Regulate the level of the floor plate by adjusting the pins. Use the built-in level to help you.
3. After reaching the desired level, tighten the screws on the floor.
4. If necessary the floor stand can now be aligned slightly more (+/- 5°) by turning the upper plate. After achieving the final setting, tighten the locknuts to fix the position and alignment of the floor stand.

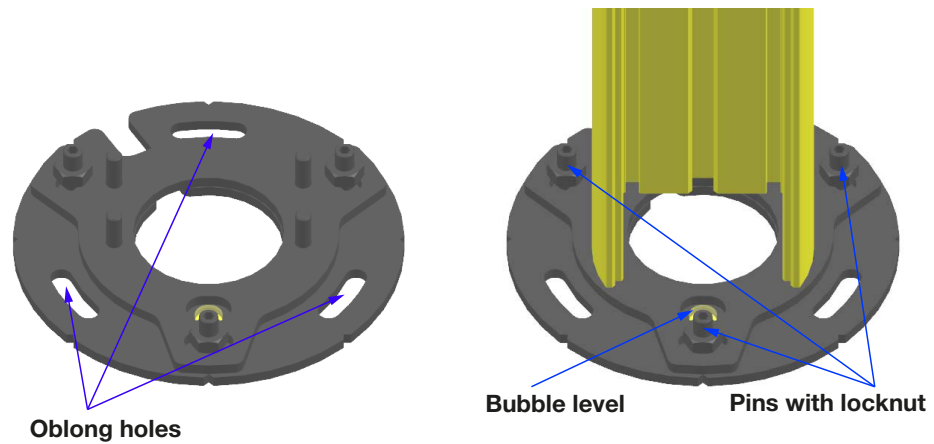


Figure 23: Attaching the base plates to the floor (left), leveling and angle setting of the base plate (right)

6

Assembly

6.10 Securing a hazard area using deflecting mirrors

If only one AOPD is used, the hazardous areas can be monitored using different but adjacent access sides by using correspondingly arranged deflection mirrors. Deflector mirrors are available as accessories (see „12.6 Deflecting mirror (optional)“ on page 55).



Note

The use of deflector mirrors requires a high degree of accuracy. The greater the number of beams in the protection field, the more difficult it is to align using deflector mirrors.

For this reason the use of deflector mirrors together with bodily protection light curtains BLG 4A-...-B.-... is practical.

The following cautionary measures must be taken and conditions met when using deflector mirrors:

- Even a slight angle offset on the mirrors can result in lost of perfect alignment. For this reason use of a laser pointer is recommended (available as accessory, see „12.10 Laser pointer“ on page 56).
- Never more than three mirror protection area and AOPD should be used.
- The length of the mirror must be at least 100 mm longer than the protection field of the light curtain.
- The mirror must be installed so that its horizontal and vertical axes agree with the respective axes of the safety device and it must not be capable of being moved accidentally or from strong vibrations.
- Each mirror used reduces the range of the light curtain by 20%. When using a mirror a correction factor of 80 % for one mirror, 60 % for two mirrors and 40 % for three mirrors must be calculated in.

Range as a function of number of mirrors

Number of mirrors	BLG 4A-...-B.-...
1	40 m
2	30 m
3	20 m



Note

Dust or dirt on the reflecting mirror surface will cause a drastic reduction in range.

- ▶ Balluff recommends regular cleaning of the mirror surface with a damp, soft cloth. The frequency of cleaning depends on the ambient conditions in which the system is used.

Safety distance to hazardous area

The following example shows monitoring for three different access sides using two deflection mirrors arranged at a tilt angle of 45° to the beams.



WARNING

Insufficient safety distance

Insufficient safety distance means there is not sufficient security for the hazardous area.

- ▶ Maintain the minimum safety distance (S) for all beam sections (see „Installation Requirements“ on page 13).

6

Assembly

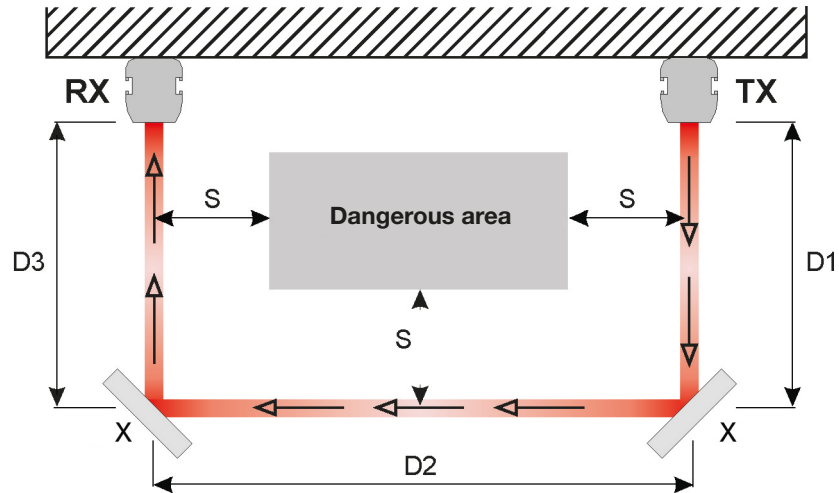


Figure 24: Securing the hazardous area using deflector mirrors

D1, D2, D3	Light paths
S	Safety distance to hazardous area
X	Deflector mirror
TX	Emitter
RX	Receiver

- For safety distance S the same principles apply as for the minimum safety distance with direct use of the light curtain. For information on calculating the minimum safety distance, see section „5.3 Minimum safety distance“ on page 14.



Installing the protection system (body protection light curtain + deflector mirror):

1. Determine the area to be protected and the exact positions where the deflector mirrors as well as the emitters and receivers need to be installed.
2. Install the deflector mirror in the protective housing (see „Installing the deflector mirror for the BLG 4A-...-B.-...“ on page 26). For recommended combinations of light curtain and deflector mirror see „Deflector – Light curtain combinations“ on page 31.
3. Attach the base plates for the floor stands to the determined points on the floor. Check that the axes are aligned plumb to the floor. If necessary use the included bubble level for fine adjustment.
4. Align the mirror at approximately 45° to the light beam. The floor stand can be aligned another +/- 5° in the vertical axis after attaching the base plate to the floor.
5. Attach the laser pointer (BAE TO-LG-010-01) to the upper part of the emitter and align the unit (emitter unit incl. laser pointer) so that the laser beam strikes the surface of the first mirror centrally and at the same height at which the laser pointer is installed.
6. Repeat the procedure and attach the pointer to the lower part of the unit. If necessary repeat the steps until the desired result has been achieved.

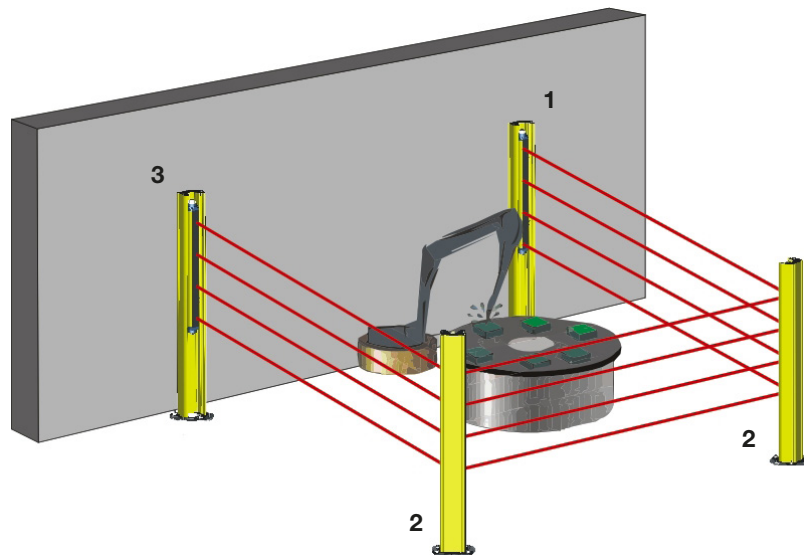


Figure 25: Protection system consisting of one light curtain and 2 mirrors

- 1 Emitter
- 2 Deflector mirror
- 3 Receiver

7. Align the first mirror so that the laser beam strikes the second mirror in the previous described positions.

Setting instructions when using floor stands (BAM MB-LG-024-...) can be found in „Installing and setting the base plates for the floor stand“ on page 27.

6

Assembly

Deflector – Light curtain combinations

The following table shows various combinations of deflector mirrors and light curtains.

Deflector mirror	Light curtain
BAM BD-LG-003-0600	BLG 4A-050-50X-B02-O01-SX
BAM BD-LG-003-0900	BLG 4A-080-50X-B03-O01-SX
BAM BD-LG-003-1200	BLG 4A-090-50X-B04-O01-SX
BAM MB-LG-024-1650	BLG 4A-120-50X-B04-O01-SX

6.11 Laser pointer

The laser pointer BAE TO-LG-010-01 (see accessories „12.10 Laser pointer“ on page 56) effectively helps in aligning and installing the light curtains. To check the complete orientation of the protection system the pointer can be slid along the light curtain profile (upwards and downwards).

- ▶ More instructions for the laser pointer can be found in „12.10 Laser pointer“ on page 56.

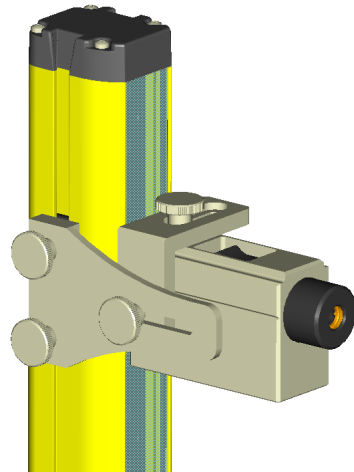


Figure 26: Laser pointer

Safety instructions



CAUTION
Laser beam
 The BAE TO-LG-010-01 laser pointer uses a laser beam which can cause injury if it strikes the eye.

LASER RADIATION	P = ≤ 1 mW
DO NOT STARE INTO BEAM	λ = 640...660 nm
CLASS 2 LASER PRODUCT	
EN 60825-1 (1994) + A1 (2002) + A2 (2001)	

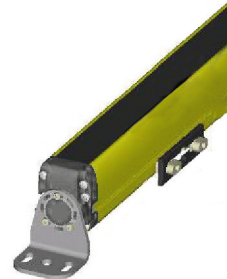
- ▶ Do not look directly into the laser beam.

6

Assembly

Installing the laser pointer

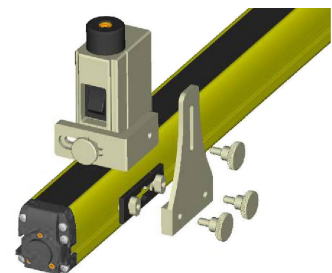
1. Place the retaining cam on the mounting plate at an angle, insert the mounting plate into the housing slot from the side at the desired location and turn the bolt 90°.



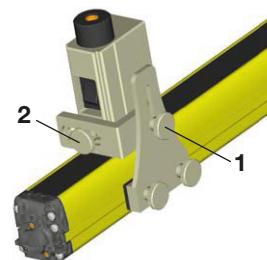
2. Attach the adjusting bracket to the laser pointer using a knurled screw. Loosely tighten.



3. Attach the side plate to the mounting plate using the two knurled screws.
4. Use the remaining knurled screw to attach the assembled adjusting bracket to the side plate. Tighten loosely.
⇒ The laser pointer can now be adjusted.



5. Place the laser pointer on the front of the light curtain and tighten the side knurled screw **(1)** firmly.
6. Align the laser pointer side-to-side and tighten the front knurled screw **(2)** firmly.

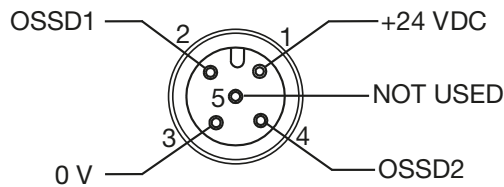


7

Connection

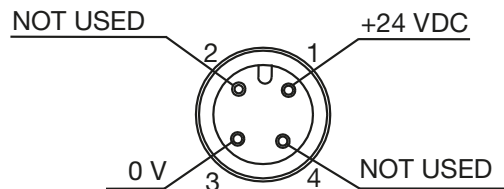
All electrical connections on the emitter and receiver are made using an M12 connector which is in the lower section of each unit.

Receiver (RX):



Pin	Interface
1	+24 V DC
2	OSSD 1
3	0 V
4	OSSD 2
5	NOT USED

Emitter (TX):



Pin	Interface
1	+24 V DC
2	NOT USED
3	0 V
4	NOT USED

7.1 Important Notes

Follow the instructions below for making connections.

- The BLG 4A light curtains can be operated without any additional grounding. Use of an appropriately isolated power supply of type SELV or PELV is obligatory.
- For installation follow EN 60204.



Note

Never combine the OSSDs from multiple light curtains in a multi-conductor cable.

- The unit is already equipped internally with a suppressor against over-voltages and over-currents. The use of other external protection circuits is not recommended.



Note

The use of varistors, RC circuits or LEDs in series with the OSSD outputs is not permitted.

- The output signal switching devices OSSD1 and OSSD2 may not be connected in series or parallel. They may however be used singly while adhering to the safety requirements of the system (see Figure 29 on page 35).

Wiring errors (see „Operating mode“ on page 40).



7

Connection

► Connect both OSSDs to a downstream logic in order to achieve the required PL/SIL!

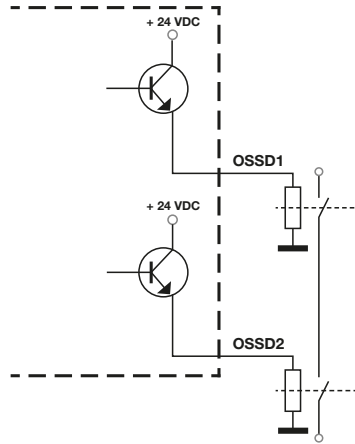


Figure 27: Proper connection

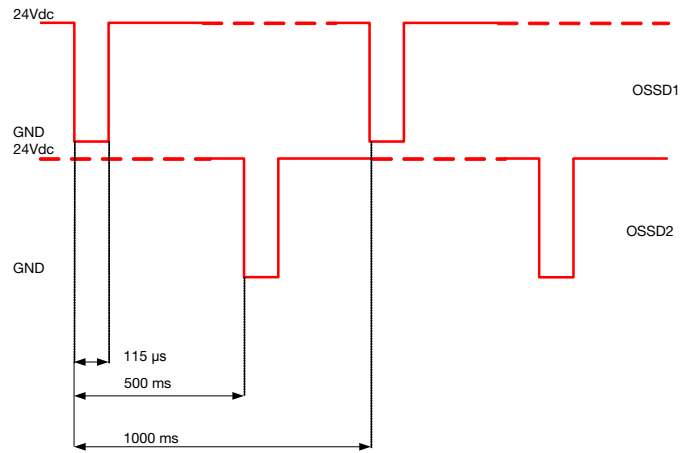
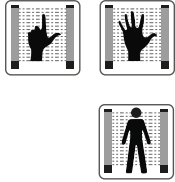


Figure 28: OSSD test signal

8

Commissioning

- ▶ Alignment of the emitter and receiver is essential for flawless operation of the equipment. The more precisely the units are aligned with respect to each other, the more resistant the unit is to dust or vibration effects.



Optimal alignment is achieved when the optical axes of the first and last light beam of the emitter and receiver coincide. To synchronize the two units the beam located closest to the plug is used. SYNC indicates the lens which is coupled to this beam and LAST the lens which is synchronized beginning with the last beam.

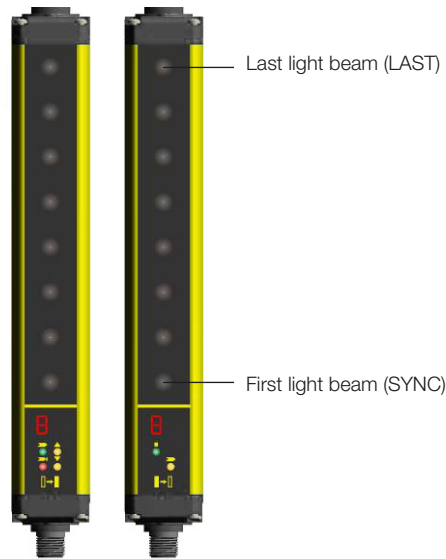


Figure 29: Emitter and receiver alignment (Fig. shows BLG 4A-...-014/030-...)

The function states are indicated by symbols which enable simple status checking regardless of the orientation of the emitters and receivers.

8.1 Function indicators

Four LEDs on the receiver and 2 LEDs on the emitter provide the user with the operating status of the light curtains (Figure 30). The two yellow LEDs (LAST, SYNC) facilitate the alignment procedure.

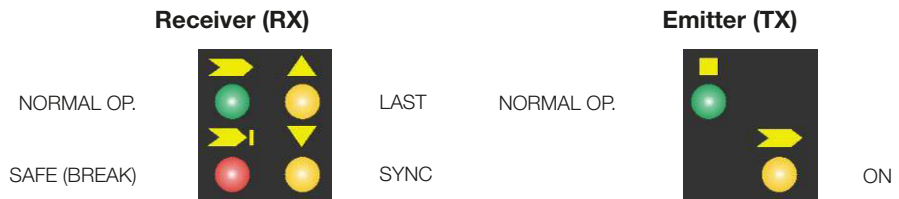


Figure 30: LED indicators

8

Commissioning

The following descriptions refer to the standard installation position according to the information in Figure 29 on page 35 and installation with downward facing connectors.

Correctly aligning the light curtain

Once the mechanical assembly and electrical connections are complete according to the previous sections, the light curtain can be aligned. The status can be checked using the following tables.

BLG 4A-...-014/030-...



Display	Green LED ➤ NORMAL OP.	Red LED ➤ I SAFE (BREAK)	LED Yel-low ▼ SYNC	LED Yel-low ▲ LAST	Explanation	Alignment status
A	OFF	ON	ON	ON	Sync not OK Last not OK	NOT CORRECT
			OFF		Sync OK Last not OK	
			OFF	OFF	Sync OK Last OK Intermediate lenses not OK	
/	ON	OFF	OFF	OFF	Each beam lies above the minimum operating value. The number of beams above the optimal threshold value is between 0 and 25 %.	MINIMUM
2	ON	OFF	OFF	OFF	Each beam lies above the minimum operating value. The number of beams above the optimal threshold value is between 25 and 50 %.	
3	ON	OFF	OFF	OFF	Each beam lies above the minimum operating value. The number of beams above the optimal threshold value is between 50 and 75 %.	
4	ON	OFF	OFF	OFF	Each beam lies above the minimum operating value. The number of beams above the optimal threshold value is between 75 and 100 %.	MAXIMUM

This means the desired goal for flawless operation is a display of 4.



BLG 4A-...-B.-...

Green LED ➤ NORMAL OP.	Red LED ➤ I SAFE (BREAK)	LED Yel-low ▼ SYNC	LED Yel-low ▲ LAST	Explanation	Alignment status
OFF	ON	ON	ON	Sync not OK Last not OK	NOT CORRECT
		OFF		Sync OK Last not OK	
OFF	ON	OFF	OFF	Sync OK Last OK Intermediate lenses not OK	OK
ON	OFF	OFF	OFF	Sync OK Last OK	

8

Commissioning

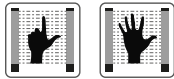
8.2 Aligning the safety light curtain with the laser pointer

For easier alignment of the emitter and receiver, use of the laser pointer is recommended. Attach the laser pointer to the emitter (see "Installing the laser pointer" on page 32).

1. Use the rocker switch to turn on the laser pointer and align the receiver so that the laser beam strikes the protection field area centered and at the same height as the laser pointer.
Note: The mounting brackets included as well as the separately available mounting brackets can be used for alignment and vertical adjustment.
2. Repeat the procedure by attaching the laser pointer to the lower section of the emitter. If necessary repeat the steps until the desired result has been achieved.
3. Repeat steps 2 and 3 by attaching the laser point to the receiver and aligning the emitter accordingly.
4. After alignment is complete, tighten down the light curtains and remove the switched off laser pointer from the light curtain.

After mechanical assembly and electrical connection (see „6 Assembly“ on page 20 and „7 Connection“ on page 33) the light curtain can be aligned.

8.3 BLG 4A-...-014/030-... alignment



1. Hold the receiver and move the emitter until the yellow LED (▼ SYNC) goes out.
2. Rotate the emitter around the axis of the first light beam until the yellow LED (▲ LAST) goes out.



Note

Be sure that the green LED (➤ NORMAL OP.) is continually on.

3. Align both units for center and delineate the protection area with a fine setting - first on the emitter and then on the receiver. While these settings are being made the green LED (➤) should be continually on. Strive for a condition of maximum alignment (display shows 4) (see „Correctly aligning the light curtain“ on page 36).
4. Tighten down emitter and receiver.
5. Verify functionality with the cylindrical test rod having a diameter corresponding to the resolution (see „Testing“ on page 39):
 - The green LED (➤) on the receiver must come on when the protection field is clear.
 - The red LED SAFE (BREAK) (➤ I) must come on even when one light beam is interrupted.
6. Turn the device off and on to switch to normal mode.

The status is indicated during normal operation by the display indicators (see „Diagnostic messages BLG 4A-...-014/030-...“ on page 41).

Once the light curtain has been aligned and fixed in place, this display is helpful both for checking its alignment and for showing a change in the ambient conditions (dust, interference from impinging light etc.).

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Commissioning

**8.4 BLG 4A-...-B..-
...alignment**



1. Check the emitter to see if both the lower green LED (POWER ON) and the yellow LED (NORMAL OP.) are on. This will confirm correct function of the emitter..
2. Verify that one of the following conditions is true for the receiver:
 - The red LED (SAFE) is on.
Operating condition without alignment.
 - The green LED (NORMAL OP.) is on.
Operating condition with already aligned light curtain. In this case both yellow LEDs (LAST, SYNC) will be on.
3. If the units are not yet aligned, proceed as follows:
 - a. Hold the receiver and align the emitter so that the lower yellow LED (SYNC) comes on.
This confirms alignment of the first lower beam.
 - b. Turn the emitter around the light beam of the lower lens until the upper yellow LED (LAST) also comes on. Under these conditions the red LED (SAFE) must turn off and the green LED (NORMAL OP.) turn on.



Note

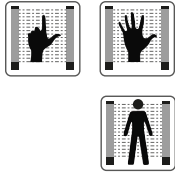
Be sure that the green LED (NORMAL OP.) is continually on.

- c. Align emitter and receiver for center and delineate the protection area with a fine setting - first on the emitter and then on the receiver. While these settings are being made the green LED should be continually on.
4. Tighten down emitter and receiver.
5. Verify functionality (see „Testing“ on page 39):
 - The green LED (▶▶) on the receiver must come on when the protection field is clear.
 - The red LED SAFE (BREAK) (▶▶|) must come on even when one light beam is interrupted.#
6. Turn the device off and on to switch to normal mode.

8

Commissioning

8.5 Testing



The following section lists essentials tests that must be performed following initial installation and during semi-annual inspection and regular maintenance . Inspection must be performed prior to each startup of the machine. Inspections must be performed by qualified and trained personnel, i.e. directly or under the supervision of the deputy for machine safety. Please follow the check list contained on the included CD for semi-annual inspection and regular maintenance.

Check the following points:

- ▶ The AOPD remains turned off (➡) as long as the protection field is interrupted in the inspection routine and using the corresponding test rod as shown in Figure 31 . Use the following test rods (see Accessories, „12.8 Test rod“ on page 55):
 - BAM TO-LG-011-14 for light curtains with 14 mm resolution (BLG 4A-...-014-...)
 - BAM TO-LG-011-30 for light curtains with 30 mm resolution (BLG 4A-...-030-...)

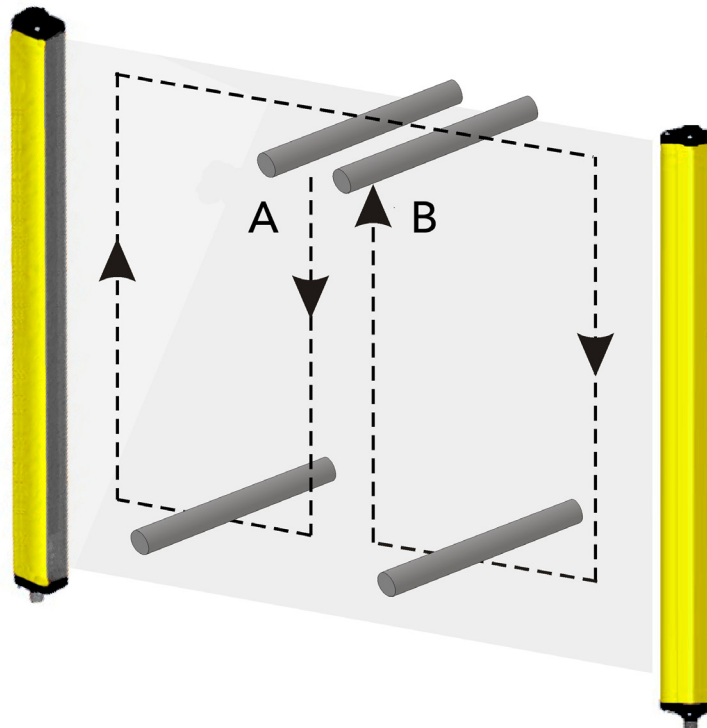


Figure 31: Test routine for testing protection field interruption with a test rod A = Start, B = End)

- ▶ Is the ESPE correctly aligned?
 Lightly pressing on the housing in both directions must not cause the red LED to come on ➡.
- ▶ Does the response time for a machine stop, including the response time of the ESPE and the run-on time of the machine, fall below the limits defined based on the calculation of the safety distance (see „Installation Requirements“ on page 13)?
- ▶ Does the safety distance between the hazardous machine functions and the ESPE correspond to the figures in „Installation Requirements“ on page 13?
- ▶ Is it ensured that no person can enter the area between the ESPE and the hazardous machine function and remain there?
- ▶ Is undetected access to the hazard areas of the machine prevented from all possible sides?
- ▶ Are there external light sources which could affect the AOPD eliminated?
 - To verify, check fault-free function of the system under normal operating conditions for at least 10 to 15 minutes.
 - Then place the test rod in the protection field and use the same time period to check whether the AOPD remains in the safe condition.

9

Operation



WARNING

Persons in the hazard area

If persons are present within the hazard area, starting the machine may result in severe injury or death.

- ▶ Start the machine in normal mode only if there are no persons within the hazard area.

9.1 Restart

Interrupting a light beam causes the OSSD switching outputs of the light curtain to switch off, SAFE condition (BREAK) I.

Normal operation of the AOPD (activation of OSSD switching outputs = NORMAL OP.) is restored by an **automatic reset**. After tripping, the AOPD resumes normal operation as soon as the object is removed from the monitored area.



WARNING

Potential risk from automatic reset

Severe injury or death can result.

- ▶ The automatic reset function of the AOPDs must be taken into account for the risk assessment. An automatic restart must be prevented especially if there is full access to the hazard area.
- ▶ The reset key for restarting the machine must be located outside the hazardous area and must not be accessible from inside the area. The operator must have a clear view of the protected area when he performs the reset.
- ▶ Closely weigh the hazard conditions and the reset (must be taken into account in the risk assessment for the hazard location). If there is a manual reset procedure for example, a controller function block must have a corresponding manual reset function.

9.2 Operating mode

- **Green LED NORMAL OP.:**
LED on = no objects have been detected
- **Red LED SAFE:**
LED on = an object was detected. In this condition the outputs are OFF (Status SAFE).

The LEDs on the emitter (TX) mean the following:

- **Yellow LED NORMAL OP.:**
LED on = the unit is emitting correctly
- **Green LED POWER ON:**
LED on = the unit is being correctly powered (diagnostic function)

9.3 Display

The operator can read the operating status of the light curtains on a display which is present on both the receiver unit (four LEDs) and the transmitter unit (two LEDs).

The following illustration shows all display conditions of the LEDs:

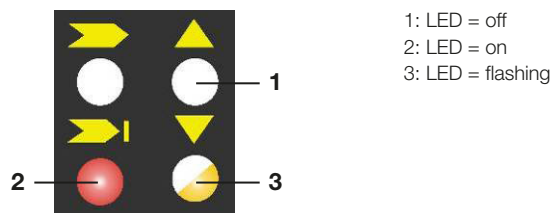


Figure 32: Display conditions of the LEDs

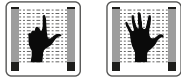
9

Operation

9.4 Diagnostic messages
BLG 4A-...-
014/030-...

The display and the LED indicators allow the operator to assess the essential causes for the stop or a defect in the system.

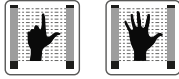
Receiver



Operating status	Status	LED	DIGIT	Meaning/remedy
Normal operation	Alignment			See „Commissioning“ on page 35
	Fault-free reception (OSSD ON) (green on)			Light curtain functioning in normal operation
	Break (OSSD OFF) (red on)			Light curtain operational and in safety block mode
	Locked Monitored area occupied (red and yellow on)			Light curtain locked. The OSSD status must be OFF.
	Signal level			<ul style="list-style-type: none"> – Minimum (1 bar) – Average (2 bars) – Maximum (3 bars)
Error status	OSSD error (red on)			<ul style="list-style-type: none"> ▶ Check the connections on the OSSD. Check that they are not contacting each other or the supply voltage. ▶ Perform a power reset to the unit. ▶ If the condition persists, contact customer service.
	Internal error (red on)			<ul style="list-style-type: none"> ▶ Turn the power supply off and on. ▶ If the condition persists, contact customer service.
	Optics error (red on)			<ul style="list-style-type: none"> ▶ Perform a power reset. ▶ If the condition persists, contact customer service.
	No power (all LEDs off)			<ul style="list-style-type: none"> ▶ Check the connections for presence of power. ▶ If the condition persists, contact customer service.

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Operation



Emitter

Operating status	Status	LED	DIGIT	Meaning
Normal operation	Emitter is emitting (green and yellow on)			Light curtain in normal operation
Error status	Internal error (green on)		FU	<ul style="list-style-type: none"> ▶ Turn the power supply off and on. ▶ If the condition persists, contact customer service.
	Optics error (green on)		Fb	<ul style="list-style-type: none"> ▶ Turn the power supply off and on. ▶ If the condition persists, contact customer service.
	No power (LEDs off)			<ul style="list-style-type: none"> ▶ Check the connections and the correct value of the supply voltage. ▶ If the condition persists, contact customer service.

9







Operation

9.5 Diagnostic messages BLG 4A-...-B...-...




These LEDs help the user identify the essential causes for the machine stop and any system defects.



Receiver

Status	Meaning	Checking and remedying
Green on Off  Off Off	Fault-free reception (OSSD ON) (green on)	Light curtain functioning in normal operation
Off Off  Red on Off	Break (OSSD OFF)	Light curtain operational and in safety block mode
Off Yellow flashing  Red flashing Yellow flashing	Output malfunction	<ul style="list-style-type: none"> ▶ Check the output wiring. ▶ Ensure that the load is compatible with the technical specifications.
Off Yellow flashing  Off Yellow flashing	Microprocessor malfunction	<ul style="list-style-type: none"> ▶ Restart the unit. ▶ If the display does not go off, contact customer service.
Off Off  Off Yellow flashing	Optical fault	<ul style="list-style-type: none"> ▶ Check the alignment of emitter and receiver. ▶ Restart the unit. ▶ If the display does not go off, contact customer service.
Off Off  Off Off	<ul style="list-style-type: none"> - No power - Supply voltage is outside the permissible range - Malfunctions in the main microprocessor 	<ul style="list-style-type: none"> ▶ Check the power supply ▶ Turn the unit off and on. ▶ If the display does not go off, contact customer service.

Emitter

Status	Meaning	Checking and remedying
Green on  Yellow on	General emitter irregularity	<ul style="list-style-type: none"> ▶ Check the power supply. ▶ If the display does not go off, contact customer service.
Switched off  Switched off	No voltage	<ul style="list-style-type: none"> ▶ Check the power supply. ▶ If the display does not go off, contact customer service.
Green on  Switched off	<ul style="list-style-type: none"> - Supply voltage is outside the permissible range. - Malfunctions in the main microprocessor 	<ul style="list-style-type: none"> ▶ Check the power supply ▶ Turn the unit off and on. ▶ If the display does not go off, contact customer service.

10 Maintenance and Care, Disposal

Series BLG 4A light curtains require no special maintenance.

10.1 Regular inspections

The following points should be checked by technical personnel on a regular basis (see also „Testing“ on page 39). The frequency of the inspection depends on the specific application and on the conditions under which the light curtain is being operated..

- ▶ Does the ESPE remain locked (▶ I) while the beams are being broken by an appropriate test rod over the entire safety field area (as per the diagram in Figure 31 on page 39)?
- ▶ Is the ESPE correctly aligned? Lightly pressing on the edge of the product in both directions should not cause the red LED to come on ▶ I.
- ▶ Does the response time for a machine stop, including the response time of the ESPE and the run-on time of the machine, fall below the limits defined based on the calculation of the safety distance (see „Installation Requirements“ on page 13)?
- ▶ Does the safety distance between the hazardous parts and the BLG 4A protection field correspond to the figures in „Installation Requirements“ on page 13?
- ▶ Is it ensured that no person can enter the area between the ESPE and the hazardous machine function and remain there?
- ▶ Is it ensured that access to the hazardous areas of the machine is not possible from any unprotected side?
- ▶ Do the ESPE and/or the external electrical connections show any visible evidence of damage?

10.2 Cleaning front surfaces

- ▶ To prevent reduced range, regularly clean the front surfaces of the lenses.

CAUTION

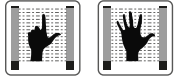
Use of unsuitable cleaning procedures and products prohibited

Unsuitable cleaning procedures and cleaning agents can cause the front surfaces of the lenses to dull and damage plastic surfaces or painted parts.

- ▶ To clean the front surfaces of the lenses use only water and a damp cotton cloth.
 - ▶ To clean the plastic surfaces and painted parts of the light curtain, do **not** use the following materials:
 - Alcohol and solvents
 - Wool cloths or synthetic materials
 - Paper or other abrasive material
-

10 Maintenance and Care, Disposal

10.3 Fuses



For BLG 4A-...-014/030-...

The fuses used in the unit are not self-resetting.

For BLG 4A-...-B.-...



The fuses used in the unit are self-resetting.

In case of a short circuit that results in these fuses tripping, turn off the power and wait for approx. 20 seconds so that the fuses can resume their normal function.




Faults that cause voltage drop-outs in the supply voltage can cause the outputs to momentarily open, which does not however affect safe operation of the light curtain.

10.4 Disposal




Depending on the national and European directives, Balluff is not responsible for disposing of the product at the end of its useful life.

Balluff recommends disposing of the equipment in accordance with national regulations for waste disposal or using the local facilities for separate waste disposal.

1 1 Technical Data

				
		BLG 4A-...-014-...	BLG 4A-...-030-...	BLG 4A-...-B.-...
Electrical	Protection class	Class III		
	Input voltage Ue	19.2...28.8 V DC		
	Rated insulation voltage Ui	SELV/PELV power supply required		
	Short-circuit protected	1.4 A max.		
	Permissible cable length	50 m max. at 50 nF capacitive load and Ue DC = 24 V		
Environment	Front surface material	PMMA		
	Housing material	Al		
	Surface protection	Paint (yellow RAL 1003)		
	Degree of protection as per IEC 60529	IP 65		
	Temperature class	T6 (TX/RX)		
	Shock rating	16 ms (10 G) 1000 shocks per axis (EN 60068-2-29)		
	Vibration rating	Amplitude 0.35 mm, frequency 10...55Hz 20 vibrations per axis, 1 octave/min.		
	Weight	1.3 kg/m or the overall height	1.2 kg/m or the overall height	
	Ambient temperature	0°...+55° C	-10°...+55° C	
Relative humidity	15 ... 95% (no-condensing)			
Emitter	Connection type	Plug connector		
	Connector type Tx	M12, 4-pin		
	Coding	A-coded		
	Power consumption Tx	max. 90 mA / 2.5 W	max. 30 mA / 0.9 W	
	Light type	Infrared		
	Wavelength	950 Nm	880 Nm	

11 Technical Data

				
		BLG 4A-...-014-...	BLG 4A-...-030-...	BLG 4A-...-B..-...
Receiver	Connection type	Plug connector		
	Connector type Rx	M12, 5-pin		
	Coding	A-coded		
	Power consumption Rx	max. 140 mA / 4 W (no load)	75 mA max. / 2.2 W	
	Switching output	2x PNP (OSSD)		
	Switching function	NC		
	Polarity reversal protected	Yes		
	Load capacitance max. (at Ue)	2.2 µF	65 nF at 25°C	
	Purely resistive load (OSSD)		56 ohms at 24 VDC max.	
	Rated operating current Ie	max. 0.5 A on each output		
	Output voltage ON	min. Ue -1 V		
	Output voltage OFF	max. 0.2 V		
	Leakage current	< 2 mA	< 1 mA	
system	ESPE type	4		
	Performance Level	PL e		
	Safety category	4		
	Hardware fault tolerance (HFT)	1		
	SIL CL	3		
	SIL	3		
	Mission time	20 years		
	Diagnostic coverage	98.80 %		
	PFHd	2.65E-0.9 1/h	2.62E-0.9 1/h	
	MTTFd	444 years	384 years	
Safe Failure Fraction (SFF)	99.30 %	99.38 %		

1 1 Technical Data

Overview of models and versions



Model	Protection field height (mm)	Number of beams	Response time (ms)	Range	Detection capability (mm)
BLG 4A-015-600-014-O01-SX	150	16	11	0.2...6 m	14
BLG 4A-030-600-014-O01-SX	300	32	15		
BLG 4A-045-600-014-O01-SX	450	48	18		
BLG 4A-060-600-014-O01-SX	600	64	22		
BLG 4A-075-600-014-O01-SX	750	80	25		
BLG 4A-090-600-014-O01-SX	900	96	29		
BLG 4A-105-600-014-O01-SX	1050	112	33		
BLG 4A-120-600-014-O01-SX	1200	128	36		
BLG 4A-135-600-014-O01-SX	1350	144	40		
BLG 4A-150-600-014-O01-SX	1500	160	43		
BLG 4A-165-600-014-O01-SX	1650	176	47		
BLG 4A-180-600-014-O01-SX	1800	192	50		






Model	Protection field height (mm)	Number of beams	Response time (ms)	Range	Detection capability (mm)
BLG 4A-015-19x-030-O01-SX	150	8	9	0.2...19 m	30
BLG 4A-030-19X-030-O01-SX	300	16	11		
BLG 4A-045-19X-030-O01-SX	450	24	13		
BLG 4A-060-19X-030-O01-SX	600	32	14		
BLG 4A-075-19X-030-O01-SX	750	40	16		
BLG 4A-090-19X-030-O01-SX	900	48	18		
BLG 4A-105-19X-030-O01-SX	1050	56	19		
BLG 4A-120-19X-030-O01-SX	1200	64	21		
BLG 4A-135-19X-030-O01-SX	1350	72	23		
BLG 4A-150-19X-030-O01-SX	1500	80	25		
BLG 4A-165-19X-030-O01-SX	1650	88	26		
BLG 4A-180-19X-030-O01-SX	1800	96	28		



Model	Protection field height (mm)	Number of beams	Response time (ms)	Distance (mm)	Range (m)	Detection capability (mm)
BLG 4A-050-50X-B02-O01-SX	515	2	14	500	0.5...50	515
BLG 4A-080-50X-B03-O01-SX	815	3		400		415
BLG 4A-090-50X-B04-O01-SX	915	4	16	300		315
BLG 4A-120-50X-B04-O01-SX	1215			400		415

11 Technical Data

Safety values

				
		BLG 4A-...-014-...	BLG 4A-...-030-...	BLG 4A-...-B...-...
EN ISO 13849-1	PL	e		
EN 954-1	CAT	4		
EN IEC 61508	SIL	3		
EN IEC 62061	SIL CL	3		
Prob. of Dangerous Failure per Hour	PFHd (1/h)	2.64E-09		
Mission time	T1 (years)	20		
Mean time to dangerous failure	MTTFd (years)	444	384	
Diagnostic Coverage	DC	98.80 %		
Safe Failure Fraction	SFF	99.30 %		
Hardware Fault Tolerance	HFT	1		

11.1 Installation dimensions
BLG 4A-...-014/030-...

Model	L1	L2
BLG 4A-015-...	233.3	153.3
BLG 4A-030-...	383.2	303.2
BLG 4A-045-...	533.2	453.3
BLG 4A-060-...	683.2	603.2
BLG 4A-075-...	833.2	753.3
BLG 4A-090-...	983.2	903.2
BLG 4A-105-...	1133.2	1053.2
BLG 4A-120-...	1283.3	1203.3
BLG 4A-135-...	1433.2	1353.2
BLG 4A-150-...	1583.3	1503.3
BLG 4A-165-...	1733.3	1653.3
BLG 4A-180-...	1883.3	1803.3

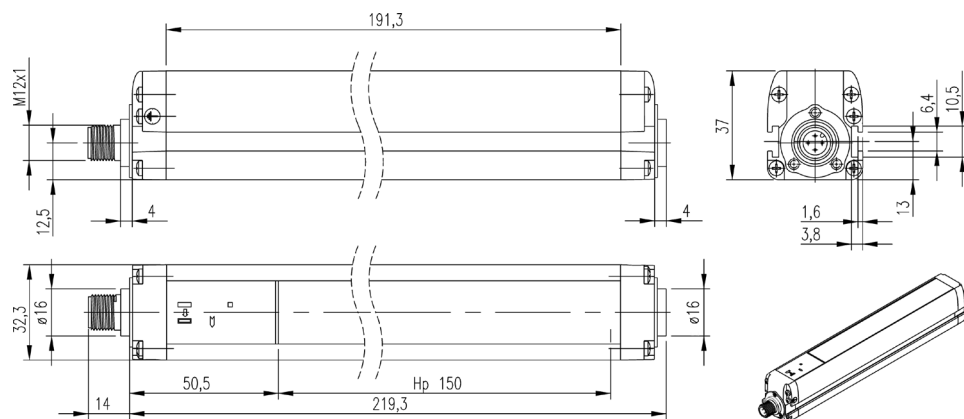


Figure 33: Installation dimensions BLG 4A-...-014/030-...

1 1 Technical Data

11.2 Installation dimensions
BLG 4A-...-
B.._...

Model	L_T	L_1	L_2
BLG 4A-050-50X-B02-O01-SX	617	664	538.4
BLG 4A-080-50X-B03-O01-SX	917	964	838.4
BLG 4A-090-50X-B04-O01-SX	1017	1064	938.4
BLG 4A-120-50X-B04-O01-SX	1317	1364	1238.4

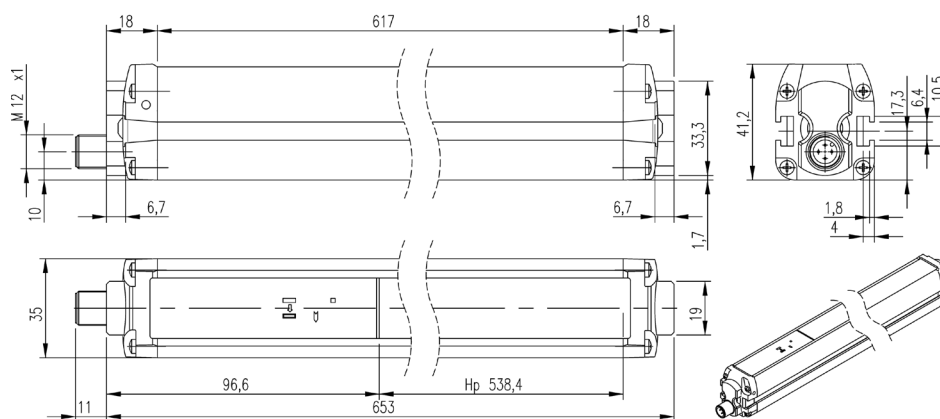


Figure 34: Installation dimensions BLG 4A-...-B-...

12 Accessories

12.1 Rotating mounting bracket for BLG 4A-...-014/030-...

Model	Description	Order code
BAM MB-LG-023-B13-3	Rotating mounting bracket (4-piece kit)	BAM02NC

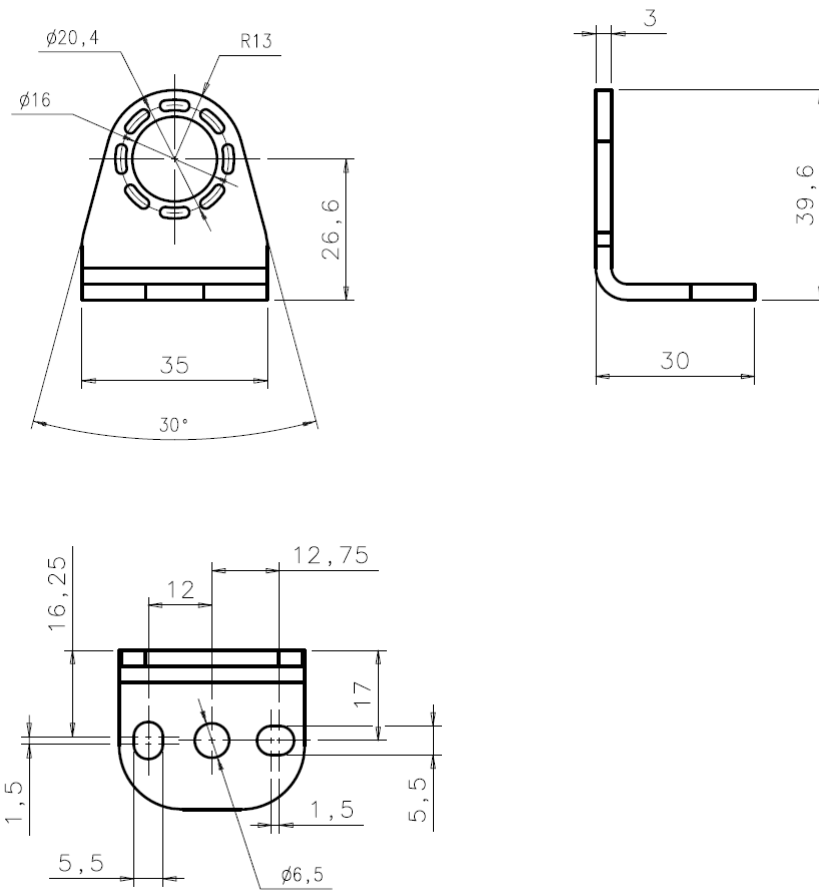


Figure 35: Rotating mounting bracket BAM MB-LG-023-B13-3

12 Accessories

12.2 Rotating mounting bracket for 4A-...-B...-...

Model	Description	Order code
BAM MC-LG-036-T01	Rotating mounting bracket (4-piece kit)	BAM02N2

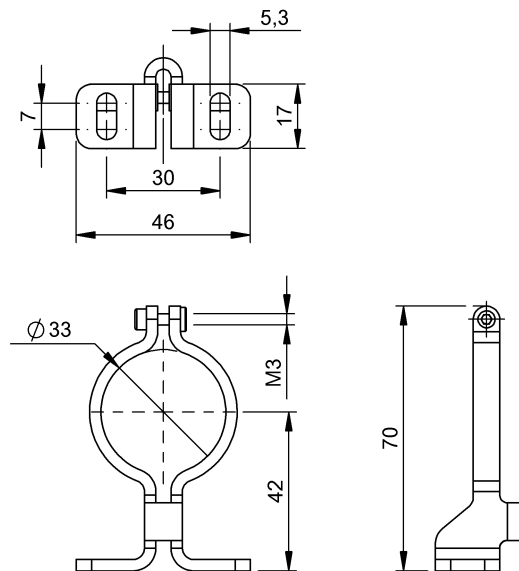


Figure 36: Rotating mounting bracket BAM MC-LG-036-T01

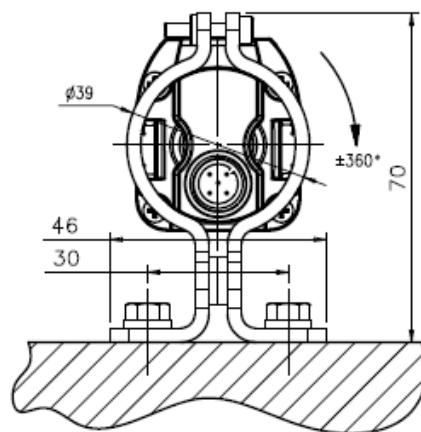


Figure 37: Installation of rotating mounting brackets

12 Accessories

12.3 Mounting bracket (optional)

Model	Description	Order code
BAM MC-LG-037-B07-3	Mounting bracket (4-piece kit)	BAM02MZ

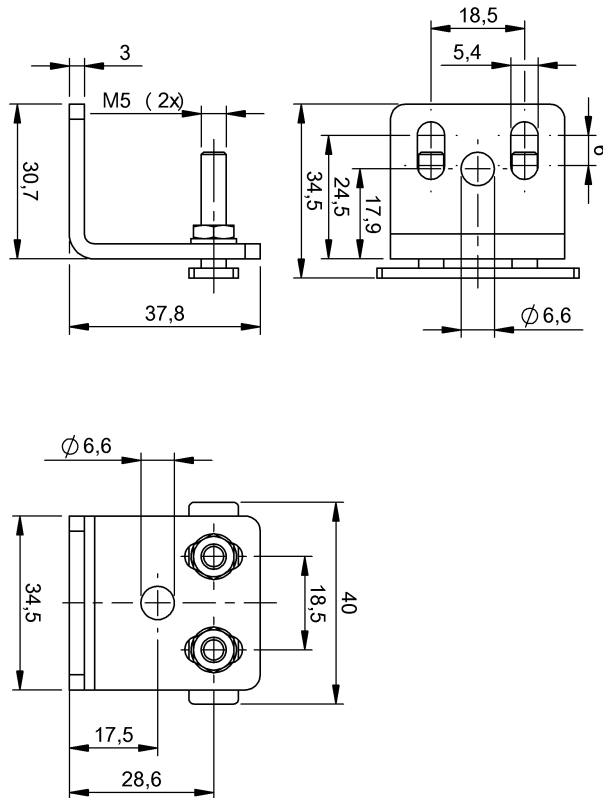


Figure 38: Mounting bracket dimensions

Mounting dimensions

Mounting A		Mounting B	
BLG 4A-...-014/030-...	BLG 4A-...-B...	BLG 4A-...-014/030-...	BLG 4A-...-B...

Figure 39: Mounting bracket mounting dimensions

12 Accessories

12.4 Adjustable holder (optional)

Model	Description	Order code
BAM MC-LG-038-B07-01-3	Adjustable holder (4-piece kit)	BAM02N0
BAM MC-LG-038-B07-02-3	Adjustable holder (6-piece kit)	BAM02N1

The mounting bracket (see 12.3) is not included in the scope of delivery. Please order separately.

Mounting dimensions

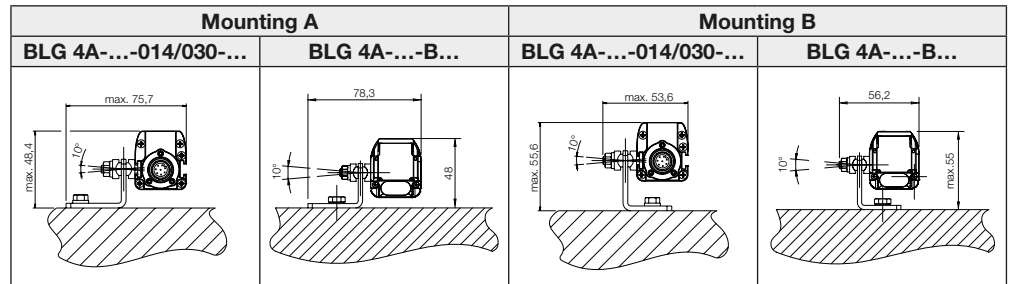


Figure 40: Mounting bracket + adjustable holder

12.5 Vibration damper

Model	Description	Order code
BAM IA-XA-017-01	Vibration damper (4-piece kit)	BAM02N6
BAM IA-XA-017-02	Vibration damper (6-piece kit)	BAM02N7

The mounting bracket (see 12.3) is not included in the scope of delivery. Please order separately.

Mounting dimensions

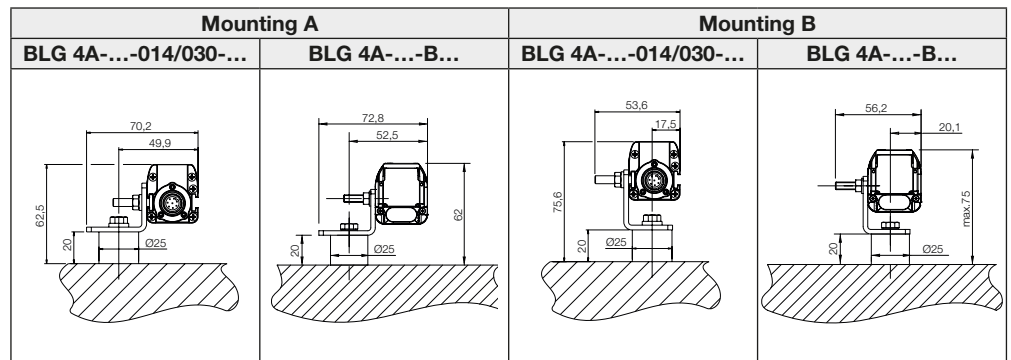


Figure 41: Mounting bracket with vibration damper holder

The mounting bracket (see 12.3) as well as the adjustable holders (see 12.4) are not included. Please order separately.

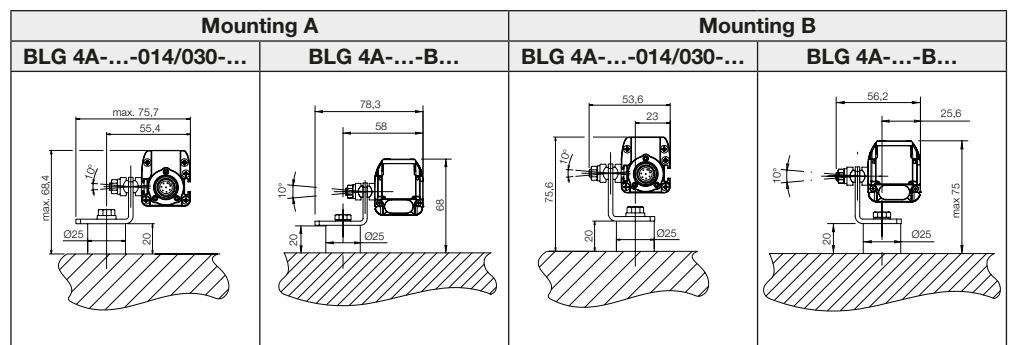


Figure 42: Mounting bracket + adjustable holder + vibration damper

12 Accessories

12.6 Deflecting mirror (optional)

Model	Description	L1 (mm)	L2 (mm)	L3 (mm)	Order code
BAM BD-LG-003-0600	Deflector mirror	545	376	580	BAM02NE
BAM BD-LG-003-0900		845	676	880	BAM02NF
BAM BD-LG-003-1200		1145	976	1180	BAM02NH
BAM BD-LG-003-1650		1595	1426	1630	BAM02NJ
BAM BD-LG-003-1900		1845	1676	1880	BAM02NK

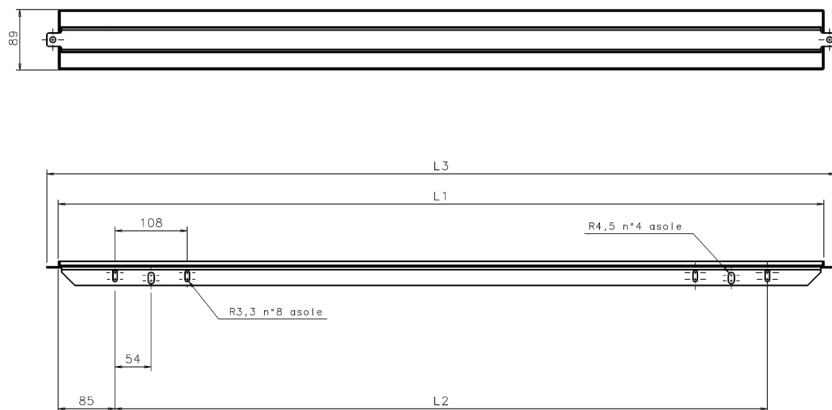


Figure 43: Deflector mirror dimensions

12.7 Floor stand

Model	Description	Length	Order code
BAM MB-LG-024-0600-1	Floor stand	600 mm	BAM02NL
BAM MB-LG-024-1000-1		900 mm	BAM02NM
BAM MB-LG-024-1200-1		1200 mm	BAM02NN
BAM MB-LG-024-1650-1		1650 mm	BAM02NP
BAM MB-LG-024-1900-1		1900 mm	BAM02NR

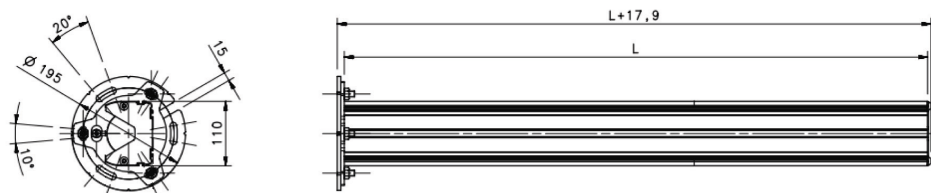


Figure 44: Protection housing dimensions

12.8 Test rod

Model	Description	Order code
BAM TO-LG-011-14	Test rod Ø 14 mm	BAM02P9
BAM TO-LG-011-30	Test rod Ø 30 mm	BAM02PA

12 Accessories

12.9 Connection cables

Connection cable (black), M12-female, 5-pin / M12-male 4-pin

Model	Female/male	Length	Order code
BCC M415-M414-3A-304-PX0434-006-C033	Straight/straight (yellow, A-coded)	0.6 m	BCC0H1C
BCC M415-M414-3A-304-PX0434-020-C033		2.0 m	BCC0H1E
BCC M415-M414-3A-304-PX0434-050-C033		5.0 m	BCC0H1F
BCC M415-M414-3A-304-PX0434-100-C033		10.0 m	BCC0H1H
BCC M415-M414-3A-304-PX0434-200-C033		20.0 m	BCC0H1J
BCC M415-M424-3A-304-PX0434-006-C033	Straight/right-angle (yellow, A-coded)	0.6 m	BCC0H1K
BCC M415-M424-3A-304-PX0434-020-C033		2.0 m	BCC0H1L
BCC M415-M424-3A-304-PX0434-050-C033		5.0 m	BCC0H1M
BCC M415-M424-3A-304-PX0434-100-C033		10.0 m	BCC0H1N
BCC M415-M424-3A-304-PX0434-200-C033		20.0 m	BCC0H1P

12.10 Laser pointer

Model	Description	Order code
BAE TO-LG-010-01	Laser pointer	BAE00WJ

The laser pointer facilitates mechanical alignment of the emitter/receiver and can be used with all light grids in the BLG 4A series. The special mounting system enables attachment to one of the two light curtain profile sides from above or from below, regardless of which mounting brackets are used (rotating or fixed).

The upper and side mounting clamps together with the two mounting buttons allow adjustment of the laser pointer lengthwise and crosswise. Regardless of the housing size the beam remains oriented exactly to the optical axis of the light curtain.

Scope of delivery

The following parts are included:

- 1 x laser pointer
- 1 x mounting plate
- 1 x holder for lengthwise mounting
- 1 x holder for crosswise mounting
- Quick start instructions
- 4 x knurled screws (DIN 464)

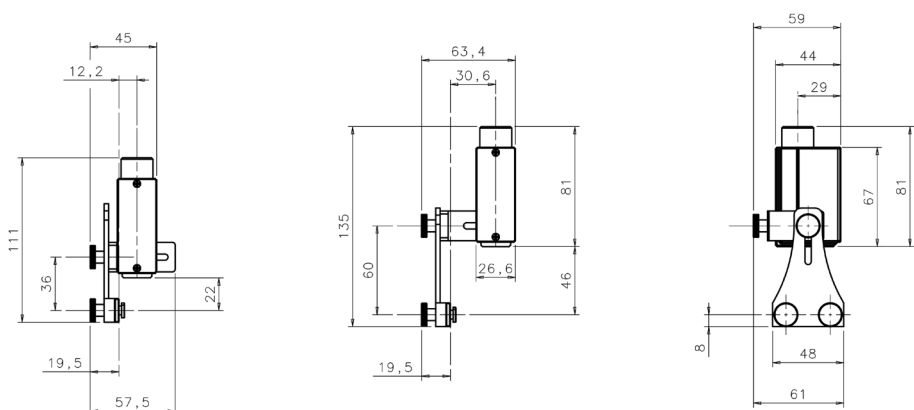


Figure 45: Laser pointer dimensions

12 Accessories

Battery replacement

The laser pointer is powered by two 1.5 V AAA batteries.

1. Use a Phillips head screwdriver to loosen the screws on the back side and remove the battery compartment cover.
2. Remove battery holder and replace batteries.
Observe polarity!
3. Insert battery holder, replace battery compartment cover and tighten screws hand-tight.



Recycling the batteries

Used batteries may not be disposed of with regular waste. You may return used batteries to the seller or to the proper recycling facilities at no cost. For additional information please consult your local authorities.

13 Glossary

Active opto-electronic protective device (AOPD)	Device whose detection function is accomplished through the use of opto-electronic emitter and receiver elements. The elements detect an interruption in the optical beams generated by the device by an opaque object present in the specified protection field. An active opto-electronic protective device can be used both as an emitter-receiver or as a retro-reflective device.
Response time	Maximum time between the occurrence of an event which results in triggering of the sensing device and reaching of the inactive state of the output signal switching device (OSSD).
Work place	Position at a machine where the material or semi-finished parts are processed. If one contact remains "hanged", no other relay contact is able to move. This function allows the control of the EDM status.
Resolution/ detection capability	See Detection capability
Output signal switching device (OSSD)	Part of the ESPE connected to machine control system. When the sensor is enabled during standard operating conditions, it switches to disabled status.
Electrosensitive protective equipment (ESPE)	Assembly of devices and/or components working together to activate the protective disabling function or to detect the presence of something. Includes at least: a sensor, command/control devices and output signal switching devices.
Receiver	Unit receiving infrared beams, consisting of a set of optically-synchronized phototransistors. The receiving unit, combined with the emitting unit (installed in the opposite position), generates an optical "curtain", i.e. the detecting area.
Final switching device (FSD)	Part of the control system involving machine safety conditions. It breaks the circuit to the machine primary control element (MPCE when the output signal switching device (OSSD) becomes inactive.
Detection capability (= Resolution)	Sensor function parameter limit as specified by the manufacturer, which activates the electro-sensitive protection equipment (ESPE). In case of an active optoelectronic protective device (AOPD), with resolution we mean the minimum dimension, which an opaque object must have in order to interrupt at least one of the beams that constitute the sensitive area.
Qualified operator	A person who holds a professional training certificate or having a wide knowledge and experience and who is acknowledged as qualified to install and/or use the product and to carry out periodical test procedures.
Crossing hazard	Situation under which an operator crossing the area controlled by the safety device and this latter stops and keeps the machine stopped until the hazard is eliminated, and then enters the dangerous area. Now the safety device could not be able to prevent or avoid an unexpected restart of the machine with the operator still present inside the dangerous area.
Dangerous area	Area representing an immediate or imminent physical hazard for the operator working inside it or who could get in contact with it.
Machine primary control element (MPCE)	Electrically-powered element having the direct control of machine regular operation so as to be the last element, in order of time, to operate when the machine has to be enabled or blocked. In this condition OSSD 1 and OSSD 2 of the light curtain switch the device OFF at the same time within the response time.
Machine operator	Qualified person allowed to use the machine.
Protective device	Device having the function to protect the operator against possible risks of injury due to contact with potentially dangerous machine parts.
Protection field	Area where a specified test object is detected by the ESPE.
Emitter	Infrared beams, consisting of a set of optically-synchronized LEDs. The emitting unit, combined with the receiving unit (installed in the opposite position), generates an optical "curtain", i.e. the detecting area.
Safety distance	Min. distance necessary to allow machine dangerous moving parts to completely stop before the operator can reach the nearest dangerous point. This distance shall be measured from the middle point of the detecting area to the nearest dangerous point. Factors affecting min. safety distance value are machine stop time, total safety system response time and light curtain resolution.

13 Glossary

Safety Light Curtain	An active optoelectronic protective device (AOPD) including an integrated system consisting of one or several emitting elements and one or several receiving elements forming a detection area with a detecting capacity specified by the supplier.
OFF status	Status when the output circuit is interrupted and does not allow current flow.
ON status	Status when the output circuit is operational and allows current flow.
Test rod	Opaque object having a suitable size and used to test safety light curtain correct operation.
Type (of ESPE)	The Electrosensitive Protective Equipment (ESPE) have different reactions in case of faults or under different environmental conditions. The classification and definition of the "type" (ex. type 2, type 4, according to IEC 61496-1) defines the minimum requirements needed for ESPE design, manufacturing and testing.
Monitored machine	Machine having the potentially-dangerous points protected by the light curtain or by another safety system.
Block condition (= BREAK)	Status of the light curtain taking place when a suitably-sized opaque object (see Detection capability) interrupts one or several light curtain beams. Under these conditions, OSSD1 and OSS2 light curtain outputs are simultaneously switched OFF within the device response time.

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Wir erklären, dass die folgenden Produkte
We declare that the following products

Produkt · <i>Product</i>	BLG 4A-...
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mit den Anforderungen der Europäischen Richtlinie
conform with the requirements of the European Directive

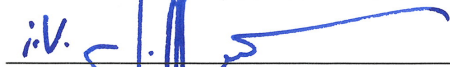
2006 / 42 / EC **Machinery Directive**
2004 / 108 / EG **EMV-Richtlinie / EMC-Directive**
2006 / 95 / EC **Low Voltage Directive**

und den harmonisierten Normen übereinstimmt
and the harmonized standards

EN 61496-1: 2013
IEC 61496-2: 2013
IEC 61508-1/2/3/4: 2010
EN 954-1: 1996
EN ISO 13849-1: 2008
EN 62061: 2005, A1: 2013
EN 50178: 1997
EN 61000-6-2: 2005
EN 55022 (Class A ITE): 2010

Die technische Dokumentation wird beim Hersteller archiviert.
The technical documentation is kept by the manufacturer.

Neuhausen a. d. F., den 08.12.2015



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