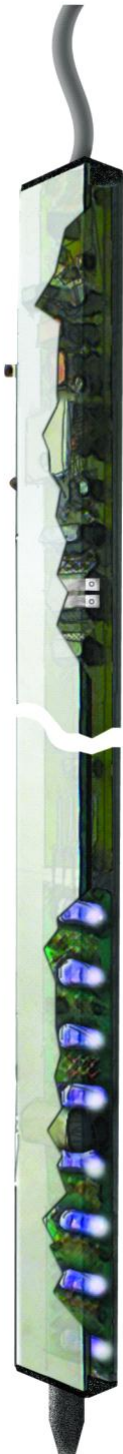# Light Curtain Type LA

Status: 2011-04-27

Subject to change without notice.
No responsibility is taken for the correctness of this information.

Your suggestions for corrections or improvements are welcome!

Features

- No separate control unit is needed. The device can be directly connected to 24 V DC.

- 2 short-circuit-proof PNP-outputs, NPN-outputs optionally

- Functions and parameters configurable via PC interface.

- Easy-Run:
  full configuration settings from factory.

- Automatic range setting during calibration cycle

- Diagonal beams analysis for enhanced monitoring resolution.

Table of content

The bars and mechanical design

A wide choice of beam spacing and attachment options (mechanical) is available.
Please refer to separate light curtain bar information sheet:

Information sheet:
light curtain bars

connector cable
or connector

compact profile

tenon for
mechanical model "A"

LED 1   LED 2

monitoring area

first beam   last beam
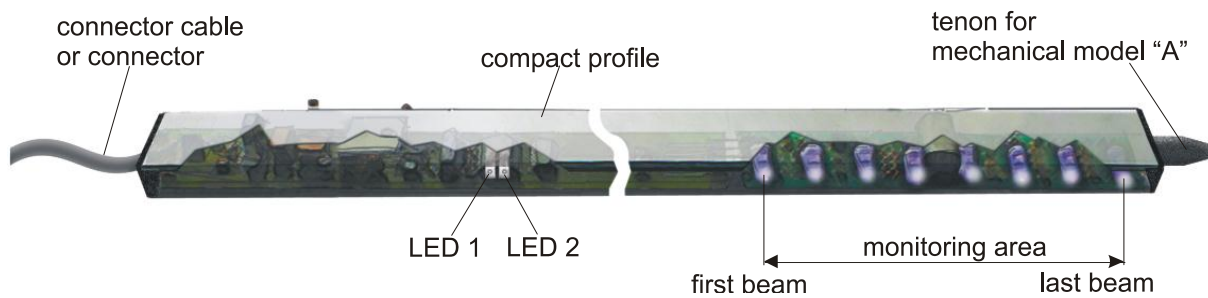
Functions

Signal output

You can configure the light curtain to be light or dark switching via the **output function** parameter.

	light	**dark**
Free beams	active	inactive
interrupted beams	inactive	active

Switching Threshold

During the calibration sequence the signal intensity of each (parallel) beam is measured and permanently stored. By multiplying with the relative switching threshold (percentage of the relative threshold) the absolute threshold for each beam is determined.
In order to have the system react to small signal reductions a higher switching threshold has to be adjusted. The threshold shall not exceed 179 (equivalent to ~70%).

Usage
- Automatic threshold detection   => RelThreshold = 0
- Detection of transparent objects   => high threshold
- Reduced beam deflection influence   => high threshold

Output assignment

The light curtain has two outputs (wires black and yellow).
The Output functions can be set via the parameter **Output assignment**.

Output assignment „normal"

Output	Wire	Function	Description
Out 1	Yellow	Signal out	light or dark switching
Out 2	Black	Warning out	Active during disruption
Exception –> Start second range ≠ „0"			
Out 1	Yellow	Area 1	light or dark switching
Out 2	Black	Area 2	light or dark switching

Output assignment „inverted"
Functions like „normal" but with switched outputs

Output	Wire	Function	Description
Out 1	Yellow	Warning out	Active during disruption
Out 2	Black	Signal out	light or dark switching
Exception –> Start second range ≠ „0"			

Out 1	Yellow	Area 2	light or dark switching
Out 2	Black	Area 1	light or dark switching

Output assignment „inverted without warning"

Out 1 is without function.
Out 2 is used as Signal out on black wire

Output	Wire	Function	Description
Out 1	Yellow	-	No function
Out 2	Black	Signal out	light or dark switching
Exception –> Start second range ≠ „0"			
Out 1	Yellow	-	No function
Out 2	Black	Area 1	light or dark switching

Output assignment „antivalent "

Out 1 is as Signal out on yellow wire
Out 2 is active when Out 1 is inactive.

OutDelay

This configuration value delays the status change of switching outputs by the set value in milliseconds (ms). Maximum delay value is 255 ms.

Beam variations

Parameter	*Diagonal* = 0	*Diagonal* = 1	*Diagonal* = 4
Description	diagonal beams off	diagonal beams on	Multiple beam crossings
Number of beams	n	2n-1	5n-6
Max beam number (n)	128	64	26
Drawing			

Recommendations:
- o After changing this parameter run a calibration cycle.
- o The cycle time increases with the number of beams.
- o A total of 128 logical beams is supported.

Contamination alarm

If the beam brightness remains under a certain threshold (**weak signal threshold**) for a specific duration (**weak signal delay**), the light curtain signals a "simple error". Remedy:

- Clean the beam output.
  Attention: do not damage the front foil. Do not use caustic cleaning agents.
- Align the bars and recalibrate.

Recommendations:
Set the **weak signal threshold** parameter to "0" in order to switch off the contamination alarm.

TopBlankable

When turning on the device interrupted beams and the bar ends can be blanked out permanently.. **TopBlankable** defines, how many consecutive beams are blanked out.
This function was specifically implemented for elevator systems.

Beam Blanking

Permanently interrupted beams can be blanked automatically. Which identical beams can be blanked is adjusted with the **Max.autoblanked** parameter.

Max.autoblanked	Automatic Blanking
0	None
1	each 2. identical beam
2	each 3. identical beam
...	...

Defective beams are not considered in the analysis. The parameter **Maxdefect** defines the number of ignored beams. A serious error is signaled should the number of defective beams exceed the value of **Maxdefect.**

Blanked out beams are not added to Maxdefect.

Recommendations:
- o Use the section Beam Configuration on the right side of the DUO-Konf-application window in order to manually blank out beams. Select there which receiver element shall be blanked out.
- o The Syncbeam must always stay active!

Syncbeam – Synchronisation beam

The **Syncbeam** parameter defines whether the first (near the connectivity point) or the last beam is used for the optical synchronisation.

Recommendations:
- o Transmitter and receiver have to be set to the same value.
- o The Syncbeam cannot be blanked.
- o Interruption of the Syncbeam is signal on both sections.

Areas

Parameter **Start second area** separates the light curtain into two areas.
The status of the areas is signaled at outputs OUT 1 and OUT 2.

Recommendations:
- o Switching ranges for **Diagonal** ≠ 0 (=> diagonal beams on) overlap.
- o Interruption of the Syncbeam is signaled in both areas.
- o Areas can be configured to be light or dark switching.

NOFDARK

Defines the threshold after which number of interrupted beams the outputs are switched (separately for both areas).

Example: NofDark1 = '5'
=> Output of areas 1 switches after 5 interrupted beams in section 1.

Special: „Start second area"= '1'
Both NofDark-values relate to the entire monitoring range.
After reaching the corresponding number id interrupts the corresponding output is switched.

Configuration values

	Standard value	Description
First Beam	1	value always equals 1
Last Beam[1]	xx	value is system dependent
Output function	→	Light switching Dark switching
Output assignment	→	normal inverted inverted without warning antivalent
Diagonal	→	0 = diagonal beams off 1 = diagonal beams on 2...4 = multiple beam crossings
Relative Threshold	84	84 equals 33% (256 equals 100%) 0 = automatic theshold adjustment activ.
Maxdefect	1	Max. number of allowed defective beams
Delay for Autoblanking	60	Time in seconds until a beam interruption can be blanked
Max. Autoblanked	0	Number of consecutive identical beams available for blanking
Start for second area	0	Beam number defining the start oft he second section. Only recommended for „Diagonal = 0"!
Syncbeam	→	first = synchronisation via first beam last = synchronisation via last beam
NofDark1	1	Minimum number of interrupted beams defining an interruption. (Area 1)
NofDark2	1	Minimum number of interrupted beams defining an interruption. (Area 2)
OutDelay	0	Duration in ms between output state changes. (range: 0 – 255 ms)
TopBlankable	0	number (1,2 or 3) of beams that can be blanked consecutively during power-up.
Weak signal threshold	147	Threshold for contamination warning. equals 57% (Wert x 256)
Weak signal delay	60	Time in seconds after which a contamination is signaled
AutoCalDelay		

Recommendation
- Configuration value „Syncbeam" must be identical for Transmitter and Reciever for the light curtain to work properly.

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[1] Only the value of physically present beams can be adjusted. A incorrect value can result in improper functionality.

Calibration Sequence

1. Place yellow wire on +24 V DC during activation.
   => self-calibration (other flashing signals as those in normal mode).

2. Both LED of the receiver bar illuminate steady
   => self-calibration is completed without an error.

3. Remove yellow wire as long as LA is still switched on
   => saves sensitivity data.

Example for implementation with standard connectivity (plus switching):

1. Insert a bridge between connection points of yellow wire and brown wire (plus).

2. Ensure that the entire monitoring range is uninterrupted.

3. Turn on supply voltages.

4. Remove bridge.

Recommendations:
The calibration is important for proper functionality of the light curtain.
Rerun the calibration after each change on the light curtain.

For an error-free calibration the monitoring range must be free of obstacles and both LEDs on the receiver must light up.

Flashing codes during the calibration cycle

One LED flashes	Defective beams
LEDs flash in-phase	Differences too big or not yet calibrated. Verify alignment of bars as well as monitoring range.
LEDs flash out-phase	Error during Selftest

LED Indicators / Error Diagnosis

When the light curtain detects a failure, the warning output is enabled and the LED displays one of the following error codes. As soon as the failure is resolved, the output becomes inactive again.

Receiver bar

LED1	LED2	Operating mode	Monitoring area
off	off	off	unknown
on	on	operational	free
on	off	operational	beam interrupted
flashing	on	simple error	free
flashing	off	simple error	beam interrupted
Double flashing	Off	Configuration error	unknown
flashing	flashing (in phase)	fatal error A	unknown
flashing	flashing (out of phase)	fatal error B	unknown

Simple error:
Light curtain continues to run with constriction, for example, beam blanked or contamination alarm.

Fatal error:
Light curtain no longer operational.

Transmitter bar

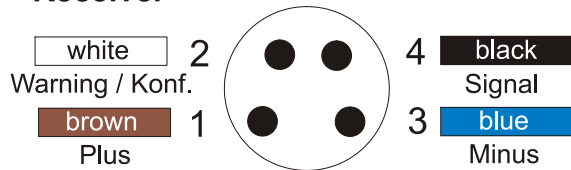| LED	Operating mode
off	off
on	operational
flashing	error

Interfaces / Outputs

Transmitter
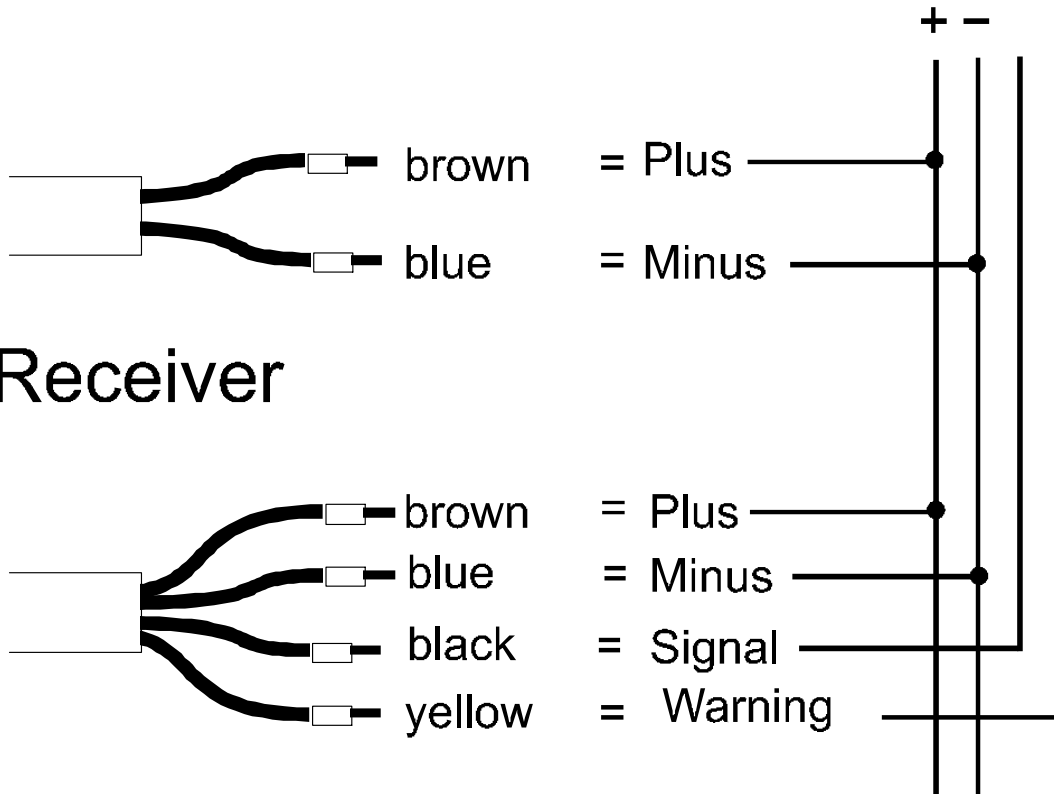
Receiver

M8 connector

View towards connector pins
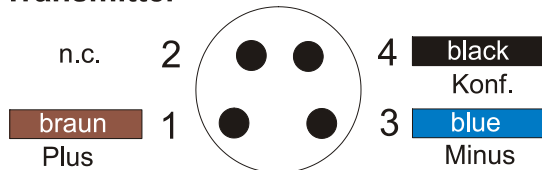
## Installation / Initial Operation

- Pay attention to the installation rules (see mounting instructions for light curtain bar pairs).
- Avoid optical sensors from mutually affecting each other, even through reflection, because this can lead to malfunction.
- Maximal 1.5 secounds after power up the light curtain is operating.
- Insulate unused wires.
- Disconnect the connections during insulation measurements.
- Execute a calibration cycle.

Conformity

The light curtain version LA is C€ compliant and meets all the requirements of the following standards:
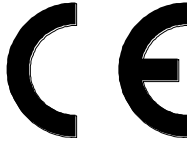
- EN 61000-6-3:2001.

- EN 61000-6-1:2001.

The light curtains are not certified safety lights curtains compliant with EN 61496. They are not safety components in the context of EU Machine Guideline 89/392/EEC with 93/44/EMW addition, Appendix 4.
Therefore, they must not be used so as not to endanger individuals.

Technical Data

Light curtain housing	Naturally anodised aluminium, plastic front panel, dark red (Do not use any cleaning agents containing solvents!)
Connection	Securely attached lines 4 m long, precut with wire end ferrules
Transmitter	2-core round cable, $\varnothing$ about 4,9 mm (PVC)
Receiver	4-core round cable, $\varnothing$ about 4,9 mm (PVC)
Operating voltage	24 V DC (-15%..+20%) with max. ripple 5%, protected against polarity reversal, use polarised earthed power supply!
Power consumption	approx. 8 W (total)
Outputs	Short-circuit-proof semiconductor outputs PNP (or NPN) switched current max. 200 mA
Operating temperature	-10°C to 45 °C
Range[2]	~ 0.7 ... 4 m (calibration necessary) default setting: 4m
Reduced range	~ 0.2 … 1 m (calibration necessary)
Response time	1 ms cycle time per beam plus base time (~4 ms)
Maximum number of beams	128 logical beams

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[2] With standard profile. Range with other profile types see techn. Information light grid bar pairs.
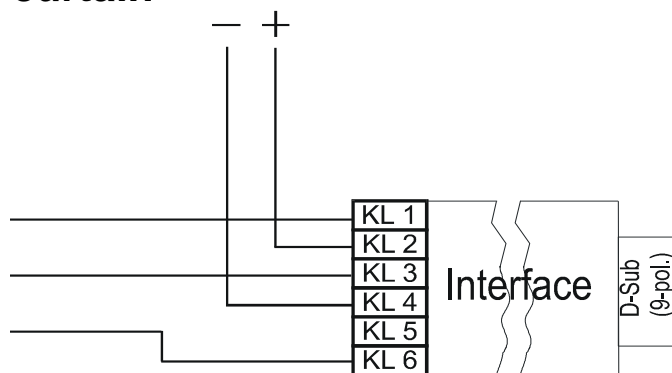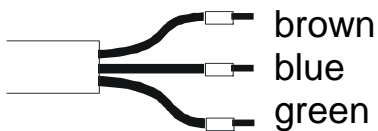
PC-Interface

The PC Interface connects to the serial port of a PC.
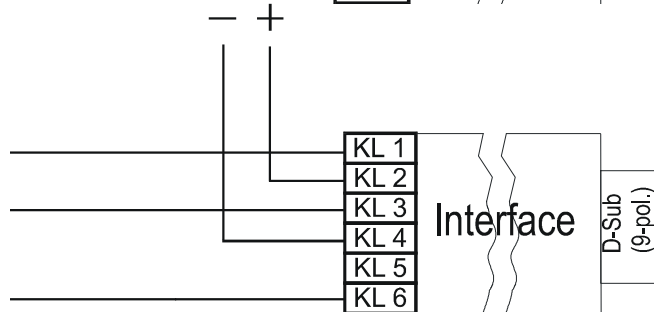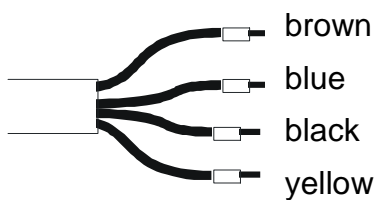Use the Software DUO-Konf for configuration of a light curtain pair.
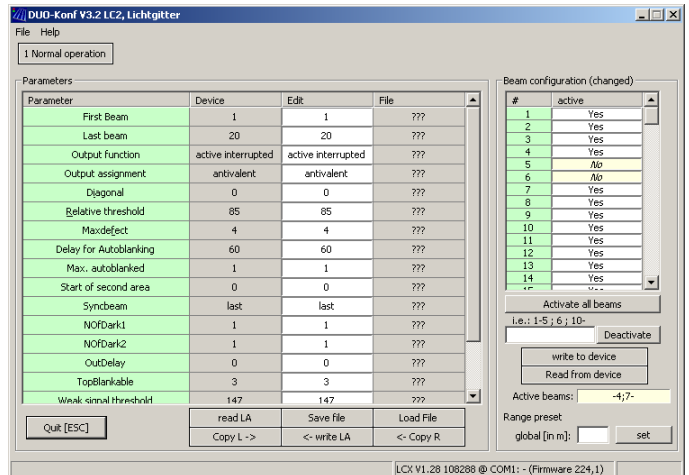
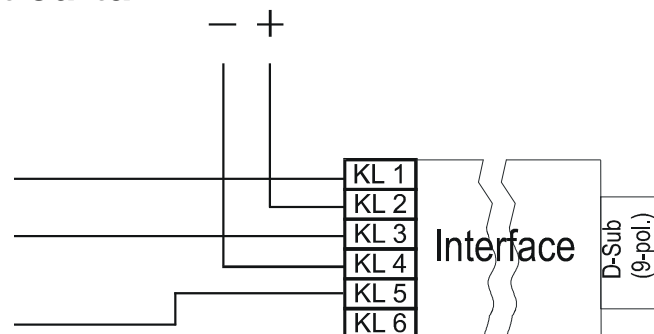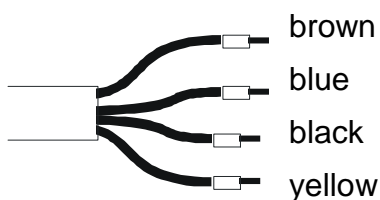

Plus switching light curtain

Transmitter

brown
blue
green

Receiver

brown
blue
black
yellow

Minus switching light curtain

Receiver

brown
blue
black
yellow

Ordering Key and Example

Key:

Light curtain bar pair Consisting of receiver and transmitter bar			
Type	**Beam Number / Beam Separation**	**Mechanical**	**Options**
„LA"	Choose from beam seperation between 5mm and 112 mm.	Choose from 4 shapes and 8 mounting options	• Color • Cable length • Connectivity option • Front cover • ….

For details regarding the specific ordering codes refer to detailed light curtain bar document.

Example

LA16/112-2000A	Light curtain bar pair with integrated controler unit • (24 Vdc, PNP) • 16 beams • Beam spacing of approx. 112 mm • Bar length 2000 mm, bar cross-section 12x24 mm, Aluminium naturally anodized • 4 bolts on top, cone on the bottom • Protection class IP54 Parameterisation: standard*)
LA24/12,5-510I	Light curtain bar pair with integrated controler unit • (24 Vdc, PNP) • 24 beams • Beam spacing of approx. 12,5 mm • Bar length 510 mm, bar cross-section 12x24 mm, Aluminium naturally anodized • 2 M4x10 threaded stud bolts spaced 400 mm apart • Protection class IP54 Parameterisation: • dark • diagonal beams

*) Default values can be found in the configuration table. Please mention different parameterisations in your purchase order.

Accessories

LCPower/2
FP-110-00001

Power Supply(24Vdc) for types LC/LA/LT
- 230/110 Vac
- plastic housing
- Protection class IP65
- Relais

LCPower/2-SR
FP-110-00002

Power Supply(24Vdc) for types LC/LA/LT
- 2xRelaisoutput
- connections via PG 9
- internal connection via terminal block
- plastic housing
- buzzer

Programming-
interface LA
FP-20-13538

Programming interface for plus- and minus switching systems
Including connection wires
DUO_Konf-Software for Download:
http://www.duometric.com/Dokus/LA/