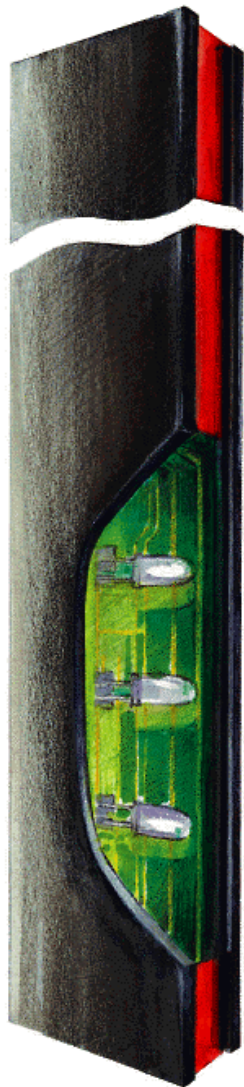


# Light Grid Profiles



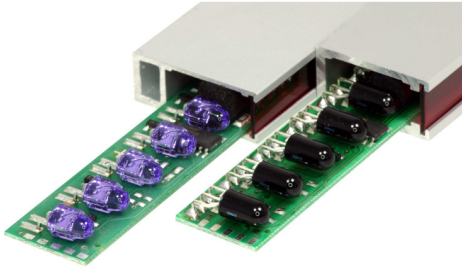
Take 4 easy steps to get to your light grid:

1. Select a beam spacing between 5 and 112 mm. (→ page 2)
2. Determine the beam count based on the required monitoring height. (→ page 2)
3. Choose the light grid type. (→ page 6)
4. Select the profile type according to your mounting requirements, (→ page 7)

Starting on page 2, you will also find interesting options and suggestions for installation as well as usage of our lights grids.

## Step 1 of 4 Select the beam spacing (a)

The beam spacing defines the distance between the centres of two adjoining light beams. This distance defines the resolution of your light grid (i.e. the minimal size of to-be-detected objects) and the measurement accuracy.



Beam spacings	Module-type
5 mm	5
10 mm	10
12,5 mm	12,5
25 mm	25
27,94 mm	28
50 mm	50
55,88 mm	56
94 mm	94
100 mm	100
111,76 mm	112

## Step 2 of 4 Determine the beam count

Based on the selected beam spacing and the monitoring height, you determine the total beam count for your light grid.

### Example:

- 1.) Select desired beam spacing (in this example 25 mm)
- 2.) Find required monitoring height in selected column (in this example 1375 mm)
- 3.) Determine the corresponding beam count (in this example 56 beams)

Technische Information

Lichtgitterleistenpaare

Strahlanzahl (n)	Strahlabstand (a)									
	5	10	12,5	25	27,94	50	55,88	94	100	111,76
46						2250	2515	4230	4500	5029
47				1150	1285	2300	2570	4324	4600	5141
48	235	470	588	1175	1313	2350	2626	4418	4700	5253
50						2450	2738	4606	4900	5476
51						2500	2794	4700	5000	5588
52						2550	2850	4794	5100	5700
53						2600	2906	4888	5200	5812
54						2650	2962	4982	5300	
55						2700	3018	5076	5400	
56	275	550	688	1350	1509	2700	3018	5076	5400	
58						2850	3185	5358	5700	
59						2900	3241	5452	5800	
60					1475	2950	3297	5546		
61						3000	3353	5640		
62						3050	3409	5734		

## Selection table

Monitoring height (MH): Distance from first to last beam (rounded).

a = beam spacing; n = beam count

$$MH = a * (n - 1)$$

Preference types in bold, greys only on request.

Beam count (n)	Beam spacing (a)									
	5	10	12,5	25	27,94	50	55,88	94	100	111,76
4				75		150	168	282	300	<b>335</b>
5				100		200	224	376	400	447
6				125		250	279	470	500	559
7				150	168	300	335	564	600	671
8	35	70	88	175	196	350	391	658	700	782
9				200				752	800	894
10				225		450	503	846	900	1006
11				250		500	559	940	1000	1118
12				275		550	615	1034	1100	1229
13				300		600	671	1128	1200	1341
14				325		650	726	1222	1300	1453
15				350	391	700	782	1316	1400	1565
16	75	150	188	375	419	750	838	1410	1500	1676
17				400				1504	1600	1788
18				425		850	950	1598	1700	1900
19				450		900	1006	1692	1800	2012
20				475		950	1062	1786	1900	2123
21				500		1000	1118	1880	2000	2235
22				525		1050	1173	1974	2100	2347
23				550	615	1100	1229	2068	2200	2459
24	115	230	288	575	643	1150	1285	2162	2300	2570
25				600				2256	2400	2682
26				625		1250	1397	2350	2500	2794
27				650		1300	1453	2444	2600	2906
28				675		1350	1509	2538	2700	3018
29				700		1400	1565	2632	2800	3129
30				725		1450	1621	2726	2900	3241
31				750	838	1500	1676	2820	3000	3353
32	155	310	388	775	866	1550	1732	2914	3100	3465
33				800				3008	3200	3576
34				825		1650	1844	3102	3300	3688
35				850		1700	1900	3196	3400	3800
36				875		1750	1956	3290	3500	3912
37				900		1800	2012	3384	3600	4023
38				925		1850	2068	3478	3700	4135
39				950	1062	1900	2123	3572	3800	4247
40	195	390	488	975	1090	1950	2179	3666	3900	4359
41				1000				3760	4000	4470
42				1025		2050	2291	3854	4100	4582
43				1050		2100	2347	3948	4200	4694
44				1075		2150	2403	4042	4300	4806
45				1100		2200	2459	4136	4400	4917
46				1125		2250	2515	4230	4500	5029
47				1150	1285	2300	2570	4324	4600	5141
48	235	470	588	1175	1313	2350	2626	4418	4700	5253
49				1200				4512	4800	5364
50				1225		2450	2738	4606	4900	5476

Beam count (n)	Beam spacing (a)									
	5	10	12,5	25	27,94	50	55,88	94	100	111,76
51				1250		2500	2794	4700	5000	5588
52				1275		2550	2850	4794	5100	5700
53				1300		2600	2906	4888	5200	5812
54				1325		2650	2962	4982	5300	
55				1350	1509	2700	3018	5076	5400	
56	275	550	688	1375	1537	2750	3073	5170	5500	
57				1400				5264	5600	
58				1425		2850	3185	5358	5700	
59				1450		2900	3241	5452	5800	
60				1475		2950	3297	5546		
61				1500		3000	3353	5640		
62				1525		3050	3409	5734		
63				1550	1732	3100	3465			
64	315	630	788	1575	1760	3150	3520			
65				1600						
66				1625		3250	3632			
67				1650		3300	3688			
68				1675		3350	3744			
69				1700		3400	3800			
70				1725		3450	3856			
71				1750	1956	3500	3912			
72	355	710	888	1775	1984	3550	3967			
73				1800						
74				1825		3650	4079			
75				1850		3700	4135			
76				1875		3750	4191			
77				1900		3800	4247			
78				1925		3850	4303			
79				1950	2179	3900	4359			
80	395	790	988	1975	2207	3950	4415			
81				2000						
82				2025		4050	4526			
83				2050		4100	4582			
84				2075		4150	4638			
85				2100		4200	4694			
86				2125		4250	4750			
87				2150	2403	4300	4806			
88	435	870	1088	2175	2431	4350	4862			
89				2200						
90				2225		4450	4973			
91				2250		4500	5029			
92				2275		4550	5085			
93				2300		4600	5141			
94				2325		4650	5197			
95				2350	2626	4700	5253			
96	475	950	1188	2375	2654	4750	5309			
97				2400						
98				2425		4850	5420			
99				2450		4900	5476			
100				2475		4950	5532			

Beam count (n)	Beam spacing (a)						
	5	10	12,5	25	27,94	50	55,88
101				2500		5000	5588
102				2525		5050	5644
103				2550	2850	5100	5700
104	515	1030	1288	2575	2878	5150	5756
105				2600			
106				2625		5250	
107				2650		5300	
108				2675		5350	
109				2700		5400	
110				2725		5450	
111				2750	3073	5500	
112	555	1110	1388	2775	3101	5550	
119				2950	3297		
120	595	1190	1488	2975	3325		
127				3150	3520		
128	635	1270	1588	3175	3548		
135				3350	3744		
136	675	1350	1688	3375	3772		
143				3550	3967		
144	715	1430	1788	3575	3995		
151				3750	4191		
152	755	1510	1888	3775	4219		
159				3950	4415		
160	795	1590	1988	3975	4442		
167				4150	4638		
168	835	1670	2088	4175	4666		
175				4350	4862		
176	875	1750	2188	4375	4890		
183				4550	5085		
184	915	1830	2288	4575	5113		
191				4750	5309		
192	955	1910	2388	4775	5337		
199				4950	5532		
200	995	1990	2488	4975	5560		
207				5150	5756		
208	1035	2070	2588	5175	5784		
215				5350			
216	1075	2150	2688	5375			
223				5550			
224	1115	2230	2788	5575			
231				5750			
232	1155	2310	2888	5775			
240	1195	2390	2988				
248	1235	2470	3088				
256	1275	2550					
264	1315	2630					
272	1355	2710					
280	1395	2790					
288	1435	2870					
296	1475	2950					

## Step 3 of 4 Select a light grid type



With the previously determined beam count choose a light grid type according to your requirements.

### Summary

Type	Controller <sup>1</sup>	max. beam count	Cycle time	Description
<b>Switching</b>				
LA	integrated	160	1 ms/beam + 4 ms	Cost effective system for modest requirements; switching output, parameterisable, optical synchronisation, 24 VDC
LI	external LVB	500	from 70 µs/beam	two redundant safety relays; 230 Vac und 24 VDC
<b>Measuring</b>				
LI	external LVX, LVE	600	from 50 µs/beam	The standard unit for most measuring requirements! Fast data analysis. Variety of standardized interfaces for straightforward implementation.
LF	external FAW	256	from 6 µs/beam	Ultra-fast analysis for demanding applications.

### Standard connectivity

The connection to the controller is made via a permanently installed cable (4m). For pin assignments please refer to the technical documentation of the individual controller units.

Type	Picture	Comment
LA		Ferrules
LI, LF		connector type Phoenix Contact CombiCon, non-interchangeable coded

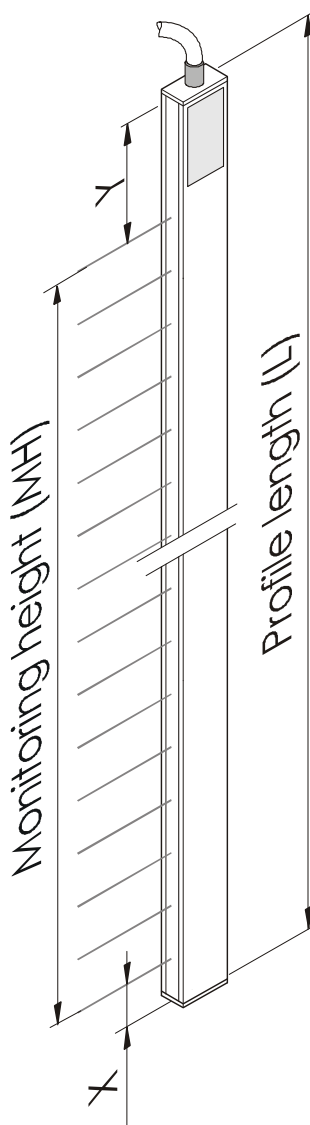
<sup>1</sup> See also product descriptions for controller units!

## Step 4 of 4 Choose profile and Mounting option

Using beam spacing and monitoring height derived in steps 1 & 2 you now can define the mechanical built of the light grid profiles.

### Profile length

Calculate the total profile length (L) by using the selected beam count (n), beam spacing (a) together with profile excesses X and Y:



$$L = MH + X + Y \text{ (rounded to the next 10 mm)}$$

$$\text{with } MH = a * (n - 1)$$

Determine profile excess from the following tables:

#### Profile excess Y

	5	10...12,5	25...28	50...56	94...112
Type LI, LF					
<b>Y</b>	17,5	38,5	45,0	70,0	130,0
Type LA (with integrated controller):					
<b>Y</b>	67,5	153,5	160,0	185,0	245,0
Type LA with relay:					
<b>Y</b>	87,5	173,5	180,0	205,0	265,0

#### Profile excess X

	5	10...12,5	25...112
<b>X</b>	17,5	13,5	20,00

Example: LI32/56, profile type I  
beam count = 32, module-type = 56

- ⇒ (from tables above) Y = 70 mm, X = 20 mm
- ⇒ (from step1) beam spacing = 55,88 mm
- ⇒ MH = 55,88 mm x (32 - 1) = 1732 mm
- ⇒ L=round(MH + X + Y) = round(1822) mm
- ⇒ L = 1830

Tolerances of beam position: ± 2 mm; all units in mm.  
Longer profiles are available at extra charge.

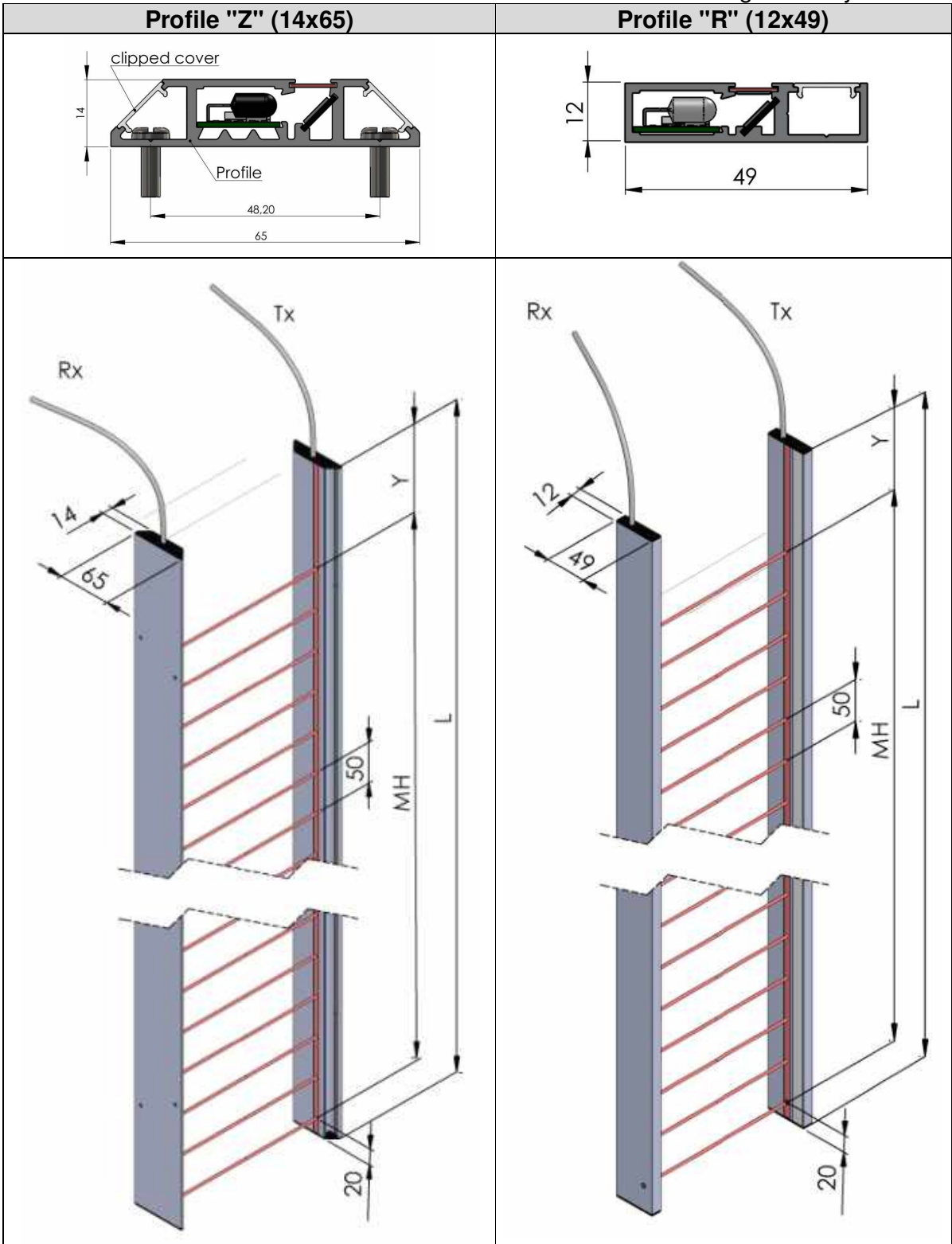
## Overview Profile Types

Acronym		Cross section in mm	max. Profile length	Description
I		12x24	6 m	M4 studs spaced out over the whole profile length. Standard configuration in the industrial environment.
Q		10x27	4 m	Cross-hole for flat assembly
T		12x58	3 m	For 5mm beam spacing only; Cross-hole for flat assembly, M4 thread at ends
Z		14x65	3 m	Vertical beam exit; no mounting holes, drill groove in mounting chamber
R		12x49	3 m	Vertical beam exit; rectangular cross section; no mounting holes, drill groove in mounting chamber
A		12x24	2,5 m	Bottom: tenon Top: M4 studs  Standard configuration for elevators!

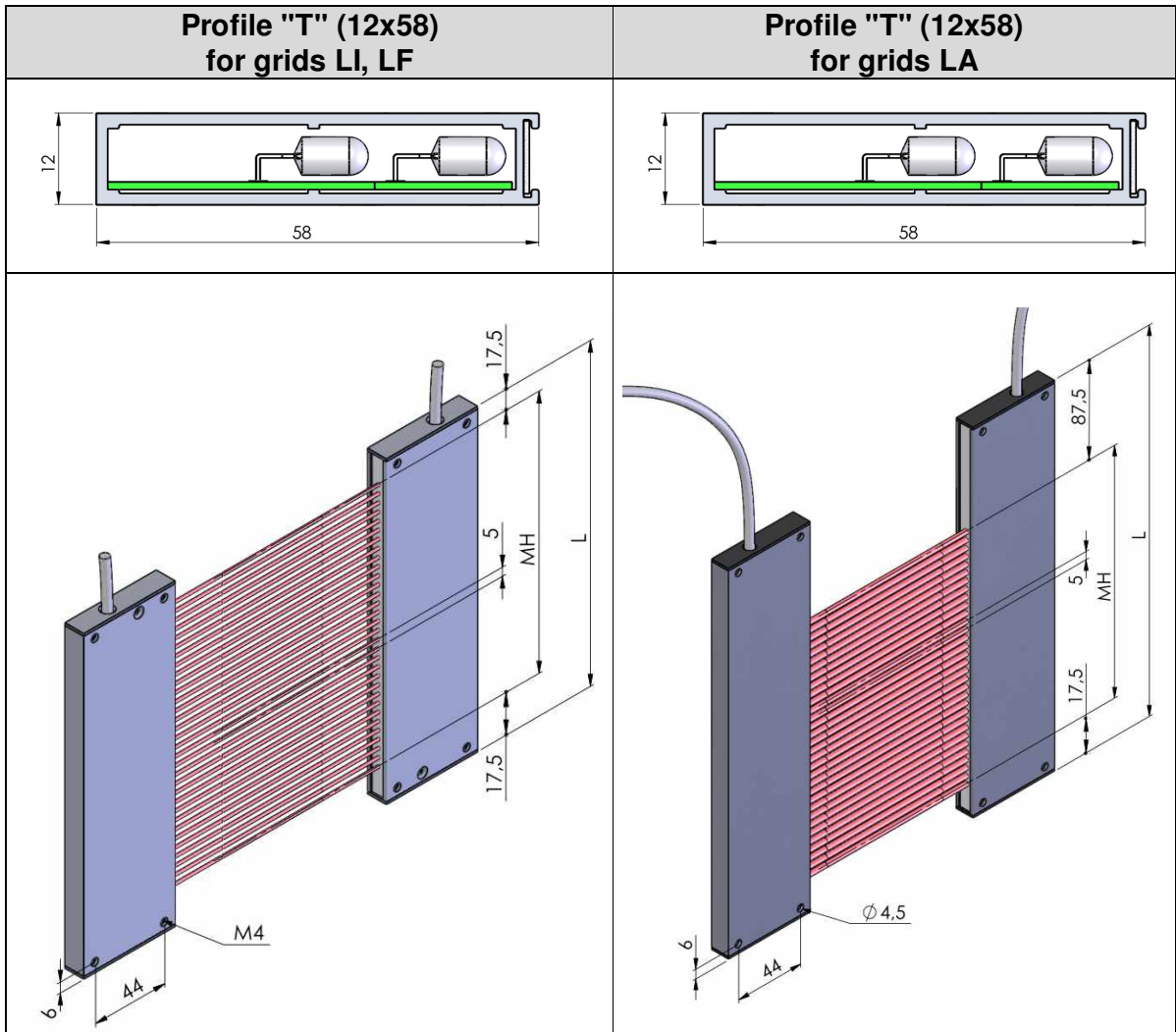


## Profile Drawings

Profile "I" (12x24)	Profile "Q" (10x27)
<p>backside threaded bolt M4x10</p>	<p>Mounting hole Ø4.5 mm</p>



for 5 mm beam spacing

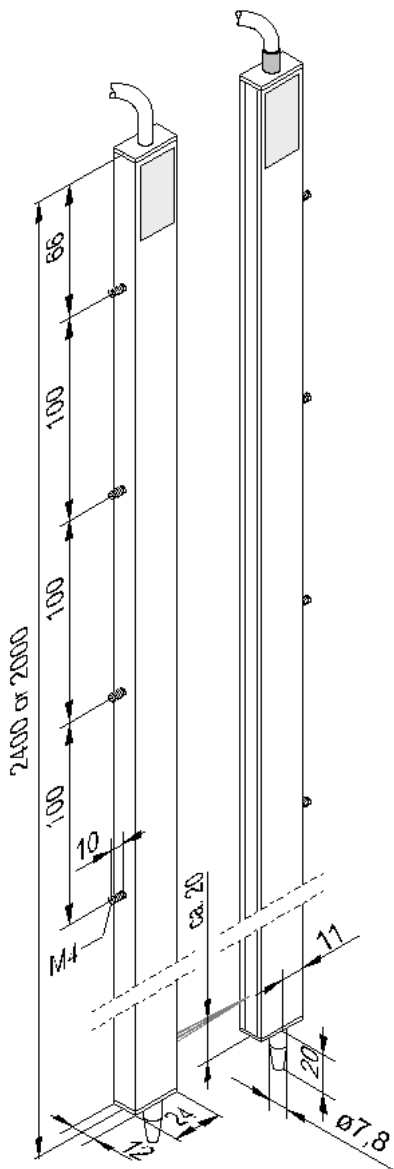


## Type A profiles for Elevators

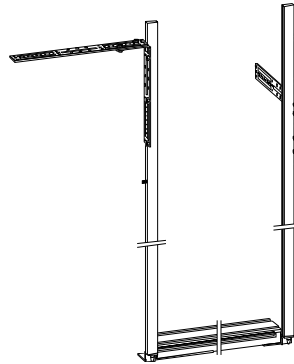
The proven mounting method in elevators: allows for quick and easy fitting in elevators door frames, door sills and imposts.

Characteristics:

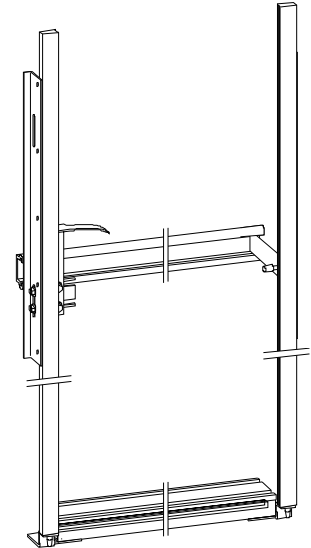
- 4xM4-threaded bolt above
- Tenon at bottom
- Preferred length: 2000 or 2400 mm  
Minimum length (see page 3):  $L=AH+X+Y$ ;  
Max length: 2500 mm



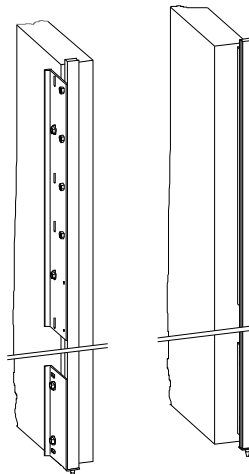
### Installation Kit Kombi:



### Installation Kit Sematic



### Installation Kit Meiller

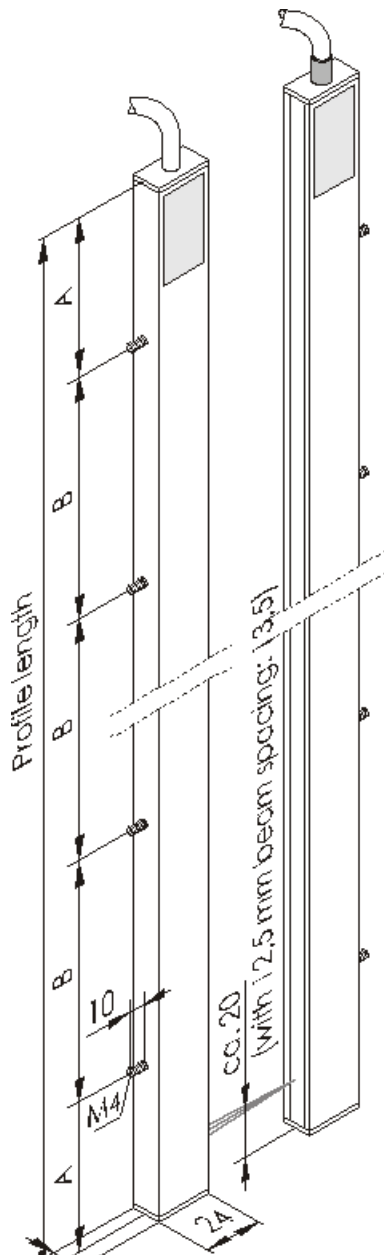


## Distances and numbers of mounting elements

Profile	Mounting element	Cross section
I	M4x10 threaded bolt	12x24
Q	Cross-hole	10x27

Options:

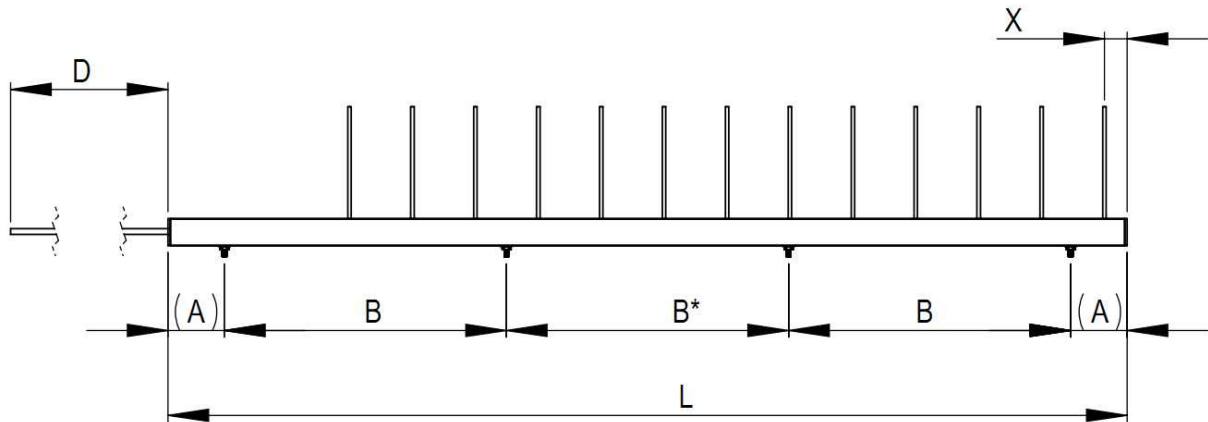
- Longer threaded bolts
- Other positions of mounting elements



length (L)	distance (B)	Number of mounting elements (z)
120...140	90	2
141...250	100	2
260...350	200	2
360...500	300	2
510...620	400	2
630...660	500	2
670...750	600	2
760...890	700	2
900...950	800	2
960...1100	400	3
1110...1250	500	3
1260...1450	600	3
1460...1550	400	4
1560...1850	500	4
1860...2060	600	4
2070...2350	500	5
2360...2450	520	5
2460...2750	600	5
2760...2890	500	6
2900...2950	520	6
2960...3140	700	5
3150...3350	600	6
3360...3560	800	5
3570...3860	700	6
3870...4030	520	8
4040...4300	900	5
4310...4570	700	7
4580...4850	500	10
4860...5130	800	7
5140...5250	700	8
5260...5450	520	11
5460...5650	600	10
5660...5850	800	8

Equation for distance "A":  $A = 0,5 \times (L - B \times (z - 1))$

## Tolerances



### Overall Length (L) and Distances for mounting Elements (B, B\*)

All dimensions in mm:

Nominal total length	30 - 120	121 - 400	401 - 1000	1001 - 2000	2001 - 4000
distance (B) for mounting elements	±0,30	± 0,30	± 0,8	± 1,2	± 1,2
Profile length (L)	±0,80	±1,20	±2,0	±3,0	± 4

Tolerances for value B\* at profile lengths from 2001 to 4000mm: ±2,0 mm<sup>1</sup>  
 Mounting elements tolerances for length above 4000 mm are available on request.

### Cable length (D)

Tolerance of wires: ± 1%, minimum ± 10 mm.

### Beam Position

Typical tolerance for beam position: ± 2mm  
 Other tolerances on request.

<sup>1</sup> For profile lengths above 20000mm B\* refer to the distance between the two centre bolts or the distance between the centre bolt and the next.

## Summary / Technical Data

### Light grids

Detail	Description					
Profile	Q	I	Z	R	T	A
Cross-section	10x27	12x24	14x65	12x49	12x58	12x24
max. Length	4000	6000	3000	3000	3000	2000 2400
Housing material	clear anodised aluminium Front cover PVC red, opaque					
Protection class acc. to DIN 40050	IP 54					
Humidity	Up to 90 % relatively, non-condensing					
Temperature	-20°C... +40°C					
Illuminant	Infrared, app. 800 ...1000 nm Other wavelengths on request					
Allowed angular deviation	+/- 10° (between transmitter and receiver)					
Ambient light immunity	high ambient light immunity, avoid direct sunlight (DC light) towards the receiver					
Wiring cable	Fix mounted wiring cable, length 4 m (± 1%); PVC;					
EMC immunity	Verify technical information of the control unit					

### Example for ordering text (short)

LI82/25-2090I, AC:00000000

Light grid Type LI for controller LVX/LVE

- Beam spacing: 25 mm
- Monitoring height: 2025 mm
- Profile cross-section: 12x24
- Profile Length: 2090 mm
- Colour: clear anodised
- Mounting: 5 threaded bolts M4x10 in 500 mm distances
- Protection class: IP54
- Connectivity: 4 m with connector plugs

## Options

### Profile colour

A1	A2	A3	A4	A5	A6	A7	A8

A 1	description
0	Standard: clear anodised
N	clear anodised
B	blank
S	black anodised
R	powder coating in RAL colours
...	additional colours on request

### Cable length

... in "dm" example:

A1	A2	A3	A4	A5	A6	A7	A8

A 2,3,4	description
000	standard (4 m)
005	0,5 m
100	10 m
150	15 m

#### Note:

- Maximum-length: 25 m with LVX, LVE, LVB and 30 m for LA
- Use longer cables preferably on transmitter side
- Cable lengths are indicated without connectors
- Please contact our technical support if you want to:
  - Make changes at the connector cable (e.g. lengthening; use of different connectors).
  - Use two light grid sets on one control unit with more than 4 m connector cable each.

### Cable outlet

A1	A2	A3	A4	A5	A6	A7	A8

A 5	0	H	F
description	standard, front side	"backward"	"side looking"
sketch			



## Range

The range of our light grids essentially depends on the control units. Please adhere to the corresponding specifications.

## Range/Profile Types

Profile	relative range
R, Z	70%
T	80%
others	100%

## Options for transmitter

A1	A2	A3	A4	A5	<b>A6</b>	A7	A8

A 6	relative range	example range for LVX*
<b>1</b>	<b>25 %</b>	<b>&gt; 60 mm</b>
<b>8</b>	<b>40 %</b>	<b>&gt; 100 mm</b>
<b>7</b>	<b>53 %</b>	<b>&gt; 180 mm</b>
<b>0</b>	<b>100 %</b>	<b>250 to 6000 mm</b>
<b>6</b>	<b>114 %</b>	<b>&lt; 7000 mm</b>
<b>3</b>	<b>124 %</b>	<b>&lt; 7500 mm</b>
<b>5</b>	<b>130 %</b>	<b>&lt; 8000 mm</b>
<b>4</b>	<b>137 %</b>	<b>&lt; 8300 mm</b>
<b>9</b>	<b>156 %</b>	<b>&lt; 9300 mm</b>
<b>2</b>	on request (special-LED)	

\*Values are measured limits, the limits have to be tested in the application. Preferential types are bold.  
LA/LC and relative range >100%: Intensive tests are necessary. Please contact our technical support.

## Options for receiver

A1	A2	A3	A4	A5	<b>A6</b>	A7	A8

A 6	receiver cable
N	single shielded
0	double shielded <sup>1</sup>

## Options for display profiles

A1	A2	A3	A4	A5	<b>A6</b>	A7	A8

A 6	description
0	red LED
G	green LED

<sup>1</sup> standard type for LI ex October 2006, all other ex April 2007.



## Front cover

A1	A2	A3	A4	A5	A6	A7	A8

A 7	description
0	standard: PVC, red transparent
S	PMMA, black
G	Glass plate
W	PMMA, white diffuse
F	PVC, red transparent with peel-off protection foil

## Cable type

A1	A2	A3	A4	A5	A6	A7	A8

A 8	type			description
	LA	LI	LG	
0	X	X	X	standard, according to light grid type.
H	X	X	X	non-halogen; cable casing PUR; Schleppflex; cable diameter 6,0 ±0,3 mm
C	X	X	-	M12 connector with 0,75 m connector cable. 
A	X	-	-	with Phoenix Contact Combi-Con connector.
W	X	-	-	with Wago connector.
D	X	-	-	with diode connector
M	X	-	-	M8 connector (4-pole at transmitter and receiver) 
B	-	X	-	preassembled M12 fitting and Phoenix Contact CombiCon, e.g. for control unit type LVB

For detailed specification please contact our technical support!

## Example

AC: S150H10GC:

Black anodized; 15m wire length, cable outlet "backward"; reduced transmission power; glass front cover; connection via M12-plug.

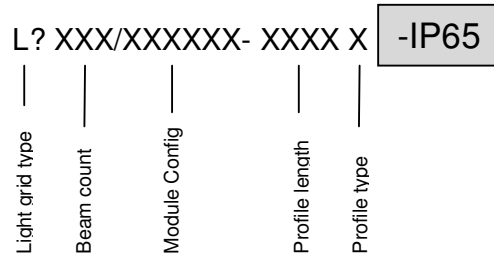
## Protection class

### Important notes:

- Protection class is specified for duly usage only.
- Adhere to the information „Mounting Instructions for Light Grid“ and „Starting up control unit...“.
- Protection class can be affected by changes to the devices (e.g. removing labels, loosen a screw, trimming a stud bolt, drill through the housing). In order to keep warranty, do not make any changes to the devices!

### Options:

Type	Description
-IP20	Protection class IP20 for all grids
-IP54	Standard: Protection class IP54 for all grids
-IP65	Protection class IP65 for type LI only
...	



## Accessory / Adapter plugs

Type	Description
LILVM	Allows for the connection of grids type LI to control unit LVM. Protection class IP00
LGSCAN	Allows for the connection of grids type LG to control unit SCAN or LVX/LVE. Protection class IP00
M12LVX	Connector cable (set) with M12 connectors. For connecting a transmitter or receiver with option M12 to the control unit LVX or LVE.
FP-30-00012	Mounting kit for „isolated mounting“ of profiles type T
FP-30-00013	Mounting kit for „isolated mounting“ of profile types I
Clip####	Cover strip; PMMA; white opaque; for profile types R and Z. length #### mm, max. 3000 mm Example: Clip2100 for LI40/50-2100Z or LI40/50-2100R

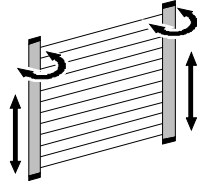
## Special Variants

The following variants are not part of our standard product offering. Additional information is available on request.

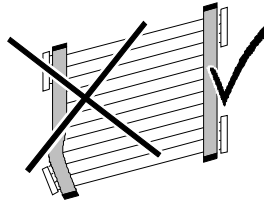
Profile	F	H	M	L	N	O
Cross-section	40x12	12x24	12x24	10x27	10x27	12x24
Description	Vertical beam outlet	2 bushings $\text{\O}4.5$ ; for flat mounting	2xM3 threads at ends; for flat mounting	Compartment for nuts and screw heads	No mounting holes	No threaded bolts
Alternative Sketch	R, Z	Q	Q	I		
Sketch						

## Details for initial setup and usage

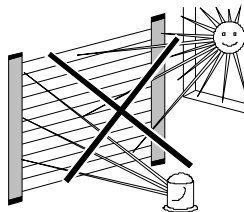
- Perform the initial light grid setup carefully and in accordance to our mounting instructions, the technical documentations and the relevant regulations. Adhere to EMC-compatible handling of the shielded connector cable for types LI and LG.
- The controller must be without power when connecting or disconnecting the profiles!
- It is generally not necessary to align the profiles exactly. Only in special cases it should be necessary to adjust the profiles. Note that the profiles may also need to be moved longitudinally.



- The monitored area between the transmitter and receiver must be clear of obstructions so that the grids can “see” each other.
- Assemble with the power supply disconnected. Do not expose the profiles to stress.

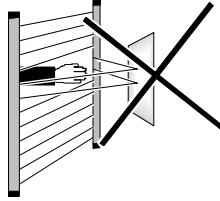


- Avoid ground loops: Profiles must have the same ground potential.
- Avoid the effects of external light sources (e.g., from flashlights or sunlight) on the receiver.

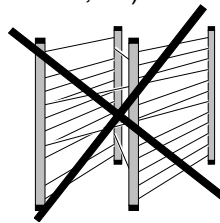


- Condensation, fog or smoke can impair the functioning of a light grid.
- The front cover must not be scratched. It must be kept free of obstacles and it must be kept clean (do not use any cleaning agents containing solvents).

- Danger from reflective surfaces: Reflective surfaces in the area around the light grid must be avoided. Otherwise obstructions will not be detected. Optical sensors can affect each other by reflections. This could affect the functionality of the devices.



- Make sure that different optical sensors do not mutually influence each other (e.g., other light grids/curtains, light barriers, ...)



- Use a test pin to check that the light grid is working in the entire monitoring area.
- Connections must be done EMC-compatible.  
Note: unshielded cable wires shall not exceed 20 mm.
- Warranty is voided if any changes are made to the light grid connector cables or the connectors itself!
- A voltage difference of 60V between the light grid housing and the supply voltage must not be exceeded.
- Do not use high-pressure washers or steam cleaners.
- Attention with horizontally mounted profiles:  
Fluid on the front foil is able to interrupt the beams and after a long residence time it can enter the profiles! There is no protection class warranty in this position!  
Increased risk of contamination!



**Important note:**

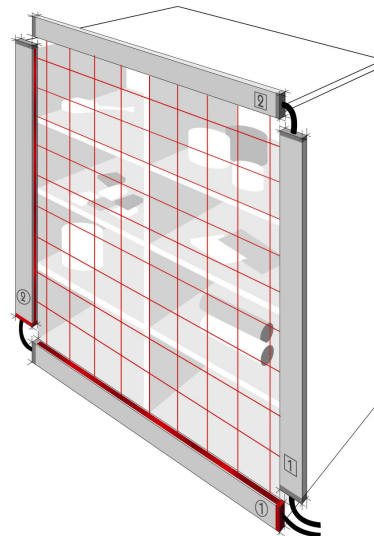
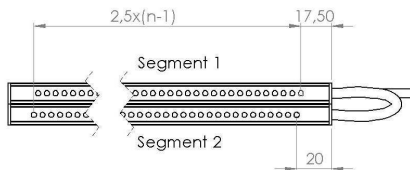
The light grids are not certified safety light curtains according EN 61496. They're no safety devices in terms of the EG-89/392/EWG including 93/44/EMW, appendix 4. Therefore, they must not be used to protect individuals from danger.

## Further Design Options

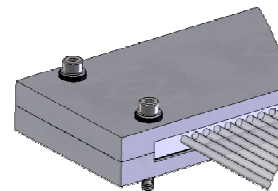
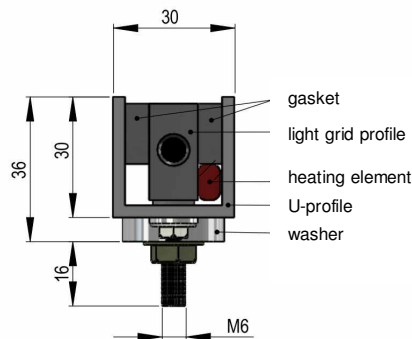
Have you not found a solution? Then please contact our sales department, we will certainly attempt to help with innovative ideas. hilft Ihnen unser technischer Vertrieb sicher mit innovativen Ideen weiter. Consecutively you can find a summary about special solutions we have created in the past:

**Segmentation**, e.g. for arrays in a poka-yoke system.

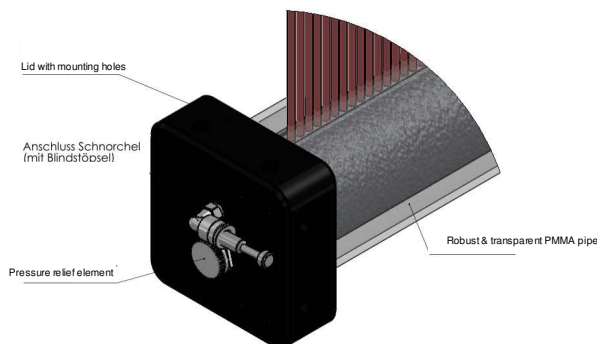
Doubling of resolution via staggered profile assembly:



For exposure to very low temperatures as well as prevention of icing and condensation our profiles can be heated.

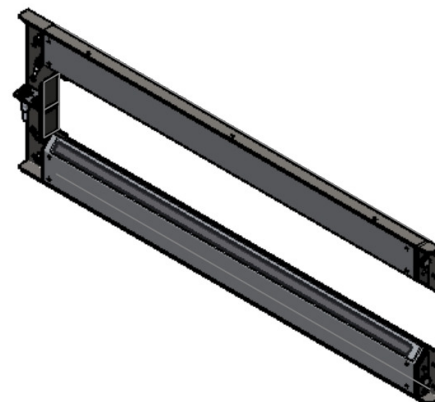


BLI: Heated profiles with 5 mm spacing



### Specialty Enclosure

Transparent enclosure pipe for increase of protection class



### Specialty Enclosure

Light Grids mounted on a U-shaped metal bracket