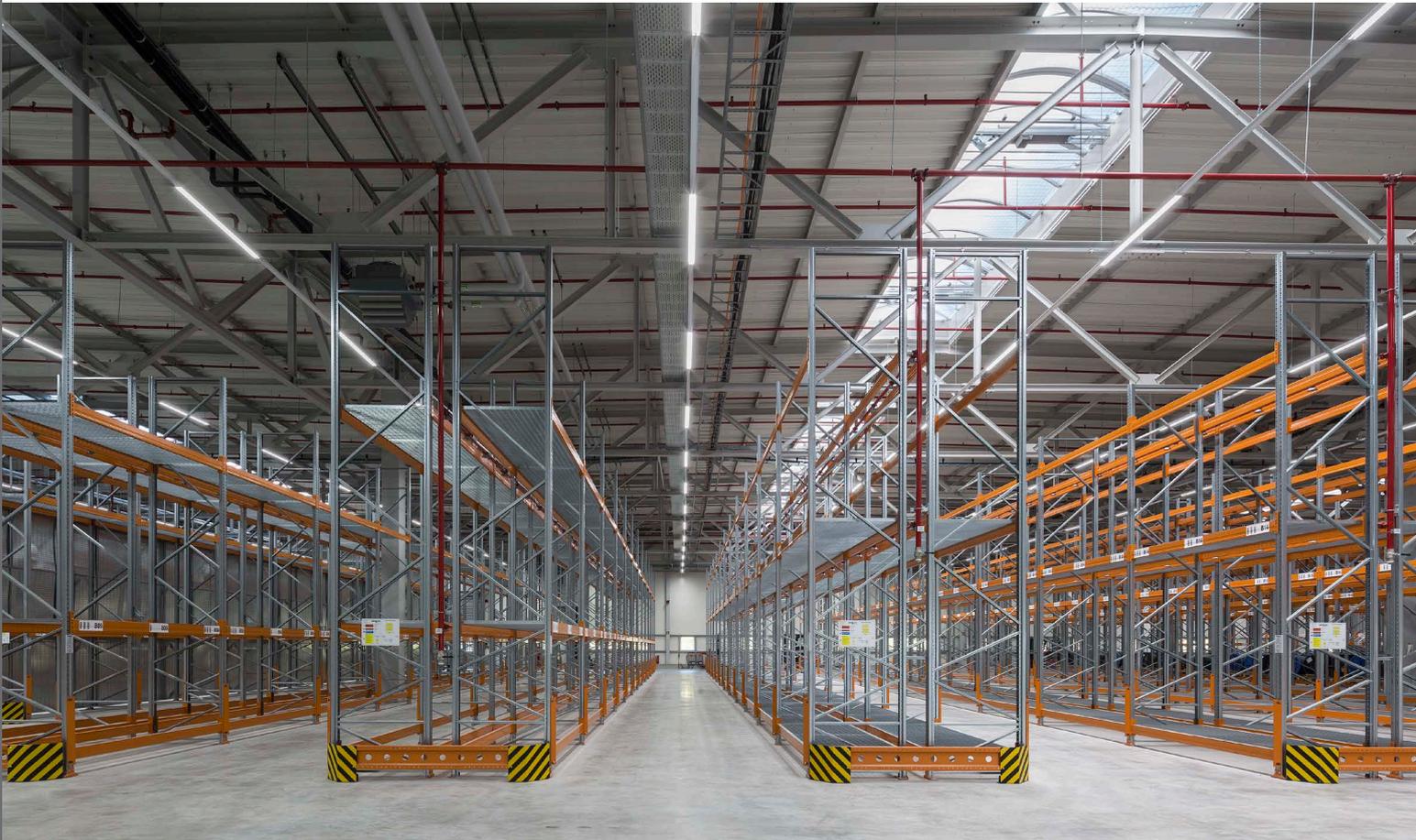


Warehouse Lighting Design Guide



RIDI GROUP UK

RIDI Spectral® **li:fy**
light for you®

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RIDI Group have been producing lighting products locally, sustainably and with an eye for longevity and maintainability for over 60 years.

Responsible Light™ is our ethos spelled out.

Sustainability

We strive to make our products and processes as sustainable as possible. Eliminating waste from our production process, locally sourcing material, reducing energy usage in our factory and employing renewable and low carbon energy.

Our products are designed to be long lived, easily maintainable with long term parts availability and eventually practical to recycle.



LEDification

Investment in LED board production at our Jungingen factory means we are able to produce the specific components we need rather than relying on generic designs from third party producers.

Because we design the boards, luminaires and cooling we can pick the optimal combination for our products.



Smart Lighting

Our simple, plug and play, lighting control options reduce energy usage by turning the lights off when they're not needed and making full use of the available natural light.



Well being

Lighting is for people. As we learn more about the physiological effects lighting has on us, we endeavour to produce and design systems that contribute to your wellbeing.



The technical requirements for Warehouse Lighting

Lighting Guide 1 (LG1) details requirements for Distribution and storage warehouses as shown below. Lighting systems based on RIDI LINIA luminaires and using our Lighting Design Guide and spacing tables comfortably meet these requirements.

Application	Maintained illuminance (lux)	UGR limit	Minimum uniformity (U_0)	R_a
Warehouses and bulk stores				
Goods storage where identification requires only limited perception of detail	100	25	0.4	60
Goods storage where identification requires perception of detail	150	25	0.4	60
Continuously occupied storage areas where identification requires only limited perception of detail	200	25	0.4	60
Continuously occupied storage areas where identification requires perception of detail	300	25	0.6	60
Automatic high bay rack stores:				
Gangway: unmanned	20	—	0.4	40
Gangway: manned	150	22	0.4	60
Control station	150	22	0.6	80
Packing and despatch	300	25	0.6	60
Loading bays	150	25	0.4	40
Storage rack face ^a	200	—	0.4	60
Cold stores				
General	300	25	0.4	40
Breakdown, make-up and despatch	300	25	0.4	40
Loading bays	150	—	0.4	40

Notes:

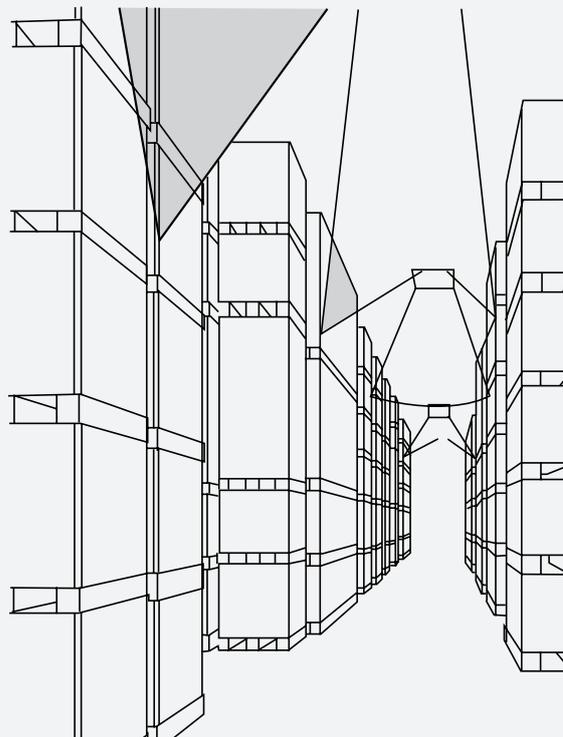
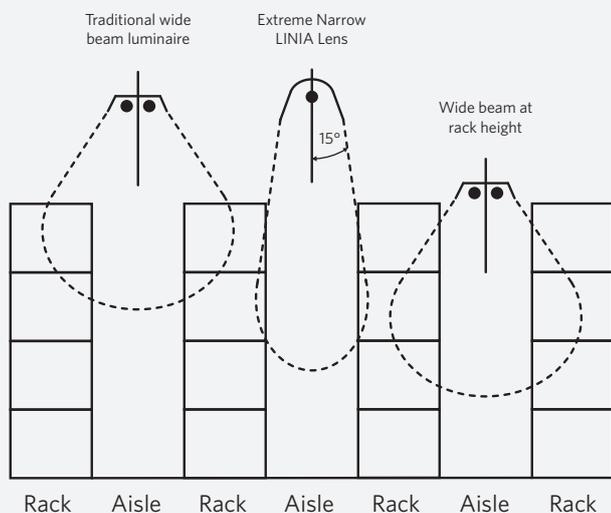
^a Calculation to be made on the vertical surface, portable lighting may be used.

In high-palletised narrow-aisle racking areas, the main problem is to get the required illuminance at floor level between the racks without too much light on the tops of the racks.

LINIA's Extreme Narrow distribution luminaires focuses light between the racks, preventing wasted light on the top of the racks.

Overspacing luminaires along the length of the Aisle leads to dark triangular patches at the top of the racks, making identification difficult.

LINIA warehouse luminaires have wide axial distribution, helped by the long luminaire body which helps overcome this problem.





barth Spedition GmbH, Hechingen

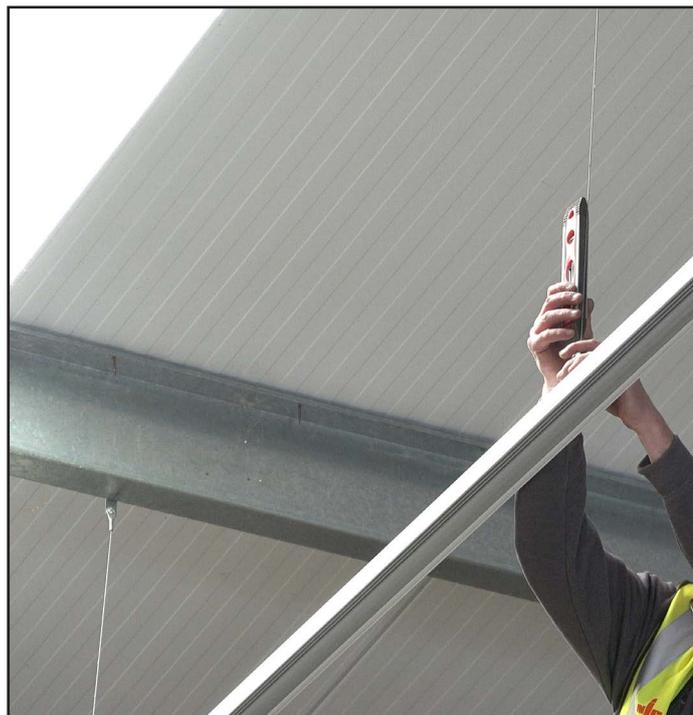
Introduction to LINIA

Fast and Easy to Install

LINIA is a Continuous BusBar Lighting system, featuring a robust trunking container with multicore electrical BusBar. Luminaires, emergency lighting units and lighting control modules all clip, without tools, into the trunking and all electrical connections are taken care of by the BusBar system.

The convenience of LINIA's installation method in large warehouses cannot be overstated. Only a single electrical feed per run of trunking is required and after that all components can be added, moved or swapped at any time without the need for an electrician.

Installation time is cut to a fraction of that of conventional lighting systems, and future maintenance can be undertaken by anyone.



Power feed

Located end of run or mid run between joins of trunking lengths

Single power feed supplies the entire run. No further wiring to be done when fitting luminaires

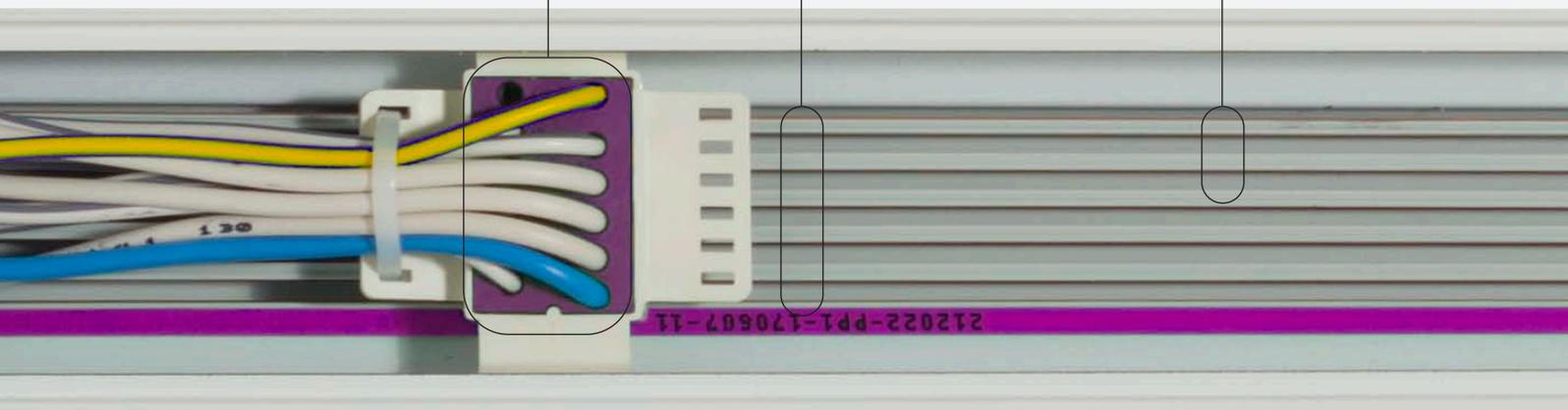
5 x 2.5mm² cores

3 Phase Supply for load balancing and ultra long run lengths

Separately switch three lighting circuits for out of hours or load shedding

2 x 1.5mm² cores

Dedicated DALI control connections.



7 Core Trunking



For warehouse projects, the 7 Core version of LINIA is ideal. Three live cores, neutral and earth and a dedicated DALI/Controls pair. It supports APCON-Easy, APCON-BLE and Control3 systems and Manual, Self-Test and Central Test emergency lighting. If the project requires a central battery emergency system, it can be supported using the 11 Core version of LINIA.

7 Core LINIA trunking is available in five metric lengths and stocked in the UK in the three most common lengths. Trunking can be cut to length on site if required.

Flexible lengths

Available in five metric lengths from 1.0 to 4.5m

Extra long lengths speed up installation time

Simple to cut to length on site



Triangular Cores

Connection is made by direct insertion of luminaire gear tray without wiring

Unique triangular cores retain cables in the carrier during multiple luminaire insertions and removals



LINIA Trunking Components

7 Core Continuous BusBar Trunking

		Part Description Article Number	Image	Length
LINIA Trunking	7 Core 1.5m	VLTM 1500-7 1500134		1500 mm
	7 Core 3m	VLTM 3000-7 1500138		3000 mm
	7 Core 4.5m	VLTM 4500-7 1500142		4500 mm

Electrical Feeds & Joiners

Electrical feeds for either Solid core or Stranded cable, Tool-less mechanical and electrical joiners. Push fit end caps feature 20mm knockout cable gland entry.

		Part Description Article Number	Image
End Feeds and Joiners	7 Core Electrical Feed	VLNE-7F-WS 1207048	
	Push fit End Cap Two Required Per Run	VLTE 205791	
	7 Core Mechanical and Electrical Joiner	VLTV-7 1207045	

Blanking Plate

Plastic blanking plate can be cut to length on site.

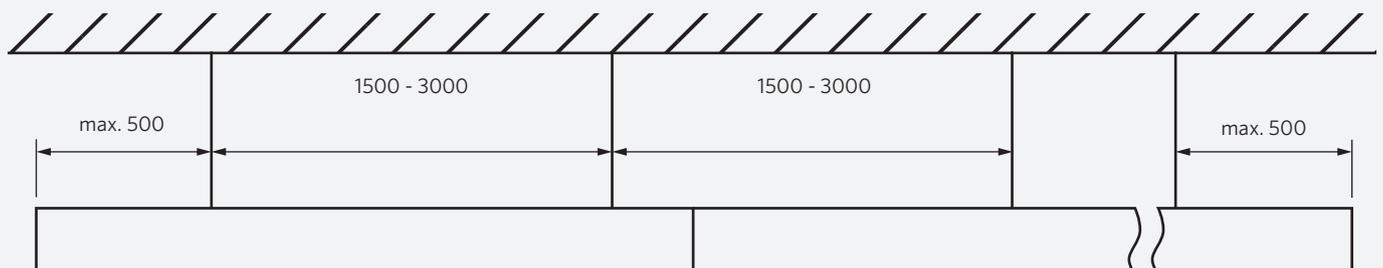
		Part Description Article Number	Image	Length
Blanking Plate	4.5m Plastic Blanking Plate	VLBKM 4500 1207289		4500 mm

Fixings and Suspensions

Standard ceiling fixings and wire suspensions. Additional fixing options are available on request for all ceiling types.

		Part Description Article Number	Image
Fixings and Suspensions	Wire Suspension	VLTHS 1.5m 0205922	
	Chain Suspension Bracket	VLTHA 0205792	

Fixing Spacings



Lighting and Luminaires

Efficiency and Accuracy

LINIA warehouse luminaires have been designed to offer the very highest efficiency, in terms of both light output and accuracy of beam formation, ensuring the right amount of light in exactly the right place.

Mid power LEDs are used in long linear configurations, rather than a smaller number of high power LEDs in a compact space. This configuration allows us to run the LEDs at lower currents, increasing efficiency and service lifetime. Spacing the LEDs along the length of the module improves heat dissipation, further improving the luminaire life.

The 'FL' optic places an accurately design lens in front of each LED chip. This design allows for very accurate beam forming as well as highly efficient light gathering. The result is that as much light as possible produced by the LED is captured by the lens and directed in a well controlled distribution towards the illumination target.

VLGFL1501 and VLGFL1502



Warehouse Luminaires

Recommended spacings are available in the Lighting Design section.

		Part Description Article Number	Image	Output (lm)	lm/W	Length
Luminaires	Rack Lighting 6-8m Extreme Narrow Single LED Module	VLGFL1501-7DAWS840E 1561067		8,433 lm	165 lm/W	1500mm
	Rack Lighting 10-16m Extreme Narrow Double LED Module	VLGFL1502-7DAWS840E 1561071		15,639 lm	164 lm/W	1500mm
	Open Area Lighting 6-16m Broad Double LED Module	VLGFL1502-7DAWS840B 1561072		14,854 lm	172 lm/W	1500mm

On Site, Maintenance and Long Term Support

Our products have a 5 year warranty, and should you need to replace anything, the LINIA plug and play clip in system means it's quick and easy for anyone to do. During the first year, should anything go wrong, you benefit from our on site rectification assurance from our in house engineers.

More than that, we support our products long term. We guarantee parts availability on any products for at least 10 years. We've been making continuous lighting trunking systems for over 35 years.

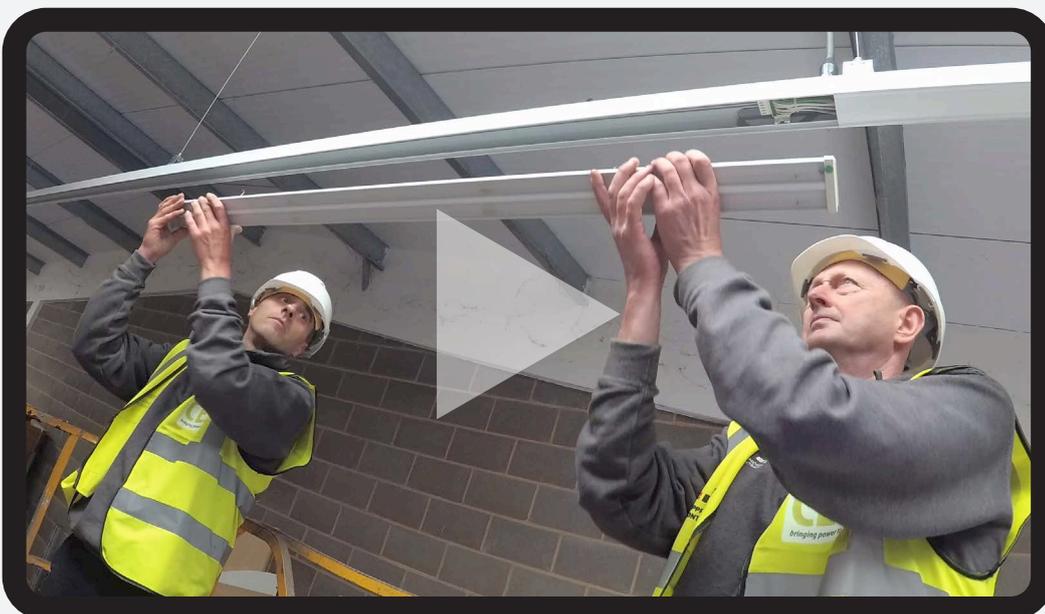
1 Yr On Site	5 Yr Warranty	10 Yr Parts Availability
------------------------	-------------------------	------------------------------------

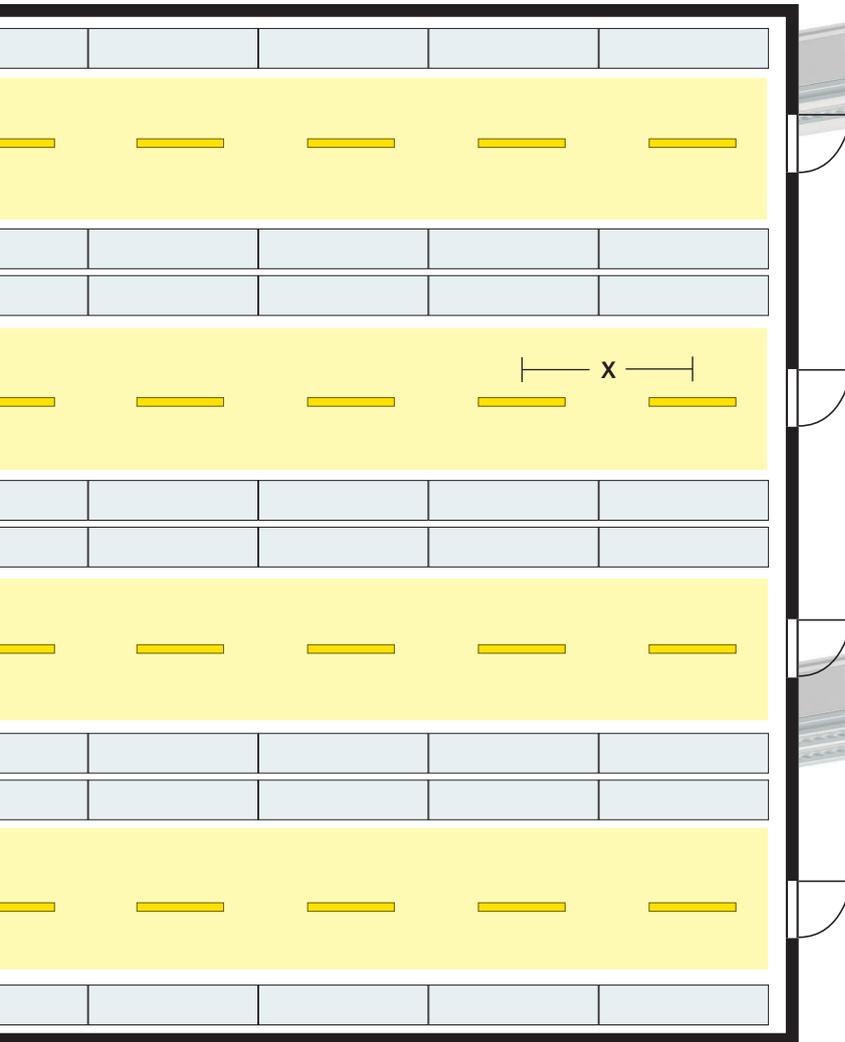
Ease of Installation

In common with the rest of the LINIA Continuous BusBar lighting system, the luminaire modules are designed to be as simple as possible to install. Luminaires can be clipped in place on the trunking without the use of tools. All electrical connections are made automatically on the BusBar and the only electrical work required is the Mains and optional DALI connection at the trunking end or joins.

Compared to convention trunking systems, LINIA has been shown to be four times faster to install.

Watch the video comparing the difference in install times by scanning the QR code, or visit ridi-group.co.uk/linia-speed/





VLGFL 1501 DA
 Mounting Height 6-8m

Target Illumination: 200 - 250 Lux

Target Uniformity: > 0.52

Extreme Narrow Distribution

Single LED Module



VLGFL 1502 DA
 Mounting Height 10-16m

Target Illumination: 200- -250 Lux

Target Uniformity: > 0.65

Extreme Narrow Distribution

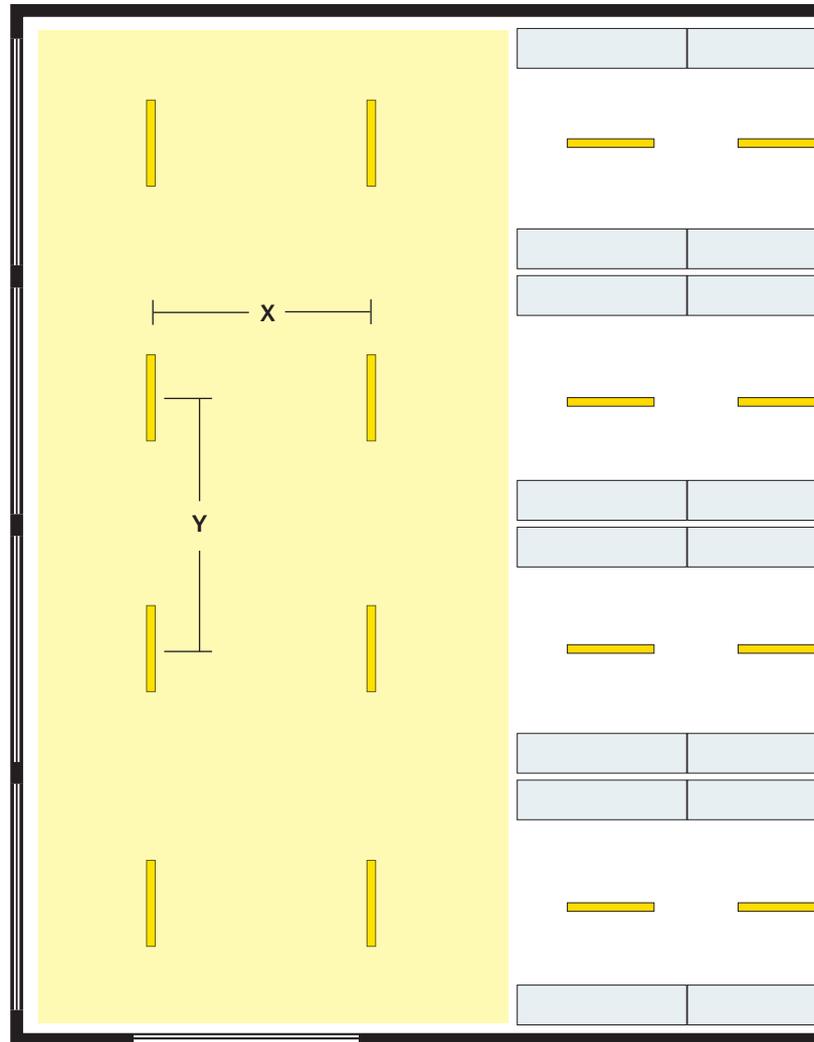
Twin LED Module

Spacing Table

Height	Spacing X	Floor Illuminance	Uniformity	Luminaire	Distribution	Output Lumens	Part No.
16m	5.5m	205 Lux	0.6	VLGFL 1502 DA	Extreme Narrow	15,400	1561071
12m	7.3m	212 Lux	0.82	VLGFL 1502 DA	Extreme Narrow	15,400	1561071
10m	8.0m	240 Lux	0.69	VLGFL 1502 DA	Extreme Narrow	15,400	1561071
8m	6.0m	205 Lux	0.79	VLGFL 1501 DA	Extreme Narrow	8,450	1561067
6m	6.0m	267 Lux	0.52	VLGFL 1501 DA	Extreme Narrow	8,450	1561067



VLGFL 1502 DA Mounting Height 6-16m
Target Illumination: 200 - 300 Lux Target Uniformity: > 0.65 Broad Distribution Twin LED Module



Spacing Table

Height	Spacing X	Spacing Y	Floor Illuminance	Uniformity	Luminaire	Distribution	Output Lumens	Part No.
16m	8.0m	6.0m	200 Lux	0.65	VLGFL 1502 DA	Broad	14,810	1561072
12m	8.0m	6.0m	222 Lux	0.69	VLGFL 1502 DA	Broad	14,810	1561072
10m	8.0m	6.0m	234 Lux	0.74	VLGFL 1502 DA	Broad	14,810	1561072
8m	7.8m	8.0m	200 Lux	0.84	VLGFL 1502 DA	Broad	14,810	1561072
6m	7.6m	6.0m	298 Lux	0.7	VLGFL 1502 DA	Broad	14,810	1561072

Emergency Lighting

Stay Safe and Compliant

Our emergency lighting modules are designed specifically for the demanding high mounting heights and conditions of warehouses, ensuring a reliable and long life emergency lighting system.

Available as Manual Test, Self Test and DALI central test in conjunction with the Control³ lighting control system.

Each module features the same high output 550 lumen LED, oval distribution high mounting height lens optic and high capacity Lithium Ion battery packs.

Installation is designed to be as simple as possible. A permanent live feed is taken to the end of run or joins of the LINIA trunking. The emergency lighting module clips into place and makes all electrical connections required on the integral BusBar system.

Manual test: A keyswitch is fitted to the permanent live supply, allowing the emergency lighting to be tested by interrupting the supply. Visual identification of all units in operation must be recorded in an emergency lighting test log.

Self Test: No keyswitch is required. The emergency modules will automatically test on a built in schedule. The status of the module is reported via a red/green LED indicator. The status must be recorded in the emergency lighting test log.

DALI central test: The module connects to the DALI control line as part of the Control³ lighting control system. During commissioning a suitable testing schedule is configured by our engineers to meet the requirements on site. The results of the tests are automatically logged and recorded on the lighting controller for download, or can be sent by email.

VLMF-NL-WH EM / EMST / EMDALI



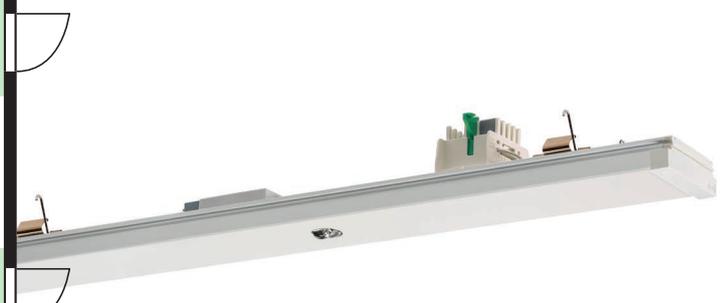
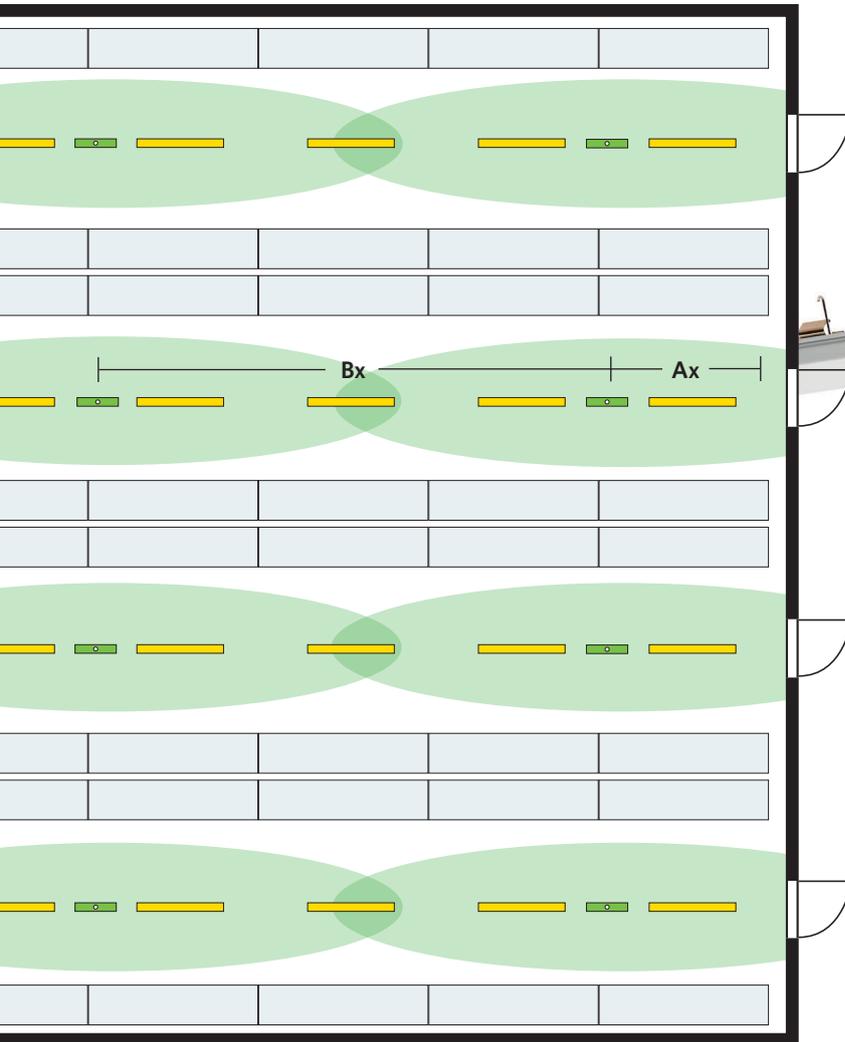
Emergency Modules

Details on the emergency lighting coverage and recommended spacings are available in the Emergency Lighting Design section.

	Part Description Article Number	Image	Module Length
Emergency Lighting	Emergency Lighting Module Manual Test (Requires Keyswitch) VLMF-NL-WH-EM 97-VLMF-EXPHO-MT		500mm
	Emergency Lighting Module Self Test (No Keyswitch) VLMF-NL-WH-EMST 97-VLMF-EXPHO-ST		500mm
	Emergency Lighting Module DALI Test (For Control ³) VLMF-NL-WH-EMDALI 97-VLMF-EXPHO-DT		500mm



HØRKRAM, AARHUS



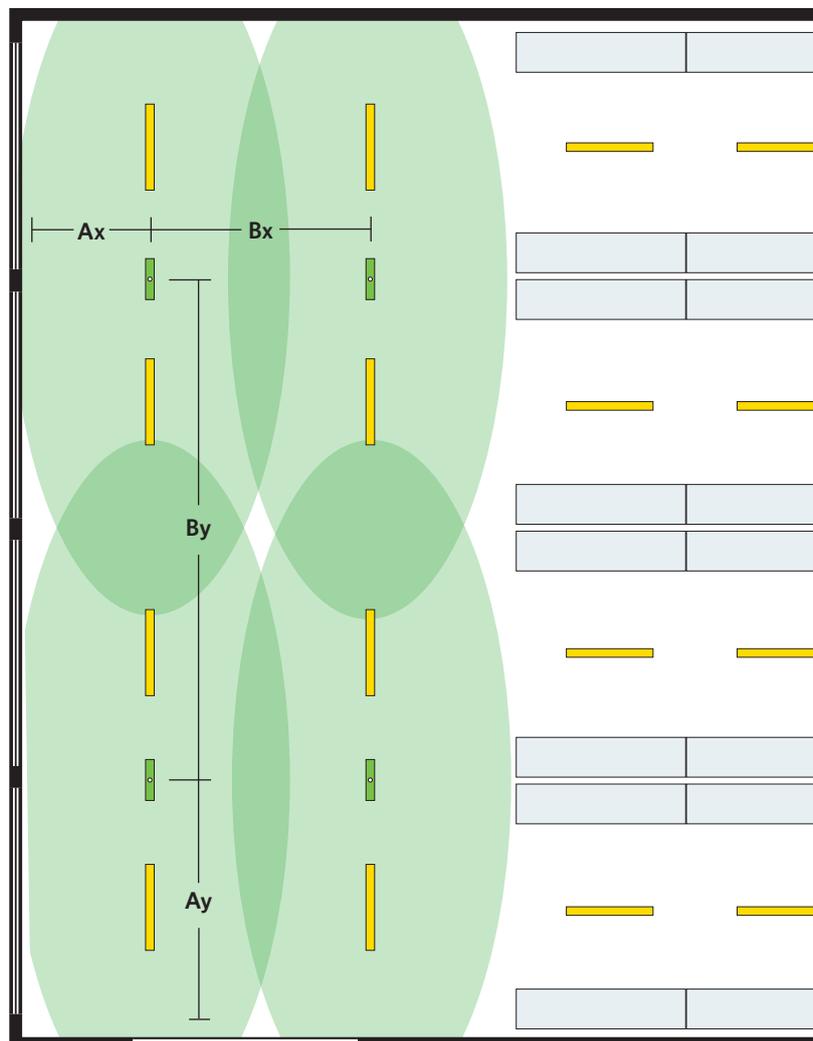
VLMF-EXPHO-MT/ST/DT Mounting Height 6-16m
EM Illumination 0.5 or 1.0 Lux
Warehouse Lens
550 Lumens
Manual, Self Test or DALI Test

Spacing Table

Height	Spacing at 0.5 Lux Min		Spacing at 1.0 Lux Min	
	Ax	Bx	Ax	Bx
16m	12.8m	32m	7.5m	25.7m
12m	11.6m	26.9m	9.2m	23.3m
10m	10.6m	23.8m	8.7m	20.9m
8m	9.1m	20.3m	8m	18.3m
6m	7.5m	16.2m	6.7m	15m



VLMF-EXPHO-MT/ST/DT Mounting Height 6-16m
EM Illumination 0.5 or 1.0 Lux
Warehouse Lens
550 Lumens
Manual, Self Test or DALI Test



Spacing Table

Height	Spacing at 0.5 Lux Min				Spacing at 1.0 Lux Min			
	Ax	Bx	Ay	By	Ax	Bx	Ay	By
16m	5.9m	24.1m	12.8m	32m	1.7m	11.8m	7.5m	25.7m
12m	8.3m	23m	11.6m	26.9m	3.7m	16.7m	9.2m	23.3m
10m	8.6m	20.9m	10.6m	23.8m	5.1m	17.1m	8.7m	20.9m
8m	7.9m	18.1m	9.1m	20.3m	6m	15.8m	8m	18.3m
6m	6.6m	14.8m	7.5m	16.2m	5.7m	13.3m	6.7m	15m

Lighting Control

Three Levels of Lighting Control

APCON-Easy, APCON-BLE and Control³ are our three lighting control systems.

All are based around long range movement detectors designed specifically for use in racking and open areas at the heights needed for warehouses.

The detectors allow lights to switch off or dim down when aisles are unoccupied, saving energy and increasing the service life of the luminaires.

The sensors feature a long range light level detector to allow for daylight harvesting, dimming the lights when natural light is available.

All systems feature simple installation, with sensors supplied on LINIA plates which click into place on the BusBar trunking. APCON-Easy and APCON-BLE need no additional wiring to the trunking system, just a single mains supply per run. Control³ requires a DALI control pair from each trunking run to be connected to the lighting controller to allow for system monitoring and connection to a BMS.

VLMF-SEN-AB-P-WH-DA



Long Range Detectors

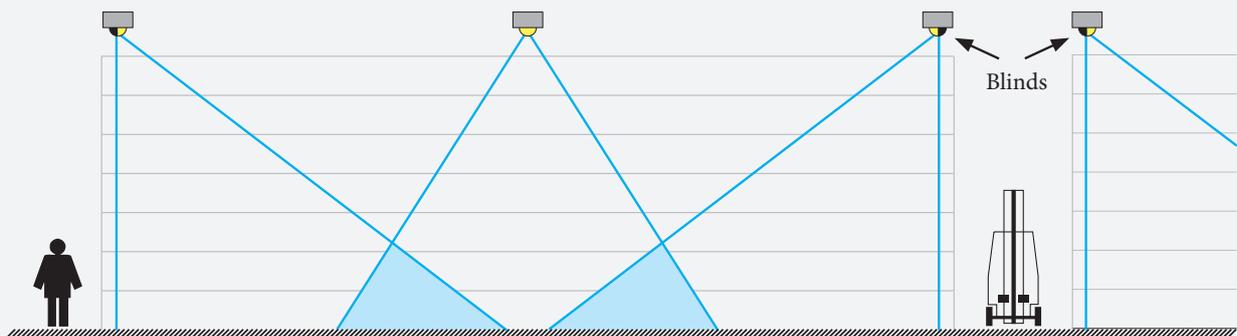
Sensors should be arranged to allow for some overlap of detection zones along Aisles and in Open Areas to allow for seamless coverage. See spacing tables in the Lighting Control Design section for details of coverage and recommended spacings. The sensor coverage area and spacings are the same for all three system options.

Where Aisles meet open areas, or crossing access, the movement sensors can be fitted with blinds (supplied) to prevent the Aisles from illuminating when there is motion in the adjacent areas.

'Zoom Lens' Light Level Sensor

Conventional light level sensors have difficulty reading the light level at the floor in warehouse aisles due to the reflection of light back from the racks.

The 'Zoom Lens' sensor features an adjustable lens which focuses directly on the floor, ignoring the light reflected from the racks. The result is an accurate and stable light level reading to allow precise daylight control. Adjustment is made by rotating the lens barrel, which has clear indications of the working height.



Overlap detection zones for seamless coverage. Blinds prevent detection in adjacent areas.

		APCON-Easy	APCON-BLE	Control 3
Energy Saving	Movement based Presence detection	✓	✓	✓
	Movement Based Absence Detection	✓	✓	✓
	Daylight Dimming for Energy Saving	✓	✓	✓
	Maintenance Factor Compensation	✓	✓	✓
	Time Based Control		✓	✓
	Energy Monitoring and Logging			✓
	Smart Circulation - Row Grouping		✓	✓
Maintenance	Luminaire Fault Monitoring		✓	✓
	Emergency Lighting Testing and Logging			✓
	Occupancy Monitoring and Logging			✓
	Luminaire Run Time monitoring and logging			✓
	Trend / BACnet BMS Integration			✓
Install / Setup	Smartphone based setup	✓	✓	
	Commissioning by engineer		✓	✓
	Wireless Control Network		✓	

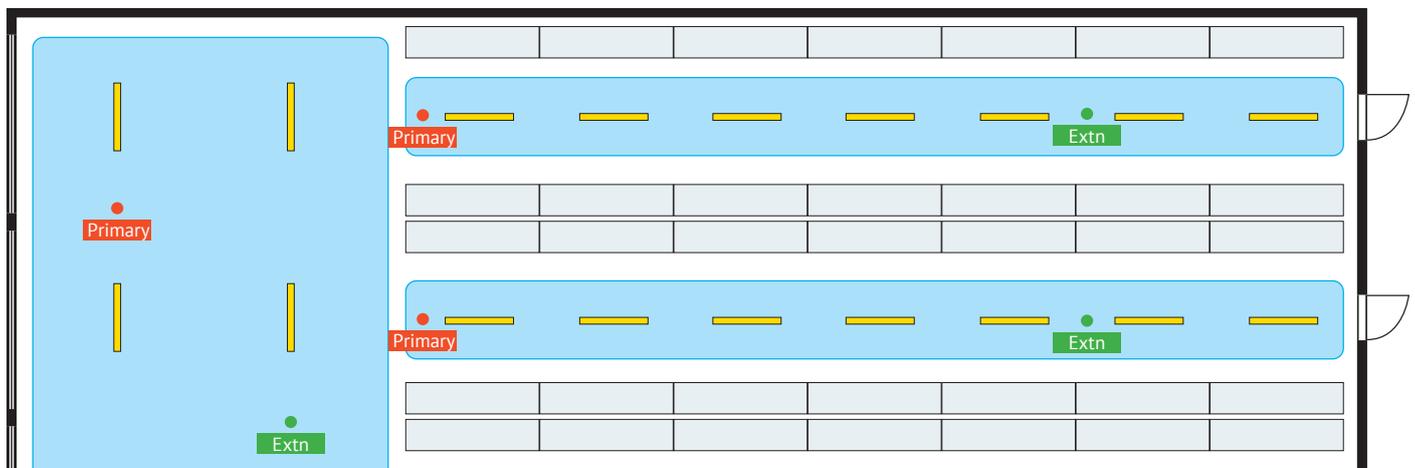
APCON-Easy is a simple, switching and daylight dimming solution which saves energy and increases luminaire service life by turning off unoccupied areas in the warehouse and reducing the luminaire output when natural light is available.

The system is simple to fit, requiring only a single mains feed to each run of LINIA trunking in the Aisles. The Sensors clip into the trunking, and all control wiring and connections are taken care of by the integral BusBar system.

Each run of trunking requires at least one **Primary** sensor and up to Eight **Extension** sensors.

In open plan areas, a single core control line, up to 60m long, can be run between trunking runs to allow the whole area to switch together. In this case a single **Primary** sensor is required per switching zone.

Time out and sensitivity settings can be set by DIP switches within the sensor, or wirelessly via a smartphone app and the optional IR smartphone adaptor. The sensors are supplied with time out setting suitable for a typical warehouse and so in many cases no adjustment will be required.



One **Primary** and up to Eight **Extension** Sensors per switching zone / Max **32** Luminaires Per Zone / Max **60m** Length Per Zone

Components

N.B. Manual override switching can be achieved using conventional momentary light switches and additional wiring.

	Part Description Article Number	Image	Module Length
APCON-Easy	Primary Sensor Trunking Mounted One Required per Row / Zone Max 32 Luminaires per Row / Zone		500mm
	Extension Sensor Trunking Mounted Maximum Eight Per Row / Zone		500mm
	Smartphone Programming Adaptor For iOS or Android		N/A

APCON-BLE features movement detection and daylight harvesting for energy saving and increased luminaire service life. It is based on Casambi Bluetooth mesh network technology which makes setup and configuration straightforward with any modern iOS or Android device.

Installation is made as easy as possible by the wireless network. Each run of LINIA trunking requires only a mains feed. All other connections are made automatically by clipping in the luminaires, sensors and wireless modules into the BusBar trunking.

Each run of trunking requires either a VLMF-CDH wireless module or VLMF-SEN-PD4-CAS-GH-DALI2 which control up to 32 luminaires. Extension sensors can be placed on the trunking at any point, and there is no limit to the number used. In open areas, it is not necessary to have a sensor on every trunking run, wireless broadcast modules from any number of lighting runs can be grouped with sensors to form a switching group.

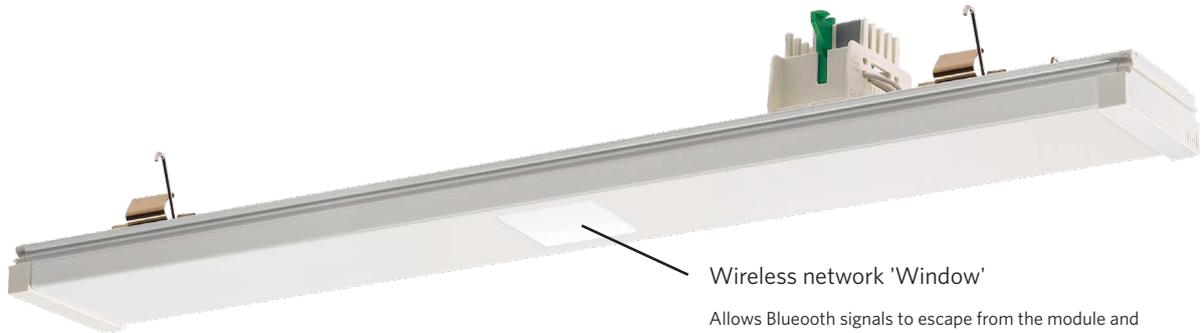
APCON-BLE adds several other useful features in addition to movement and daylight energy saving.

Time Based Control: luminaire can be configured to switch on/off at set times, or to change function based on a time schedule.

Maintenance Factor Compensation: Dim the luminaires to 80% on initial installation to allow for the maintenance factor used during the lighting design. As the system ages and light output reduces due to accumulated dirt and ageing of the LEDs the system gradually increases the DIM level to maintain the desired lighting level.

Smart Circulation: Linking switching zones allows the lights in adjacent zones to be brought on to a pre-lit level just before operatives enter the area, ensuring a high level of working safety and maximum energy saving.

VLMF-CDH



Wireless network 'Window'

Allows Bluetooth signals to escape from the module and create a robust mesh network with other modules and sensors, negating the faraday cage effect of the metal trunking system.

Components

N.B. Wireless manual override switches are available as an option to a fully automatic system.

	Part Description Article Number	Image	Module Length
APCON-BLE	Wireless Primary Multi Sensor Trunking Mounted Max One per row / zone Max 32 Luminaires per row / zone		500mm
	Wireless Extension Multi Sensor Trunking Mounted No Limit per row		500mm
	Wireless DALI Broadcast Module Max One per row Max 32 Luminaires per row / zone		500mm

Control³ is a full featured DALI control system suitable for projects of any size. Setup and commissioning of the system is completed by experienced engineers from RIDI. This ensures that every system is configured to achieve maximum energy savings and seamless functionality.

Installation of the system requires a mains feed to each row of lighting trunking and in a two core DALI control cable from each run of trunking to the lighting controller. In common with all our systems, sensor and luminaire installation is a case of simply clipping the modules and luminaires into the LINIA BusBar trunking.

In addition to the all energy saving and convenience features of APCON-BLE, Control³ add a number of useful maintenance and system monitoring options.

Emergency Light Testing: Automatic scheduled testing of the emergency lighting ensures your building remains safe and compliant. Testing reports are saved on the system and can be downloaded or sent by email on a scheduled basis.

Luminaire Fault Monitoring: The system constantly monitors all connected luminaires and reports on any faults found. This information is saved to a rolling fault log, and can be sent by email either instantly as the fault occurs or as a combined report on a scheduled basis.

Luminaire hours run: The hours run of every luminaire is logged by the system, allowing you to plan well in advance for any replacements.

Occupancy monitoring: Each lighting zone records the occupancy quotient by means of the number of movement triggers in each 5 minute period. It is possible to see which areas are over or under utilised and to plan efficient use of space.

BMS integration: Integration with common BMS systems based on either Trend or BACnet protocols allow two way communication between the lighting zones and the BMS. Information such as current occupancy, light levels and fault reports can be visualised in the BMS. Common settings such as sensor timeout and light levels can be adjusted in the BMS and sent to the lighting system.



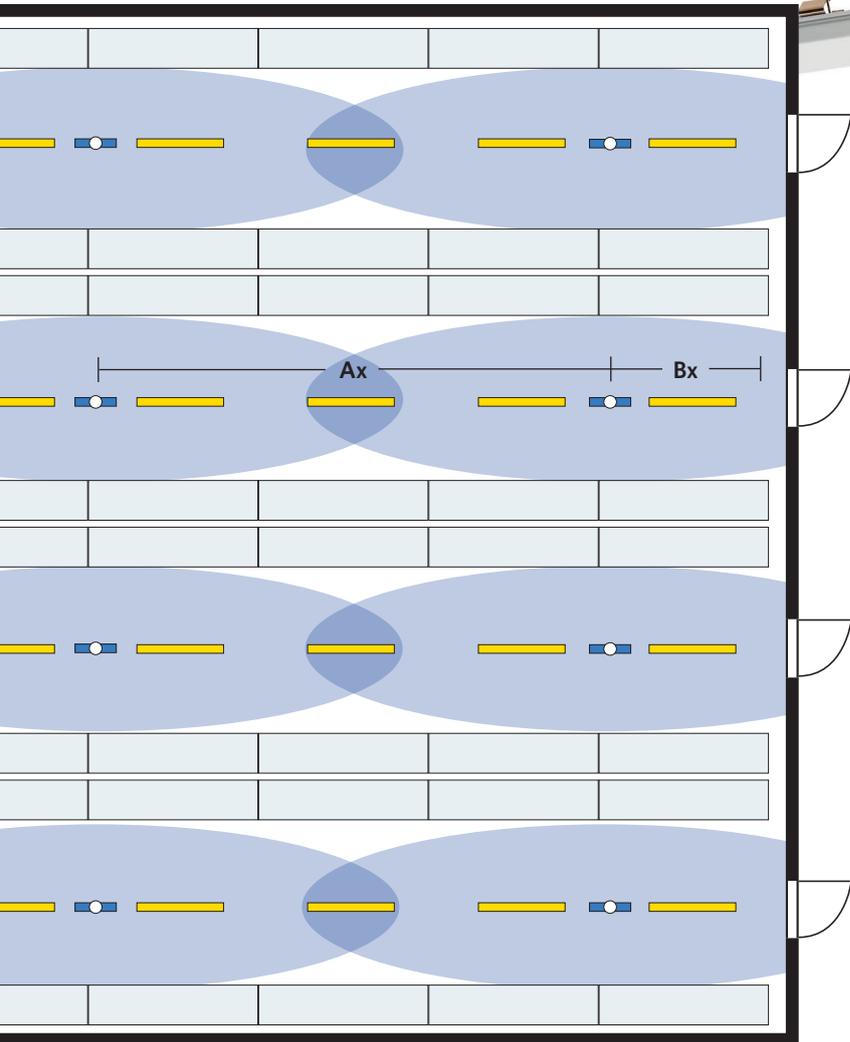
Components

N.B. Manual override switches are available as an option to a fully automatic system.

	Part Description Article Number	Image	Module Length Dimensions
Control ³	DALI Multi Sensor Trunking Mounted Max 10 per DALI Circuit	VLMF-SEN-C3-WH 97-VLMF-93545	 500mm
	DALI Lighting Controller 1 - 8 DALI Circuits per unit Includes Ethernet Network Switch With Optional BMS Integration Software	C3-ENC-1 ... 8-SW-BMS	 W 600mm H 200mm D 100mm



Gabler Immobilienverwaltung GmbH



APCON-Easy	VLMF-SEN-AE-P/E-WH-DA Mounting Height 6-16m
	<ul style="list-style-type: none"> Presence Detection Daylight Dimming One Primary per row / zone

APCON-BLE	VLMF-SEN-AB-P/E-WH-DA Mounting Height 6-16m
	<ul style="list-style-type: none"> Wireless Mesh Network Presence Detection Daylight Dimming

Control ³	VLMF-SEN-C3-WH Mounting Height 6-16m
	<ul style="list-style-type: none"> Addressable DALI + BMS Integration Presence Detection Daylight Dimming

Spacing Table

N.B. All Sensors have the same detection range and shape.

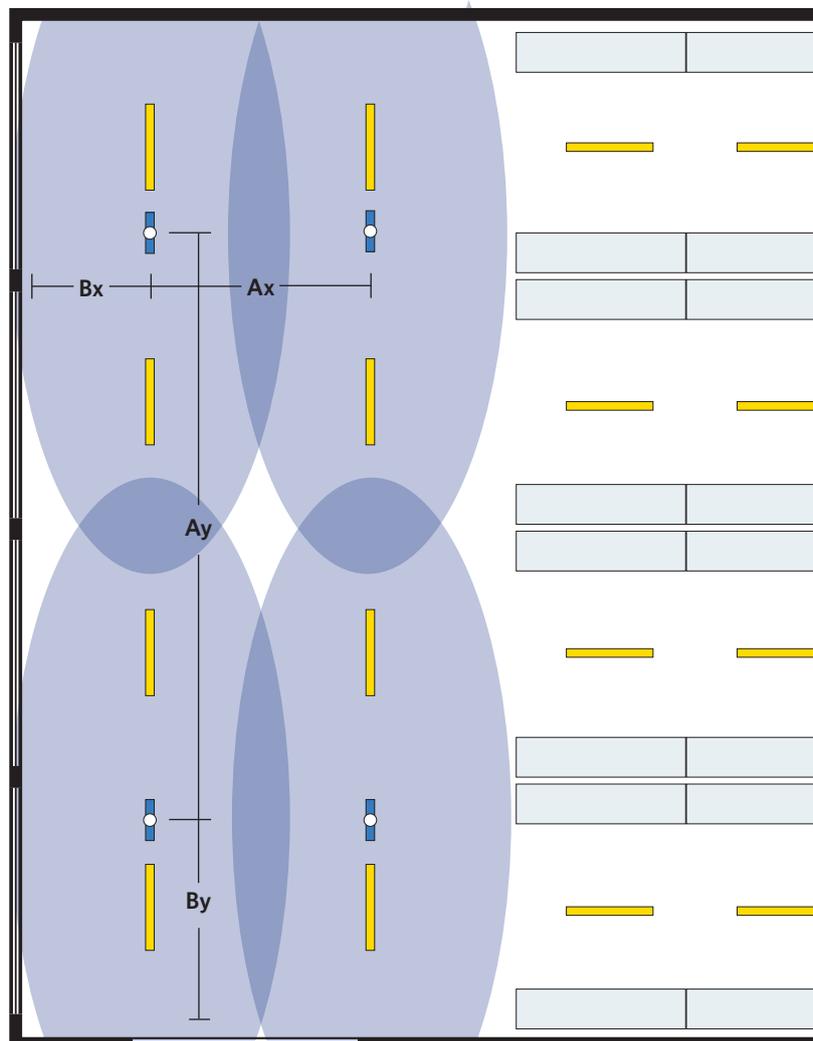
Height	Ax	Bx
16m	24m	12m
12m	24m	12m
10m	24m	12m
8m	22.4m	11.2m
6m	20.8m	10.4m



APCON-Easy	VLMF-SEN-AE-P/E-WH-DA Mounting Height 6-16m
	Presence Detection Daylight Dimming One Primary per row / zone

APCON-BLE	VLMF-SEN-AB-P/E-WH-DA Mounting Height 6-16m
	Wireless Mesh Network Presence Detection Daylight Dimming

Control ³	VLMF-SEN-C3-WH Mounting Height 6-16m
	Addressable DALI + BMS Integration Presence Detection Daylight Dimming



Spacing Table

N.B. All Sensors have the same detection range and shape.

Height	Ax	Bx	Ay	By
16m	15.6m	7.8m	24m	12m
12m	15.6m	7.8m	24m	12m
10m	15.6m	7.8m	24m	12m
8m	15.6m	7.8m	22.4m	11.2m
6m	14.4m	7.2m	20.8m	10.4m

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