

newsLIGHT

NEW PRODUCTS – NEW PROJECTS

newsLIGHT

EDITORIAL



Dear Reader,

Innovation is the force that drives our economy. And in the world of lighting, innovation is currently summed up by just three letters: LED, short for light-emitting diode. While LEDs are encountered in almost all fields of lighting technology, they are also a common feature in other non-lighting applications, such as monitors, display screens, traffic signs, information notices and many more. In addition to the well-known individual LEDs, the newer SMD and COB modules are now also found in indoor and outdoor lighting applications.

The clearly noticeable change has also led to fiercer competition with more and more new providers coming on to the market. But change of any sort equally gives established players a chance to reposition themselves and safeguard the future with high-quality and innovative products.

The following pages provide information on the products and systems with which we are preparing for the future. LED modules with an efficiency of nearly 150 lm/W and extremely low-loss drivers with a long service life are just two examples. You'll also find details on projects involving LED modules and drivers that not only yielded an excellent quality of light, but were also highly cost-effective.

Let us – jointly – face these challenges and with that contribute to the force that drives the economy. I hope you enjoy reading the latest newsLIGHT.

Yours

A handwritten signature in black ink that reads "A. Vogel". The signature is stylized and fluid.

Andreas Vogel
Managing Director

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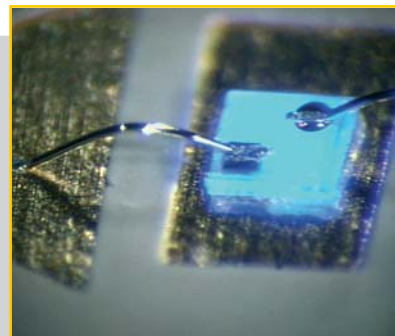
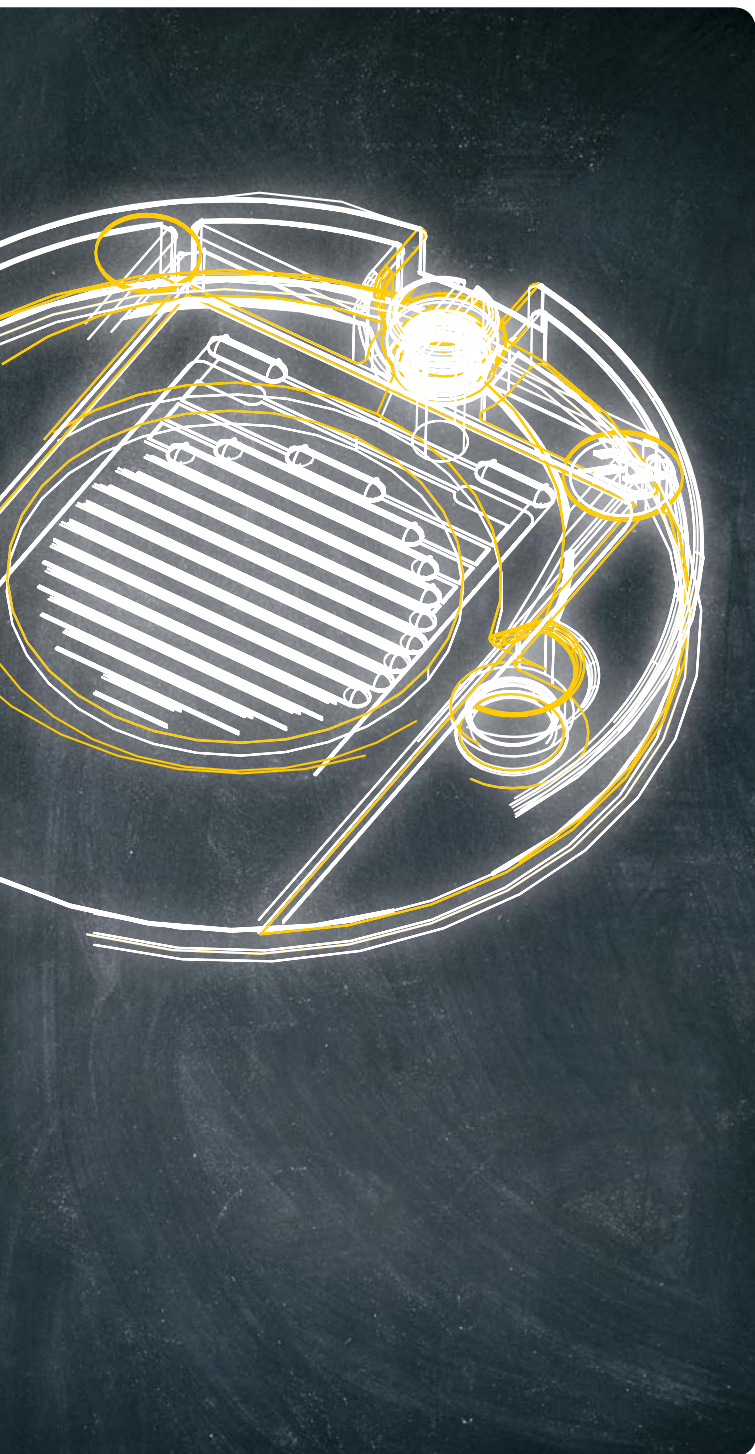
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NEARLY 25 YEARS
OF VS COB
TECHNOLOGY
GOLDEN OLDIES



Chip with wire bonding

■ **COB TECHNOLOGY – A RELIABLE AND EFFICIENT CONSTANT IN THE FIELD OF LED LIGHTING**

COB (Chip-on-Board)

The "naked" semi-conductors are attached directly to the substrate without a casing. This process allows many times the packing density in comparison to SMD technology. The advantages of COB technology include:

- ☞ Homogeneous light distribution
- ☞ Highly suitable for colour blending, even using shades of white
- ☞ Flat dimensions compared to other types of LED
- ☞ Shake- and vibration-proof
- ☞ Available on the market for many years (30 years and more)

■ **COB MILESTONES AT VOSSLOH-SCHWABE**

- 1990
Start of production with an FR4 PCB, aluminium wire for bonding and UV light (Globtop) to cure the silicone, which served to ensure quick stability and a droplet shape that facilitated further processing.
- 2005
Switch to gold and silicones: gold wire as a better alternative to aluminium wire, since gold wire is thinner and produces less shadow, which therefore improved LED efficiency.
- 2006
New PCB material: aluminium and ceramics to improve thermal properties.
- 2008
Introduction of the 6 Sigma process for the production of white LEDs. First COB on a flexible PCB.
- 2009
High-power COB modules on aluminium with an integrated COB reflector.



Airbus WC display



Aircraft cockpit

- 2010
IR drying: even faster curing, larger production volume and optimisation of facilities.
- 2011
Research into phosphorous; chip-on-reflector chip density to avoid multi-shadowing (LUGA).
- 2013
LUGA LED modules
Long service life: 50,000 hours, L90/F10
Highly efficient: up to 141 lm/W at $t_p = 65\text{ °C}$

■ EXAMPLE 1: GLASS FABRICATION

Red background lighting facilitates control during glass production as any inclusions and irregularities become visible. Using an optical recognition process, defective products can therefore be rejected.

Requirements, now as then:

- High light density
- Consistency within the field of COB
- Protective cover

Product Properties:

- Performance level (70 W) in line with the corresponding number of chips (1,536) and a surface measuring 96 x 16 mm
- Production commenced in the year 2000



■ EXAMPLE 2: AVIATION

Conversion of aircraft cockpit lighting to LED light sources (reduction by 1 maintenance interval); Example: WC display screen.

Requirements, now as then:

- Two colours (red and green)
- Shake- and vibration-proof
- Long service life and 30-year availability into the future

Product Properties:

- Ceramic substrate
- Upon production start: testing of the Airbus/Airsigna 15 years ago

■ EXAMPLE 3: ILLUMINATED ADVERTISING

Use of "neon" tubes in advertising with the aim of achieving uniform (background) lighting of display screens and lettering.

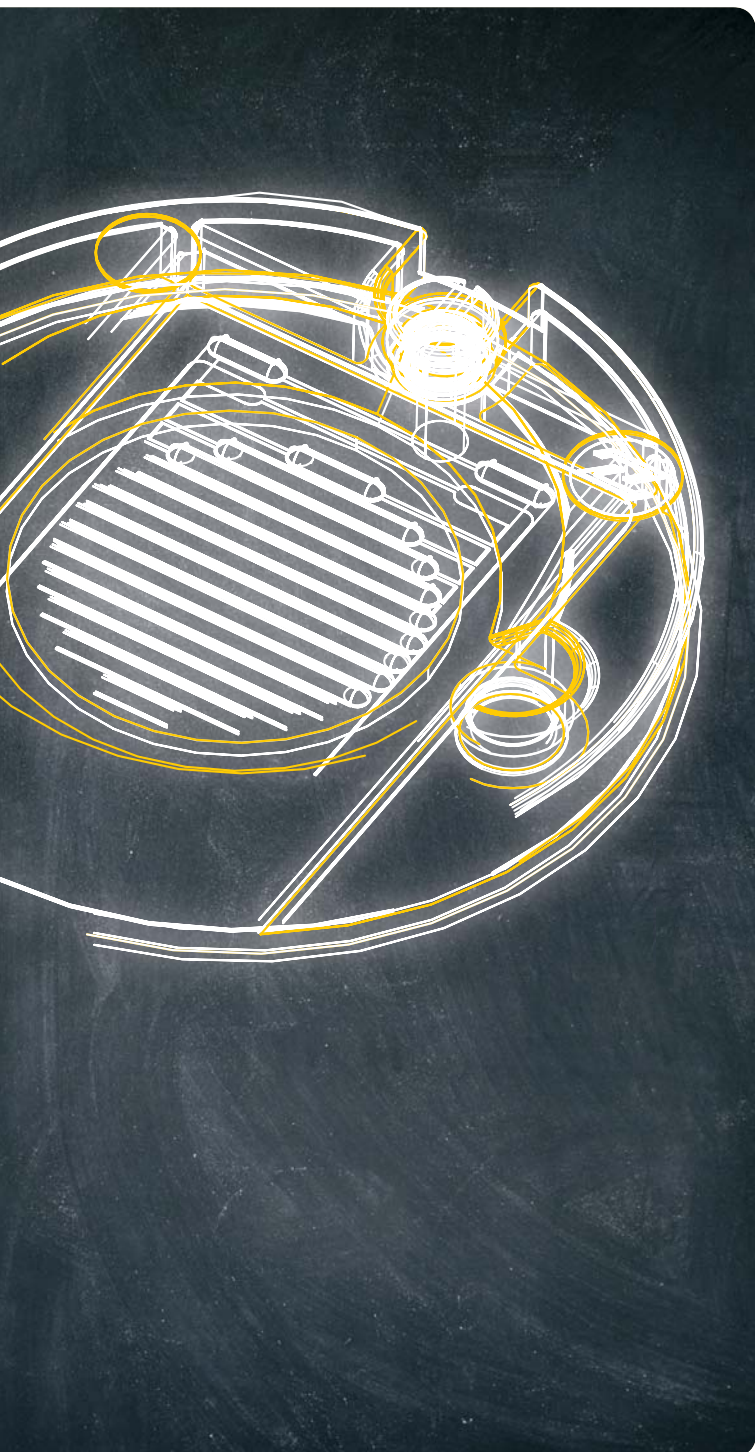
Requirements, now as then:

- At least the same service life as neon
- Uniform light distribution within the lettering
- Fine lettering

Product Properties:

- IP protection, depending on model
- Simple LED-to-LED connections
- Low operating voltage and current
- Production commenced in 1998

NEARLY 25 YEARS OF VS COB TECHNOLOGY GOLDEN OLDIES



■ THE NEXT GENERATION OF COB TECHNOLOGY

VS products featuring COB technology are still in use today, even after 20 years, which is a clear endorsement of both the long service life and reliability of our products as well as of the technology involved. However, COB technology has also undergone a continuous evolution over the years:

Switch from E chips to C chips (chip-to-chip bonding) + 65% light output

➤ + 65% light output

Introduction of new phosphorous compounds (red nitrides)

➤ 50% more efficiency

➤ Potential CRI > 90

Conversion to a highly reflective aluminium surface

Reflection > 98%

➤ + 65% light output

Phosphorous droplet in chip size

➤ + 22% light output

Current state of the art: LUGA LED modules

➤ Minimal decrease in luminous flux L90/F10 (after 50,000 hours)

➤ Highly efficient: up to 141 lm/W at $t_p = 65^\circ\text{C}$

➤ Narrow colour tolerances:

3x MacAdams (initially)

4x MacAdams (after 50,000 hours)

80% ENERGY SAVINGS

LIGHTING CONTROL FOR OUTDOOR APPLICATIONS



Stadtwerke
Schwäbisch Gmünd

PILOT PROJECT: ROTHALDEN ST., SCHWÄBISCH GMÜND

Rothalden St. in the German town of Schwäbisch Gmünd is a typical cul-de-sac in a residential area that was planned and built in the 1980s. The cul-de-sac was originally equipped with 2 x 80 W high-pressure mercury vapour lamps, which were then replaced with high-pressure sodium vapour lamps. Latterly, a 70 W retrofit high-pressure sodium vapour lamp with an internal ignitor was in use.

Due to the very low footfall in the cul-de-sac during nighttime hours (between approx. 23:00 and 04:00 hours), the street was ideal for a flexible control solution featuring a "lighting on demand" function. This was why the Schwäbisch Gmünd utility company decided to launch the "Lighting on Demand" pilot project in cooperation with Vossloh-Schwabe.

The luminaires of 7 lampposts were therefore replaced with 2 LED luminaires made by the company Grah and 5 LED luminaires made by the company Bega, each providing an output of 35 W. In addition, these luminaires were fitted with built-in iMCU luminaire controllers made by Vossloh-Schwabe. These controllers work independently in accordance with a programmed schedule that serves to regulate lighting levels in the cul-de-sac. Furthermore, the Flex Night concept makes it possible to remotely adjust all settings.

The project kicked off with the following settings:

from "lights on" time until 22:00 hours:	100%
from 22:00 to 23:00 hours:	50%
from 23:00 to 04:00 hours:	20%
from 04:00 to 05:00 hours:	50%
from 05:00 onwards:	100%

By pressing any one of three push-button switches located at either end and in the middle of the cul-de-sac, residents can increase the lighting level to 50% for a period of 10 minutes from 23:00 to 04:00 hours. This configuration not only does justice to the issue of safety (by providing the street with basic illumination at night), but also maximises energy savings.

In comparison to the previous lighting set-up, the new configuration has served to reduce energy consumption by 80%.



PRODUCT UPDATE

PRODUCT IMPROVEMENTS AND MODIFICATIONS



LUGA Shop

NEWS FROM THE FIELD OF LED SHOP LIGHTING

The next generation: LUGA Shop 2013 2000 lm to 5000 lm

- Minimal decrease in luminous flux L90/F10 (after 50,000 hours)
- Highly efficient: up to 141 lm/W at $t_p = 65^\circ\text{C}$
- Narrow colour tolerances:
3x MacAdams (initially)
4x MacAdams (after 50,000 hours)

Effectline LED constant current driver: the ideal eco- solution for shop, office and architectural lighting 700 mA / 40 W and 1050 mA / 60 W

Compact device dimensions that facilitate integration into luminaires and independent operation.

Technical Details:

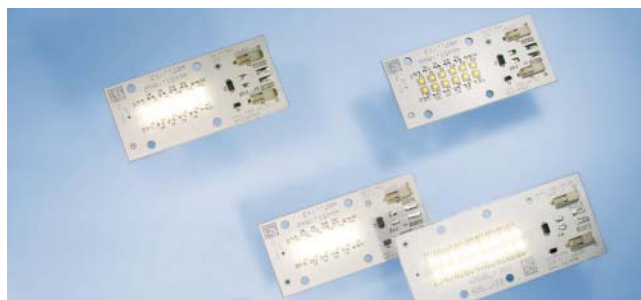
- Protection class I
- SELV
- Power factor: > 0.98
- Efficiency: > 0.88

NEWS FROM THE FIELD OF STREET LIGHTING

Streetlight FlatEmitter SMD – 12/18 SMDs

Suitable for integration into outdoor luminaires, street lighting and high-bay lighting:

- Highly efficient: up to 134 lm/W
- Protection against power surges of up to 3 kV





DecoLED



LEDLine Fix

■ NEWS FROM THE FIELD OF HOME LIGHTING

DecoLED 7 W – perfect for replacing a 50 W dichroic halogen lamp in terms of:

- Size,
- Colour temperature,
- Dimming behaviour,
- Light output, light distribution and feel (reflector look).

A 7 W DecoLED can fully replace a 50 W halogen lamp. This results in a cost saving of 85% and a corresponding reduction in CO₂ output. The protection class III DecoLED comes with a swivelling luminaire head and, at a height of only 55 mm, is ideal for installation in ceilings.

- Operation using a standard 350 mA DC driver
- Linear dimming (depending on the respective driver)
- 36° angle of radiation, good alternative in comparison to a dichroic 36° halogen lamp
- 600 lm (1,150 cd)
- Warm white for typical halogen feel
- Energy efficiency: A+

Dimmable LED Constant Current Driver 350–700 mA / 10–36 W

The constant current drivers of the ECXd series are capable of being dimmed within a range of 1 to 100%. They can be controlled using phase-cutting leading-edge or trailing-edge dimmers (although trailing-edge is recommended) and are an ideal LED replacement for low-voltage applications.

Technical Details:

- Compact device dimensions to facilitate integration in luminaires and independent operation
- Protection class II
- SELV
- Power factor: > 0.9
- Efficiency: > 0.85

■ NEWS FROM THE FIELD OF OFFICE LIGHTING

LED Line Fix SMD Linear SMD LED Module with Mounting Kit

The LED Line Fix SMD module consists of an energy-efficient LED line module plus a thermally conductive basic holder and an optional cover. It therefore constitutes a perfect means

of directly converting to LED technology. Three quick, safe and flexible methods for mounting the module within the luminaire body – adhesive bonding, snap-in and screw on (Zhaga-compliant) – make the module a great solution for indoor lighting applications

Linear LED Constant Current Driver 350 mA / 15 W, 2x20 W, 75 W 500/700 mA / 2x40 W, 4x60 mA / 4x9 W

These linear LED constant current drivers are designed for use in office and shop lighting. Combined with our LUGA Line LED modules, this linear module is particularly suitable for luminaire designs involving LEDs as a replacement for T5/T8 luminaire applications.

Technical Details:

- Overload- and open-circuit-proof
- Service life: 50,000 hours
- SELV
- Asymmetrical multi-channel solutions
- Current settings: 500/700 mA
- Very slim, flat dimensions

■ NEWS FROM THE FIELD OF HIGH-BAY LIGHTING

LUGA Industrial COB LED module for high-bay lighting

These LED modules deliver 10,000 lm and are suitable for use in both street lighting and high-bay/industrial lighting.

- Minimal decrease in luminous flux L90/F10 (after 50,000 hours)
- Highly efficient: up to 121 lm/W at $t_p = 65\text{ °C}$
- Narrow colour tolerances:
3x MacAdams (initially)
4x MacAdams (after 50,000 hours)



Further details can be found at www.vossloh-schwabe.com

COLLABORATIVE EFFORT: OPTICS

THE TRILUX E-LINE LED PROJECT



TRILUX E-Line LED Luminaire

E-Line LEDs are a leading light when it comes to efficiency. Using various optics, colour temperatures and a luminous flux between 4,000 and 6,500 lm, the light of an E-Line LED can be tailored to suit the most diverse installation conditions found in the fields of industry and commerce.

Vossloh-Schwabe provides a range of optical attachments made of modern synthetics for various applications using order-specific injection embossing tools. In concrete terms, this means that not only tool design and order placement, but also tool production itself are undertaken by VS in line with specifications made by the company TRILUX. These tools are then used in the high-precision mass production of customised synthetic optics attachments. As a result, E-Line LEDs need neither additional reflectors nor further accessories.



Vossloh-Schwabe began producing highly accurate, customised synthetic optical attachments using injection embossing tools, designed and manufactured in-house, more than 10 years ago. In combination with a partly to fully automated production line, the close interaction between product design and tool design/construction leads to cost-efficient solutions for our customers.



CLEANTECH ONE

ECO-BUSINESS PARK IN SINGAPORE



Edge lighting of a column

■ **CLEANTECH ONE IS THE FIRST BUILDING PHASE OF THE RENOWNED CLEANTECH PARK IN SINGAPORE'S FIRST ECO-BUSINESS COMPLEX**

The two towers making up the building were designed in line with ecologically sustainable standards, inclusive of solar panning, rain-water recovery and skylights that let daylight flood in. This ultramodern building is set to provide space for up to 50 companies with a focus on sustainability.

Thanks to being vibration- and shock-proof, Vossloh-Schwabe's highly efficient plug-and-play AluLED IP64 modules were ideal for the lighting system of this high-profile project. The extremely slim and flat AluLED IP64 module made it possible to illuminate complex structures and spaces in which the available options for installing conventional light sources were limited. Modules of various lengths and with a colour temperature of 6,000 K were used to flexibly satisfy customer requirements.

When it came to providing lighting for indoor spaces, the AluLED IP64 was used for cove lighting along corridors, where indirect light now serves to illuminate the entire area. The outdoor lighting landscape was extended by adding protected edge lighting on columns and architectural lighting. Parking spaces were mainly illuminated using high-contrast path markings. Furthermore, lighting elements were cleverly integrated into the façade to highlight significant features of the building.

As AluLED IP64 modules were designed for operation in spaces with high humidity, various module lengths were fixed behind mirrors over washbasins to provide homogeneous light. In addition, the uncomplicated mounting system also enables easy maintenance and cleaning. With its long service life of up to 45,000 hours, uniform light distribution and low power consumption, Vossloh-Schwabe's AluLED IP64 makes an effective contribution to lowering necessary maintenance costs and reducing CO₂ output, which in turn serves to combat global warming.

Project: Cleantech One
Customer: JTC Corporation
Luminaires: Thorn Lighting
LED supplier: Vossloh-Schwabe
Photos: Vossloh-Schwabe



LiCS OUTDOOR

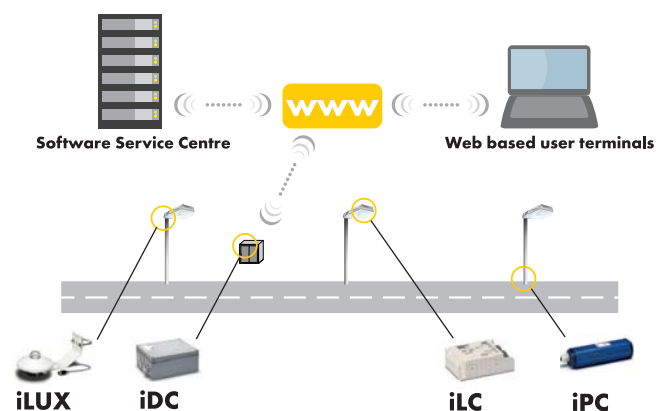
LIGHTING CONTROL WITH POWER-LINE TECHNOLOGY



iLC and iPC Controllers

■ CONTROLLERS WITH POWER-LINE TECHNOLOGY

Power-line technology enables bidirectional data transfer via the 230 V supply voltage line. Without needing additional control lines, multiple light controllers can therefore be connected to form a high-performance network in almost any environment. Data can then be transferred to any controller within the network with a high degree of reliability. If required the signal can be automatically boosted, which makes transfer distances immaterial.



Vossloh-Schwabe's light controllers for outdoor applications can also be used as independent controllers due to their integrated functionality. At a later point in time, the system can even be retrofitted with a data concentrator (iDC), which would then let luminaires be monitored centrally and addressed individually. The iDC is capable of controlling luminaires operated with magnetic ballasts (low-loss ballasts and low-loss eco-ballasts) as well as luminaires operated with up to four dimmable electronic ballasts with a 1-10 V or DALI interface. These products are suitable both for new installations and classic retrofits.

The Controllers:

The **iLC**'s particularly compact dimensions enable installation in almost all luminaires and especially ones featuring LED technology. The **iPC** controller was developed for integration into lampposts and can be connected to a light management system without needing any further wiring. Both controllers feature a control input (LST) that can be used to connect a control phase, an occupancy sensor, a key switch, a light sensor or, if used independently, to receive simple protocols.

LiCS INDOOR

THE SKY'S THE LIMIT WITH HIGH-BAY MOTION SENSORS



Vossloh-Schwabe's high-bay motion sensors supplement the LiCS Indoor light management system in the field of industrial applications. Using DALI motion sensors not only make systems more energy-efficient, but also more flexible.

VS MovementSensors detect motion even in high-bay facilities (with ceiling heights of up to 16 m). Specifically designed for operation in conjunction with VS light controllers, VS MovementSensors are optimised to withstand environmental influences upon unprotected installation (MovementSensor HB 65) and to function despite obstructions within the field of detection.

As these sensors are connected via the DALI bus, this constitutes the first time that lighting levels in entire warehouses can be regulated individually or in a uniform manner using only one light controller.

Technical Details:

- Sensors are configured via the interface to the L/LW, S and XS light controllers
- Ambient temperature t_a : -5 to $+50$ °C
- Available as IP65 and IP20 variants
- Push-in terminals with lever openers: 0.5 – 1.5 mm²
- Energy consumption due to DALI: 2 mA

MovementSensor HB 20



MovementSensor HB 65



INTRODUCING

THE LED TEST CENTRE IN KAMP-LINTFORT



■ THERMAL CHARACTERISATION

Each of our new products is put through its paces to ensure it delivers all specified properties and consistently high quality. Vossloh-Schwabe established its own test centre in the German town of Kamp-Lintfort in 2005, since which time LED chips, packages and modules, but also all necessary components such as PCBs, lenses, interface films, adhesives and potting materials have been tested. In addition to our own products, customer products are also tested and analysed at the centre.

The testing equipment used at the centre includes three climatic chambers, a shock tester, two refrigerated incubators, two ovens, a deep-freeze and a HAST tester (Highly Accelerated Stress Test). Furthermore, the centre also provides facilities to conduct independent ESD and insulation tests. For specialised tests such as salt-spray or vibration testing, VS cooperates with the quality assurance experts at Panasonic's HQ in Osaka.

During the course of product development, all modules are subjected to standard tests that can be broken down into **service life, environmental** and **stress testing**. In addition, a Failure Mode & Effect Analysis (FMEA) is undertaken to define further tests designed to exclude product-specific risks.

Example: Service Life Tests

LED modules are operated (or switched) at 100% for 10,000 hours (1 year and 2 months). In parallel to this, the modules are operated at differing ambient temperatures (55 °C, 70 °C, 85 °C) – similar to an LM80 test – and gauged at regular intervals. Forward bias and chromaticity shifts are also measured in addition to light intensity.

This ability to conduct tests in a flexible manner during the development process saves development time, which is particularly advantageous in the fast-paced LED market. As a welcome side-effect, the fact that these analyses are carried out in cooperation between the technicians at the test centre and the engineers responsible for the product in question also serves to build up know-how, the importance of which should not be underrated. This know-how later goes to inform future developments and thus contributes to the ongoing improvement of VS LED products.

STANDARDS AND TECHNOLOGY

NEWS



Energy Labelling Directive for Lamps and Luminaires

The first EU Directive governing the labelling of energy consumption, 92/75/EC, was published in 1992. Devices were then rated in accordance with energy efficiency classes from A (very efficient) to G (high energy consumption). Directive 98/11/EC on "Energy Consumption Labelling of Household Lamps" was then published in 1998. The label was limited to household lamps and excluded certain lamp types such as reflector and low-voltage lamps. The efficiency of many devices was improved and labels were amended in accordance with the new directive, 2010/30/EU, which superseded directive 92/75/EC. This led to the introduction of the following new efficiency classes: A+, A++ and A+++.

The new implementation directive for lamps, which took effect on 26 September 2012 with (EU) No. 874/2012 for energy labelling of electrical lamps and now also for luminaires, came in response to this amendment.

Eco-compliant Design of Lamps with Bundled Light, LED Lamps and some Luminaires

Directive (EU) No. 1194/2012 governing the eco-compliant design of lamps providing bundled light, LED lamps and associated devices was published on 12 December 2012. Just like directive (EU) No. 874/2012, all parts of this directive are binding and automatically took effect on the 20th day after its publication in every member state of the EU. The directive stipulates requirements with regard to energy efficiency, operating properties and product information for lamps and control gear. In particular, the provisions contain specifications governing retrofit lamps. In certain cases, these requirements also have to be fulfilled by luminaires.

Standards Governing the Function of LED Luminaires and LED Modules with Service Life Details

The new standards governing function for LED luminaires (IEC 62722-1 and IEC 62722-2-1) and LED modules (IEC 62717) serve to satisfy EU requirements, e.g. with regard to directive 1194/2012. The basic standards for assessing operating properties of luminaires and modules are specified in the new standards, which are expected to be published in 2014. In the meantime, publically available standards IEC/PAS 62722-1, IEC/PAS 62722-2-1 and IEC/PAS 62717 apply.



Whenever an electric light goes on around the world, Vossloh-Schwabe is likely to have made a key contribution to ensuring that everything works at the flick of a switch.

Headquartered in Germany, Vossloh-Schwabe has been a member of the global Panasonic group since 2002 and counts as a technology leader within the lighting sector. Top-quality, high-performance products form the basis of the company's success.

Whether cost-effective standard components or tailor-made product developments are needed, Vossloh-Schwabe can satisfy even the most diverse market and customer requirements. Vossloh-Schwabe's extensive product portfolio covers all lighting components: LED systems with matching control gear units, OLEDs and state-of-the-art control systems (LiCS) as well as electronic and magnetic ballasts and lampholders.

A member of the Panasonic group **Panasonic**

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