SEC®

SYSTEM SUPPLIER

Professional Customised Solutions

Edition 2016-2018

LED Lighting
Luggage Racks
Ceiling Panels
Functional AL Profiles

LED Svietidlá
Batožinové police
Stropné panely
Hliníkové profily

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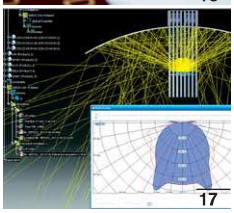
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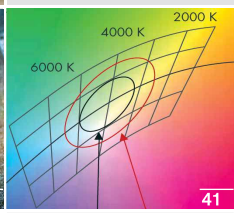

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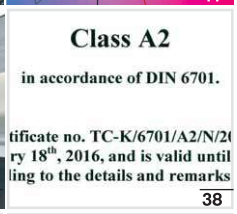

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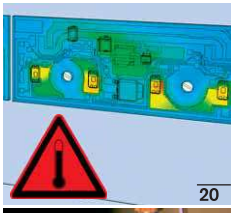
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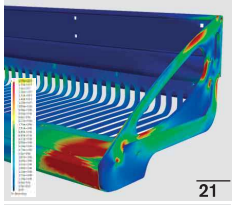
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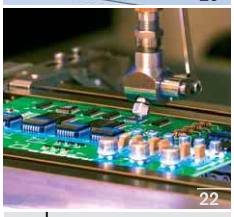
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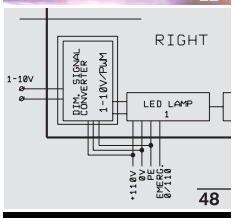

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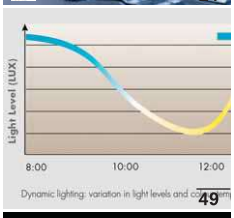

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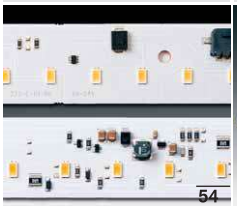
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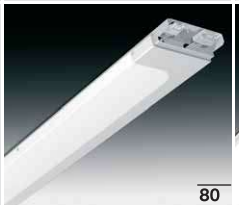

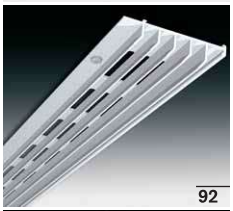

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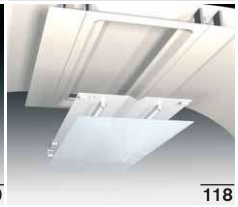
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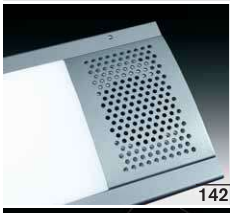
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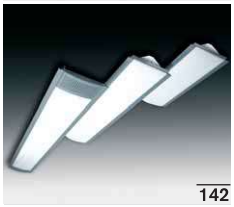
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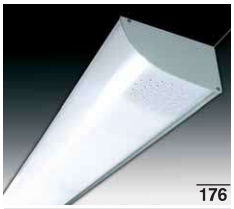
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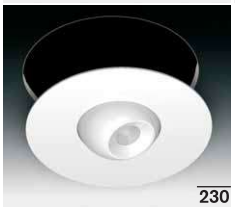
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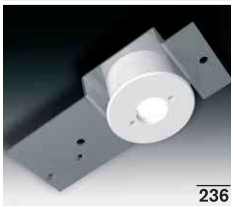
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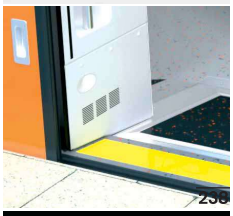
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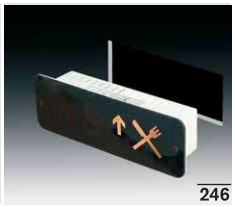
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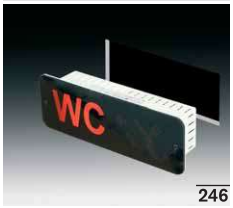

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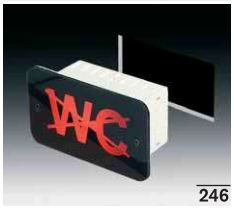

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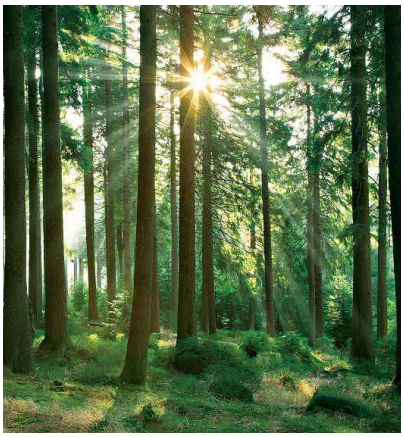
SYSTEM SUPPLIER

The level of luminaries' production has shifted upwards considerably, also thanks to SEC Lighting - one of the leading companies in the lighting industry. Thanks to the massive investments in production technologies, software, product development and ecology, SEC has become the region's leader and a serious global competitior.

Úroveň výroby svietidiel sa opäť raz zvýšila a to i vďaka firme SEC Lighting, ktorá masívnymi investíciami v oblasti výrobných technológií, softvéru, vývoja nových produktov a ekológie zaujala popredné miesto medzi výrobcami svetelnej techniky nielen v regióne ale i vo svete.

Today, SEC's area consists of **55000sqm** where also the newest additions to the SEC tech fleet have been placed: 3rd CNC AL profiles machining technology; new **CNC laser** cutting technology for all aluminium, steel and stainless steel parts, new we painting technology, PE powder painting line extension. Recently SEC has also open new production hall for electronic units which complies with the highest electronics production quality criteria including **ESD protection**. The electronics production including **LED modules** is base on HiTech **SMT SAMSUNG** lines followed by optical inspection quality gate and selective varnishing process in order to reach both the best performance and long lifetime. In addition, SEC has also invested in the latest software applications such as **ERP ORACLE** and **PDM ENOVIA SmarTeam** and applications intended to support the development of lighting fixtures **3DVIA Composer** and **OPTIS** for lighting simulations.

V súčasnosti sa výrobný závod SEC rozprestiera na ploche **55000m^2**, kde sú umiestnené najnovšie prírastky vo flotile technológií SEC: **laserové CNC centrum** na rezanie hliníkových, oceľových a nerezových komponentov, tretie CNC obrábacie centrum hliníkových profilov, nová lakovňa na báze "mokrých" farieb, rozšírenie PE lakovacej linky. Nedávno bola uvedená do prevádzky aj moderná hala na výrobu dosiek plošných spojov, ktorá spĺňa najvyššie kritériá pre elektrotechnickú výrobu vrátane **ESD ochrany.** Výroba elektronických jednotiek svietidel, vrátane **LED technológie**, je zabezpečená najmodernejšími technológiami 2x**SMT linka SAMSUNG**, ich naslednú optickú kontrolu a lakovanie povrchu pre dosiahnutie vysokej kvality a dlhej životnosti. Okrem investícií do výrobných technológií investovala firma SEC do najmodernejších softvérových aplikácií **ERP ORACLE EBS** a **PDM ENOVIA SmarTeam** a aplikácií na podporu vývoja **3DVIA Composer** a **OPTIS** pre svetelno-technické simulácie.

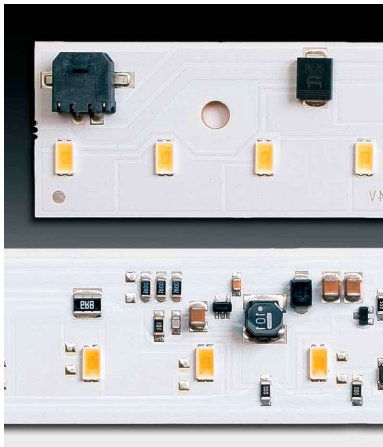


All these innovations have brought a new range of products using more increasingly progressive sources such as LEDs what ultimately led to the establishment of ECOTREND and considerably contributed to the protection of environment.

Be 'IN'... Be INnovative with the SEC Ligthting Fixtures

Všetky tieto inovácie priniesli nový rad produktov využívajúcich čoraz viac nové progresívne zdroje ako napríklad LED diódy, čím firma SEC zaviedla ECOTREND v produkcii svojich svietidiel a výrazne tým prispela k ochrane životného prostredia.

Buďte "IN"...
Buďte INovatívni so svietidlami firmy SEC



IRIS, ISO9001:2008

LRQA Business Assurance

CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

SEC spol. s r.o.
Jakuba Haška 11
949 01 Nitra
Slovakia

has been approved by Lloyd's Register Quality Assurance to the following Quality Management System Standards:

ISO 9001:2008

The Quality Management System is applicable to:

Design and development, manufacture and sales of emergency lighting, indoor lighting, electronic ballasts and lighting fixtures for public transport vehicles.

This certificate forms part of the approval identified by certificate number PRA 6005650.

Approval Certificate No: PRA 6005650/B

Original Approval: 21 February 2011
Current Certificate: 21 February 2014
Certificate Expiry: 20 February 2017

Issued by: Lloyd's Register EMEA, Prague office, for and on behalf of Lloyd's Register Quality Assurance Limited

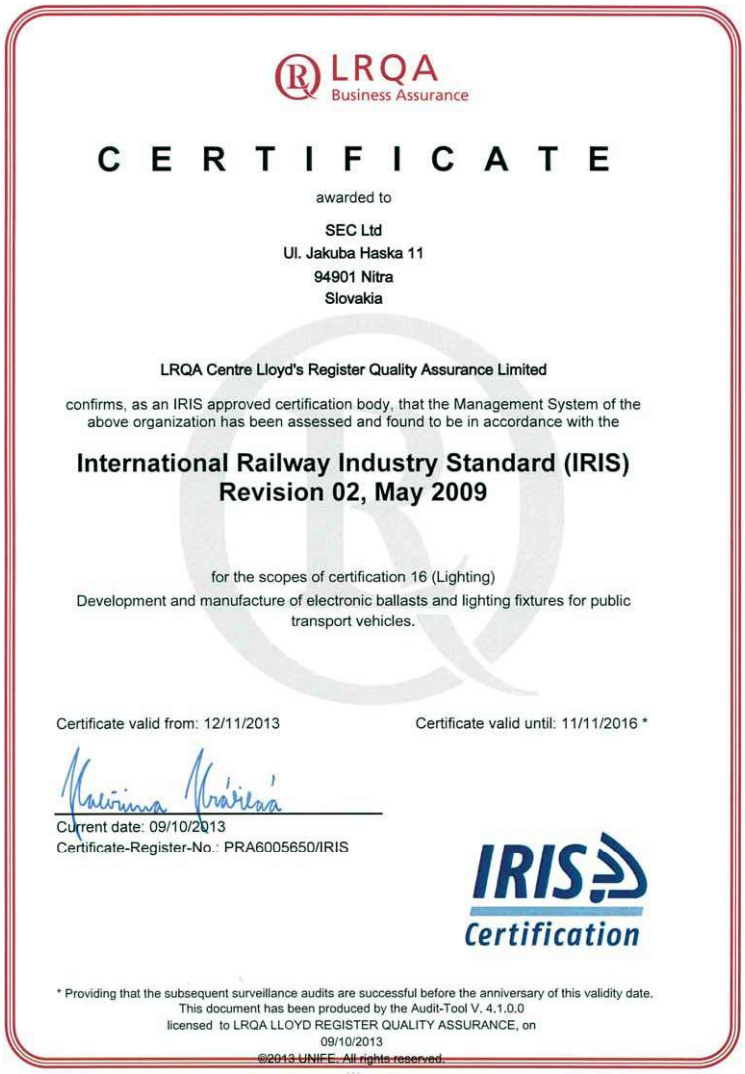
UKAS

This document is subject to the provision on the reverse.
Táborská 31, 140 00 Prague 4, Czech Republic
For and on behalf of 71 Fenchurch Street, London EC3M 4BS, United Kingdom
This approval is carried out in accordance with the LRQA assessment and certification procedures and monitored by LRQA
The use of the UKAS Accreditation Mark indicates Accreditation in respect of those activities covered by the Accreditation Certificate Number 001

SEC is the professional railway application interior components manufacturer that **owns all: IRIS, ISO9001: 2008 and DIN6701 A2 certificates** for all significant activities: from design, development and production up to marketing and services. All these activities are in tune with each other and thanks to this fact they create harmonious entirely, the company SEC, that brings to you the products of the highest quality and parameters.

With the products of SEC you are sure all the time you have made right decision.

Quality of our products proves it.



LRQA Business Assurance

C E R T I F I C A T E

awarded to

SEC Ltd
Ul. Jakuba Haska 11
94901 Nitra
Slovakia

LRQA Centre Lloyd's Register Quality Assurance Limited

confirms, as an IRIS approved certification body, that the Management System of the above organization has been assessed and found to be in accordance with the

International Railway Industry Standard (IRIS)
Revision 02, May 2009

for the scopes of certification 16 (Lighting)
Development and manufacture of electronic ballasts and lighting fixtures for public transport vehicles.

Certificate valid from: 12/11/2013
Certificate valid until: 11/11/2016 *

Current date: 09/10/2013
Certificate-Register-No.: PRA6005650/IRIS

IRIS Certification

* Providing that the subsequent surveillance audits are successful before the anniversary of this validity date.
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Firma **SEC** je profesionálny výrobca komponentnov pre interiér koľajových vozidiel, ktorý má certifikované všetky dôležité aktivity podľa noriem **IRIS, ISO9001:2008 a DIN6701 A2.** Od návrhu, vývoja a výroby až po organizáciu predaja a servisné služby. Všetky činnosti do seba zapadajú a tak vytvárajú pevný celok s presne definovanými vzťahmi. Firma SEC Vám vďaka tomu prináša výrobky tej najlepšej kvality a parametrov. So SEC si môžete byť istí, že ste učinili správne rozhodnutie.

Kvalita našich výrobkov je toho dôkazom.

CNC Stud Welding

soyer

3x CNC Aluminum Profiles Machining

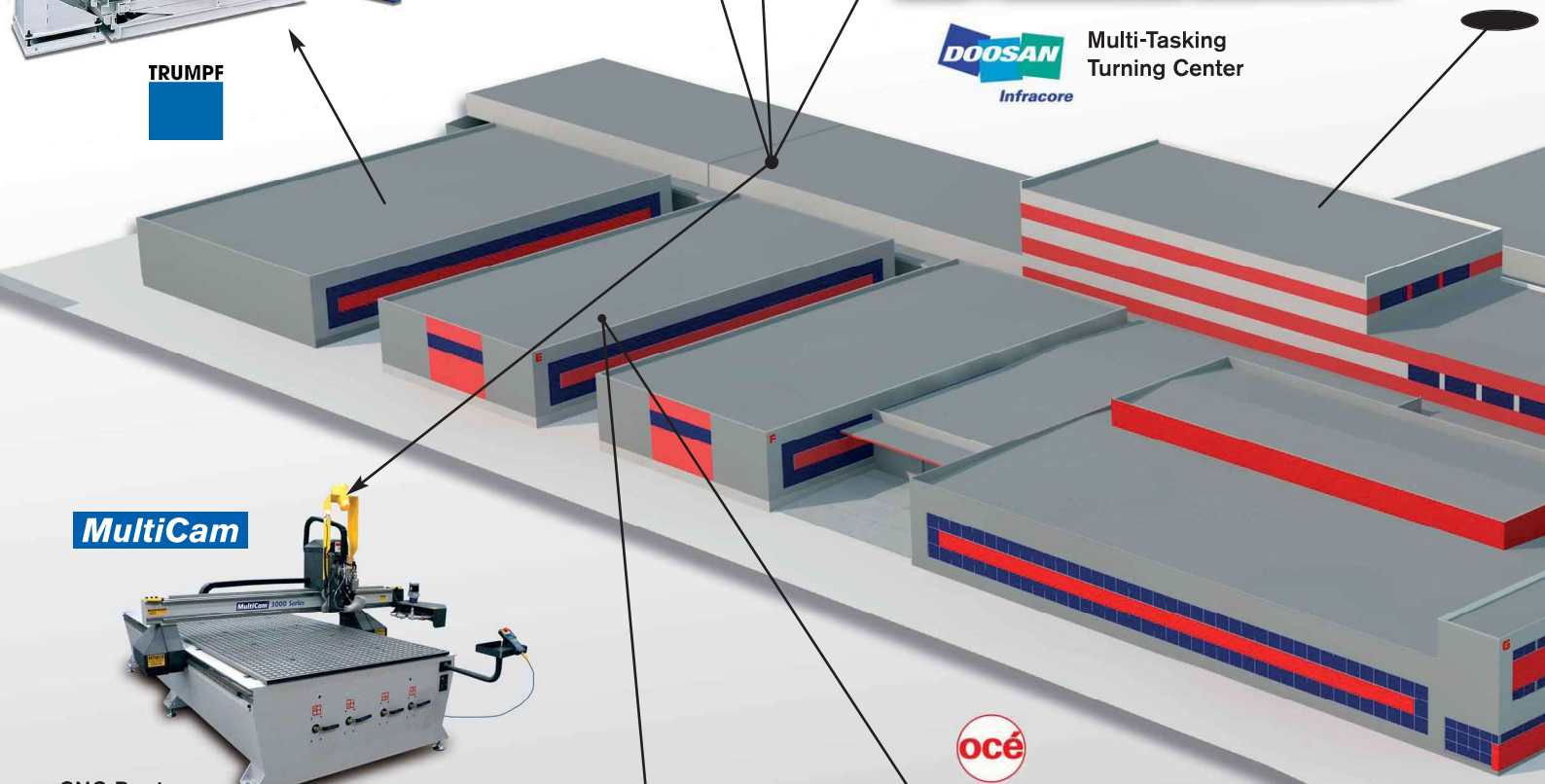
elumatec

7x CNC Punching & Bending Machines

TRUMPF

DOOSAN Infracore

Multi-Tasking Turning Center



MultiCam

CNC Router for PC sheet cutting

sei Laser

2x Laser Cutting Machines:

- 1x for acrylic sheets cutting
- 1x for metal sheets cutting

océ

Printing for Professionals

Flatbed UV Printer

MARKETING ENGINEERING PROCUREM.

Photometric Lab

18x Automatic stocking systems

TRI7500TL
Optical Inspection

Lead-free
Soldering

kirsten
soldering ag

Wet & Powder Painting
Technology
GALATEK

SAMSUNG

Pick & Place
SMT Technology
Electronics Production

Design & Engineering

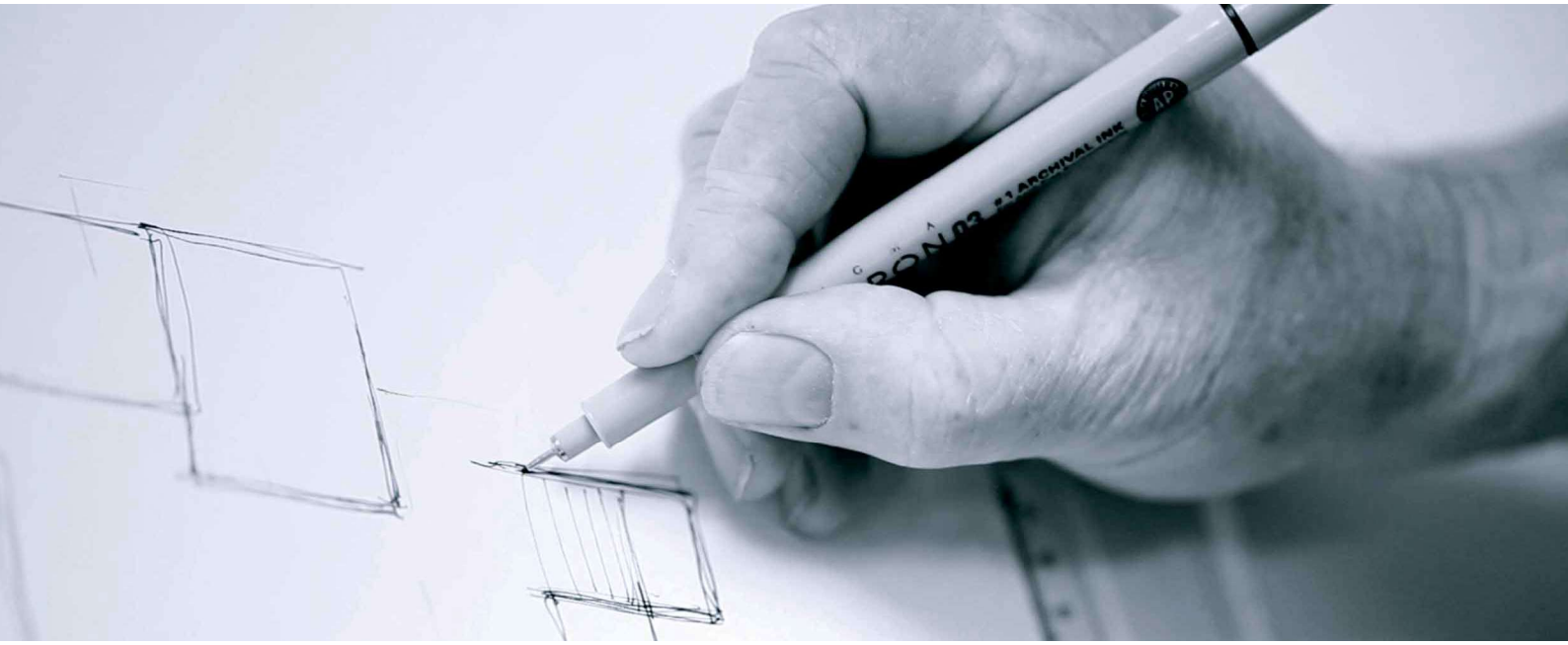
CATIA
ENOVIA
3DVIA

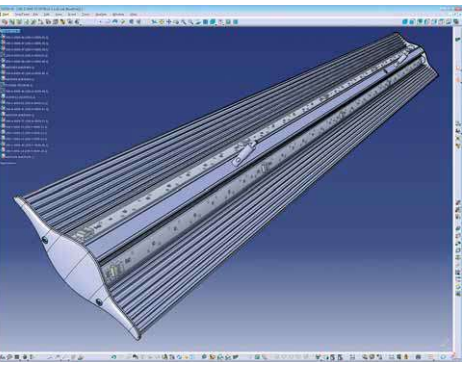
ERP
ORACLE®

OPTIS
Lighting Simulations

QUALITY
PRODUCTION
SALES
LOGISTICS

DESIGN & PDM

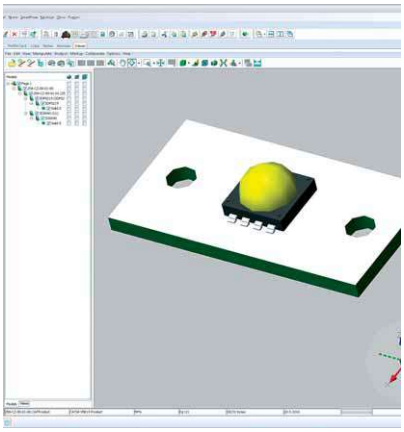




The demand to increase the feed-back speed between market requests and production has led SEC to build up a Hi-Tech base in the field of all development, design and the production process. For the needs of both development and the design of mechanical product parts, SEC uses 3D software and visualization based on **CATIA-CADAM**. This technology allows us to create the new product design before the product sample is made. The possibility of simulating the lighting fixture behaviour is another advantage of this technology.

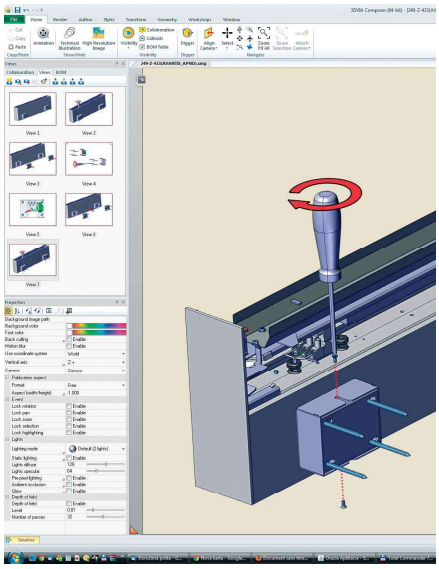
Potreba zrýchlenia odozvy medzi požiadavkami trhu a realizácie finálnych produktov viedla firmu SEC k budovaniu modernej technologickej základne v oblasti vývoja, technickej prípravy výroby i samotného výrobného procesu. Pre vývoj a konštrukciu mechanických častí výrobkov SEC používa progresívnu technológiu 3D objemového modelovania s následnou vizualizáciou v softvérovom prostredí **CATIA-CADAM**. Táto technológia nám umožňuje hneď na prvom stupni vývoja výrobku predložiť tvarové a konštrukčné riešenie verne zobrazujúce predpokladané riešenie potenciálnemu odberateľovi. Nemalou prednosťou je možnosť simulovať budúcu aplikáciu vo virtuálnom prostredí so stanovením optimálnych svetelno-technických vlastností.

Dessault Systémes' **3DVIA Composer** is a desktop application for revolutionizing the creation of product deliverables. Animation including kinematics and reverse-kinematics, as well as high-resolution raster images including BMP, JPG, PNG and TIF files, can be created easily. Producing 2Dline art as SVG and CGM files quickly and easy with 3DVIA Composer's built-in technical illustration capabilities. 3DVIA Composer allows users to control and manage access to their intellectual property in 3DVIA Composer-generated deliverables. With "Right Manager" settings, content creators can manage access control when playing content with 3DVIA Composer Player and can also use patented "Secure3D" technology to prevent copying or theft of the intellectual property.

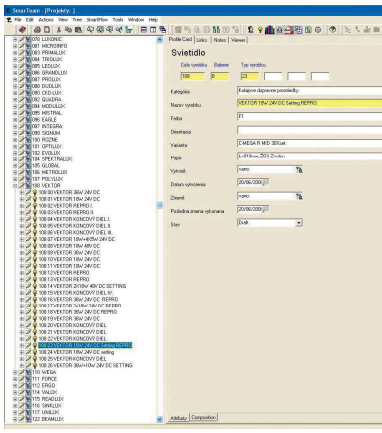


Dassault Systémes' **ENOVIA SmarTeam** delivers world-class, rapid-value Product Lifecycle Management engineering departments of large enterprises. Its customer enjoy rapid business benefits through optimised control over diverse product data across sites and product-centric processes that drive collaboration across design and engineering domains, the entire enterprise, and with supply chain partners. ENOVIA SmarTeam's robust offering is simple todeploy, flexible and offers low total costs of ownership.

3DVIA Composer od Dessault Systémes' je desktop aplikácia určená na revolučné riešenie tvorby produktových výstupov. Animácie, ktoré zahŕňajú kinematiku a reverznú kinematiku, ako aj rastrové obrázky s vysokým rozlíšením vrátane BMP, JPG, PNG a TIF, je veľmi ľahké vytvoriť. Tvorba 2D čiarových grafík ako SVG a CGM je rýchla a jednoduchá vďaka zabudovaným schopnostiam technickej ilustrácie. S nastaveniami 'Right Manager' môžu tvorcovia obsahu pri prehrávaní obsahu spravovať prístup a taktiež môžu použiť patentovanú Secure3D technológiu, aby sa tak zabránilo kopírovaniu alebo krádeži duševného vlastníctva.



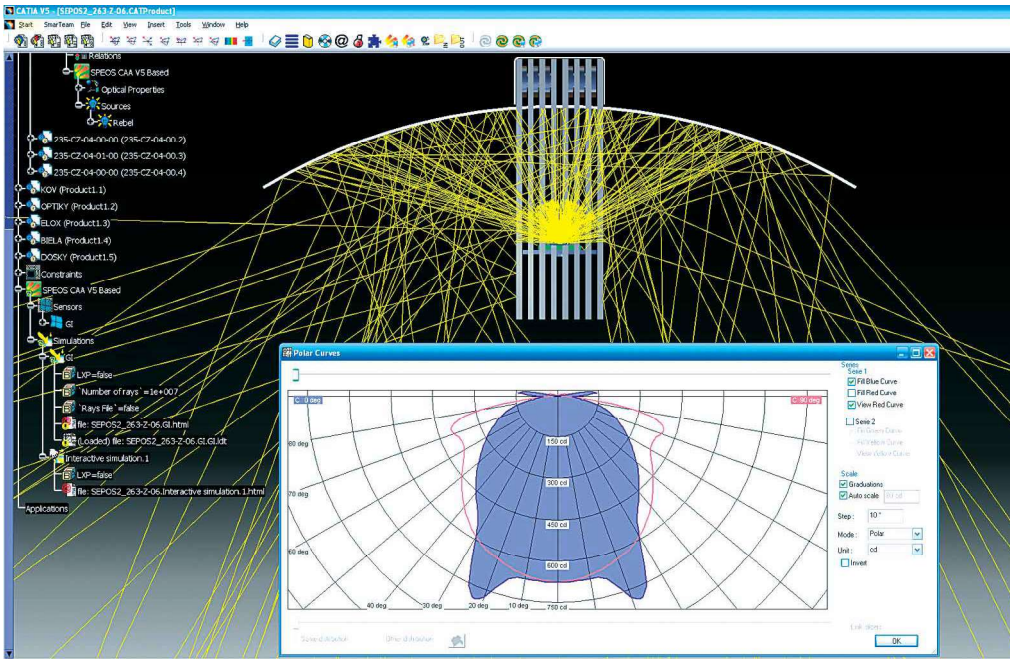
ENOVIA SmarTeam od Dassault Systéme prináša technickým oddeleniam veľkých podnikov produkt svetovej triedy a rapídnej hodnoty: Product Lifecycle Management (riadenie životného cyklu produktu). Zákazník užíva obchodné výhody, ktoré mu prináša optimalizované ovládanie rozličných produktových dát a produktovo zamerané procesy, ktoré poháňajú spoluprácu naprieč konštrukčnými a inžinierskymi doménami, celým podnikom a dodávateľskými reťazcami.

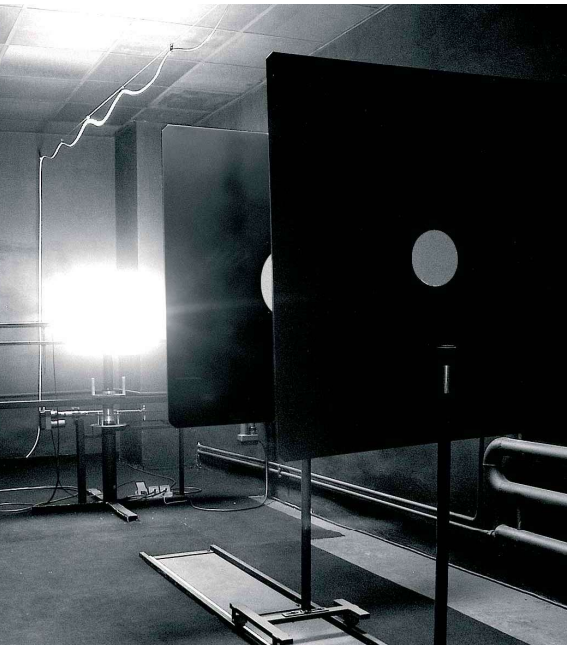


LIGHTING SIMULATIONS

SEC is one of few, lighting fixture producers that owns complete lighting simulation software and photometric lab for measuring lighting parameters. Lighting simulation **OPTIS** is the world's leading editor of **CATIA** integrated solutions providing physics-based simulation and optimization of lighting systems. By taking into account human vision and the physical properties of materials, OPTIS tools enable us to optimise lighting performance, visualise lit and unlit appearance, and collaboratively validate colours, textures and shapes. Later can be the results proved by real lighting measurements in our photometric lab.

Firma SEC patrí medzi popredných výrobcov svetelnej techniky, ktorí disponujú moderným softvérom a fotometrickým laboratóriom. Softvér **OPTIS** je svetový leader v simulácii svetelno-technických parametrov svietidiel v prostredí integrovanom pod CAD systémom **CATIA**. Vďaka tomu v reálnom čase už počas vývoja vieme simulovať a optimalizovať svetelný systém využívajúc fyzikálne parametre. OPTIS ponúka možnosť vizualizovať svietidlo rozsvietené/zhasnuté a vďaka simulácii ľudského videnia dokáže zobraziť reálne videné farby, tvary a povrchy. Následne možu byť tieto výsledky overené v našom svetelno-technickom laboratórii na reálnej vzorke svietidla.





Thanks to 12m long goniofotometer we are able even within development process to verify photometric parameters of new lighting. All of this is done with special emphasis on harmony of design and optimal lighting parameters. Optimal lighting parameters of SEC fixtures are the result of long-time measurements and conseque analysis by SPEOS. These results determine the fixture design. Lighting fixture efficiecy is measured by sphere integrator with 3m diameter

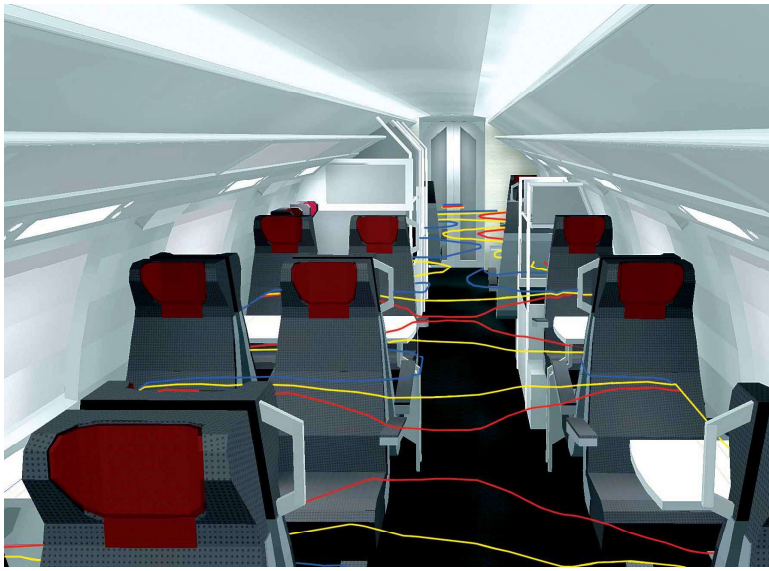
Fotometrické laboratórium na meranie fotometrických parametrov svietidiel a svetelných zdrojov. Pomocou goniofotometra s dĺžkou 12m je možné už v etape vývoja verifikovať fotometrické vlastnosti vyvíjaného svietidla s dôrazom na súlad designu s optimálnymi svetelno-technickými parametrami, ktoré sú výsledkom dlhodobých meraní a následných analýz v softvérovom prostredí SPEOS, ktorých výsledky sú premietnuté do ich konštrukcie. Účinnosti svietidiel sú merané v guľovom integrátore s priemerom až 3m.

We bring you complex software support based on professional sotware **OPTIS** which enables you to design lighting project which takes into the consideration all necessary factors in order to reach optimal power consumption balance.

Ask SEC for LIGHTING SIMULATION on lab@sec.sk

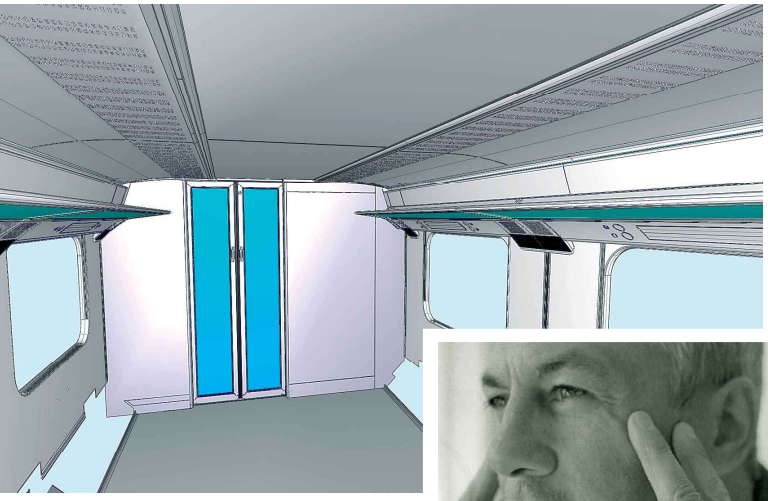
Na základe nameraných parametrov Vám prinášame komplexnú podporu, založenú na PC profesionálnom sotvére **OPTIS**, pomocou ktorých Vám navrhneme optimálnu svetelnú sústavu s ohľadom na všetky potrebné faktory s cieľom dosiahnuť komfort osvetlenia pri optimálnej energetickej bilancii.

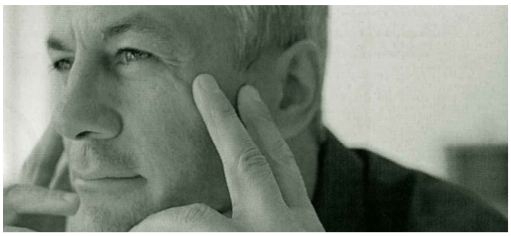
Vyžiadajte si pre váš projekt svetelno-technický výpočet na lab@sec.sk



SEC Lighting

LIGHTING CALCULATIONS





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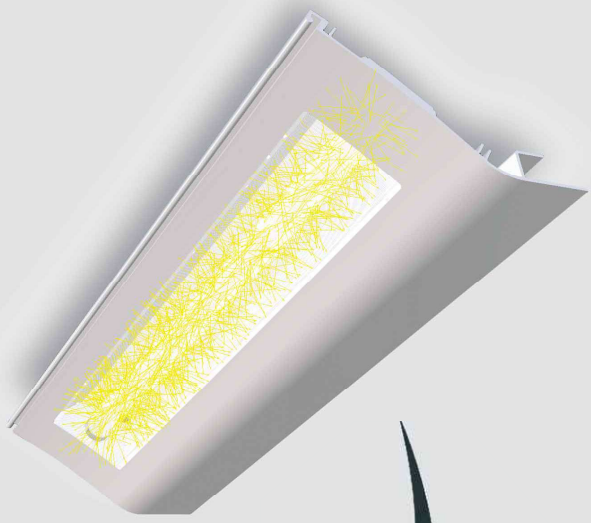
Firma SEC patrí medzi popredných výrobcov svetelnej techniky, ktorí disponujú moderným **softvérom pre kalkuláciu svetelno-technických parametrov** svetelnej sústavy. Softvér **OPTIS** je svetový leader v simulácii svetelno-technických parametrov svietidiel v prostredí integrovanom pod CAD systémom **CATIA**. Vďaka tomu v reálnom čase už počas vývoja vieme simulovať a optimalizovať svetelný systém využívajúc fyzikálne parametre. OPTIS ponúka možnosť vizualizovať svietidlo rozsvietené/zhasnuté a vďaka simulácii ľudského videnia dokáže zobraziť reálne videné farby, tvary a povrchy.

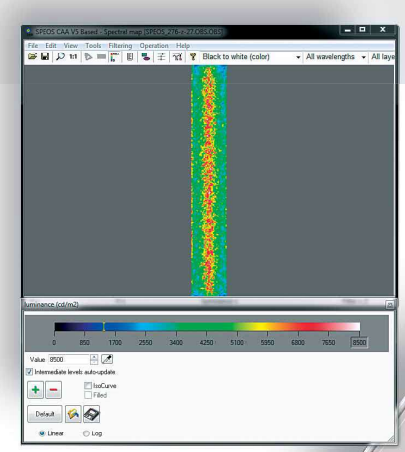
Beam propagation / Ray tracing:

This module allows us to create any optical model by applying optical properties to all surfaces, materials and light sources. After defining the optical mockup, we will be able to visualize the rays as they propagate in the mechanical system. This module comes complete with intelligent abilities to create interactive simulations where rays are propagated through 'active' components in the 3D view. Moreover the rays are propagated with their wavelength information for further analysis by us. Advanced scattering, anisotropic surface & diffusive material generator are also available.

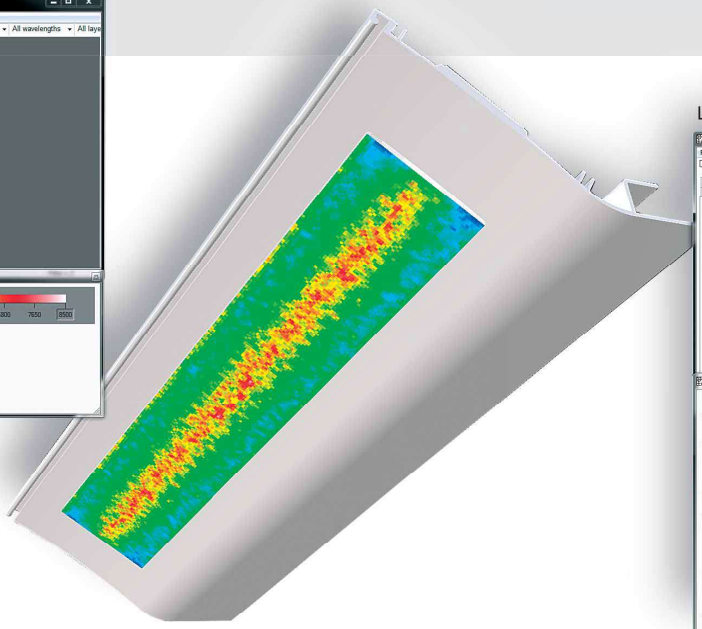
Distribúcia svetelných lúčov / Ray tracing:

Tento modul nám dovoľuje vytvorenie optického modelu definovaním optických vlastností na všetky povrchy, materiály a použité svetelné zdroje. Po nadefinovaní optického modelu interiéru vagóna, sme schopný vizualizovať distribúciu svetelných lúčov priamo v 3D modeli. Tento odel nám dáva schopnosť vytvoriť / vizualizovať interaktívnu inteligentnú distribúciu svetla v mechanickom modeli v nadväznosti na všetky aktívne prvky v 3D. Navyše svetelné lúče sú definované aj s ich vlnovou dĺžkou pre ďalšie analýzy.
Je možné využiť aj generátor rozptylu, anyzotropického povrchu a difúzných materiálov.

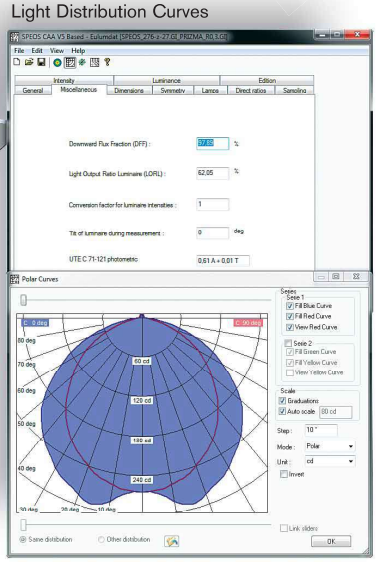




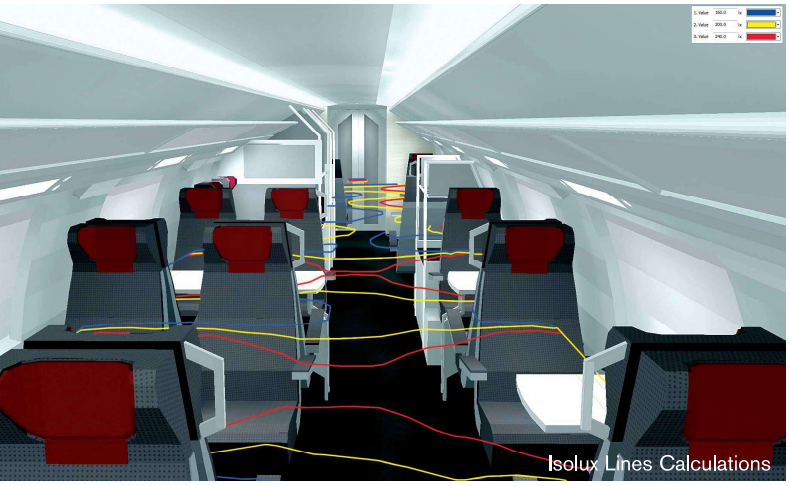
Brightness Analysis

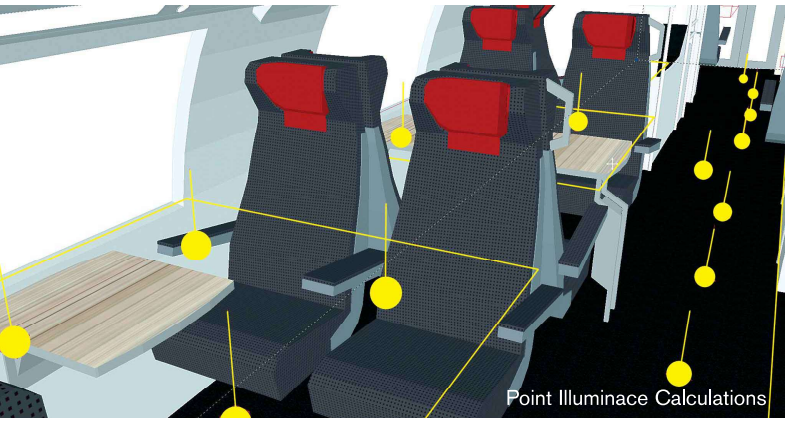


Light Distribution Curves



LIGHTING CALCULATIONS


Isolux Lines Calculations


Point Illuminace Calculations

Illumination / Photometry:

This module allows you to simulate and analyze the photometric efficiency of your lighting systems. This is made possible through several tools for illuminance (lux, footcandle....) , luminance (cd/square meter), intensity (candela...).
Propagation takes into account optical properties for surfaces, materials, and source emission. Results (photometry maps, cross-sections, point measurements..) can be used to verify compliance with International Standards or specifications, and even exported to other software solutions.

Osvetlenosť / Fotometria:

Tento modul nám dovoľuje simulovať a analyzovať fotometrickú efektvitu nášho svetelného systému. Toto je možné pomocou niekoľkých nástrojovpre osvetlenosť (lux, candela), svietivosť, jas,... (cd/m^2,cd,...). Výpočet a samotné zobrazenie berie do úvahy optické vlastnosti povrchov, materiálov a svetelný tok svetelného zdroja. Výsledky (fotometrické mapy, rezy, bodové merania) sú použité na verifikovanie súladu s normatívnymi požiadavkami a špecifikáciou zákazníka.

Customer orientated lighting systems comply with both optimal illumination parameters and design requirements of our customers. **SEC** always offers you the possibility to create lighting systems **from an idea to delivery.**

Zákaznícky orientované svetelné systémy SEC sú v súlade s optimálnymi svetelno-technickými parametrami a dezajnovými požiadavkami našho zákazníka. **SEC** Vám ponúka **komplexné riešenie vášho projektu**, od prvotnej myšlienky po sériovú výrobu.

Illuminated Interior Rendering

EN13272 COMPLIANCE

SEC Electronics & Lighting

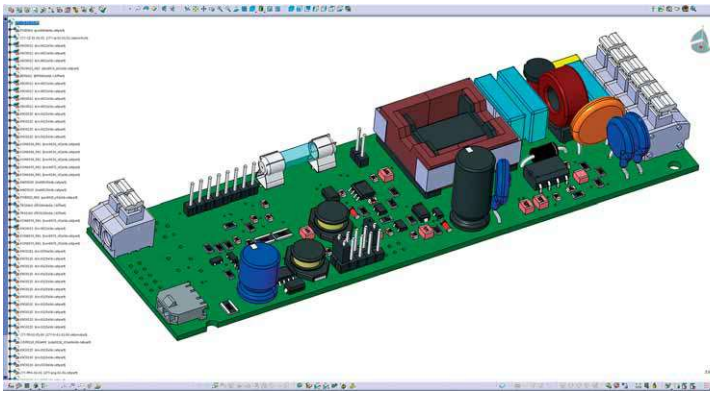
THERMAL ANALYSIS

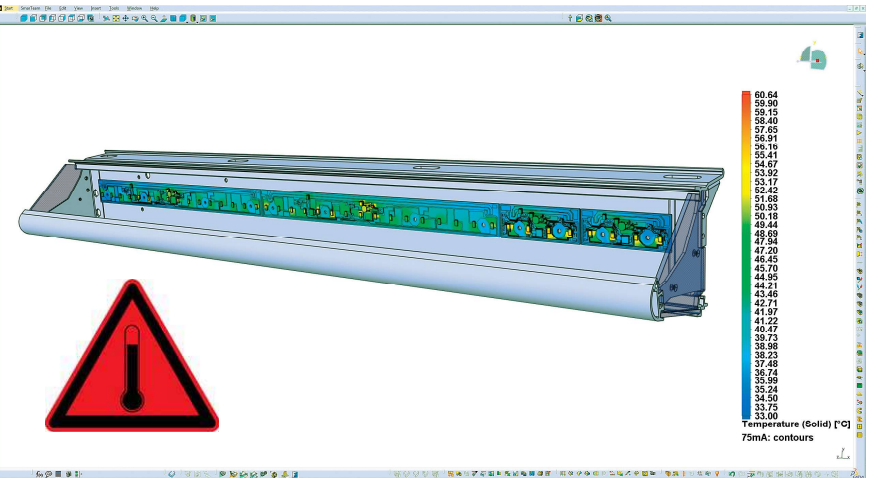
- **IMPROVE** product performance, functionality and reliability
- **REDUCE** physical prototyping and production costs
- **MINIMIZE** risk of making design mistakes

During the enginnering and design process of a new product SEC pays high attention on the **reliability and life time parameters of an electronics including the LED modules**.
In order to manufacture high quality electronics we regulary use powerful software tool for thermal analysis which allows us to identify and avoid all risks due to the thermal load of any electronic compoment.

It enables broadbased mechanical design engineers to perform fluid-flow and heat transfer simulations directly from their 3D CAD models:

- **Reduce prototyping costs drastically by replacing physical tests with virtual tests;**
- **Increase product quality while reducing production costs by helping your team reduce errors and create better products; and**
- **Shorten the development cycle by enabling your team to conduct "what-if" tests quickly.**





Electronics Module

The Electronics Cooling Module contains several features that make **thermal management simulations** of electronic systems more accurate. Besides extended databases of fan curves and packaging material or 2-Resistor components, it also contains specialized features and physics such as a PCB model and joule heating due to current flow.
The Electronics Cooling Module is ideal for more detailed simulations of electronics systems.

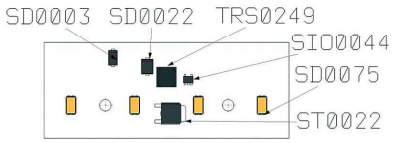
LED Module

In order to obtain accurate results in lighting applications, special physics need to be considered. The LED Module is not only suitable for LED lighting applications but also for any other lighting applications. It contains the necessary radiation models such as Discrete Ordinate and Monte Carlo and provides capabilities to absorb radiation in transparent materials and considers refraction such as in lenses.
The LED Module is the ideal module for the lighting industry and especially for LEDs, it includes a new unique LED model that provides the junction temperature and hot lumen.

Results: Normal mode 75mA

Critical components

SEC number	Name	Max temperature - analysis	Max temperature - datasheet
SIO0044	AL8807	59,5°C	150°C
TRS0249	NRS6045	52,5°C	105°C
SD0022	SS26	46,5°C	150°C
SD0003	BYG10M	54,5°C	150°C
ST0022	IRFR420	45°C	150°C
SD0075	DURIS E5	59°C	120°C



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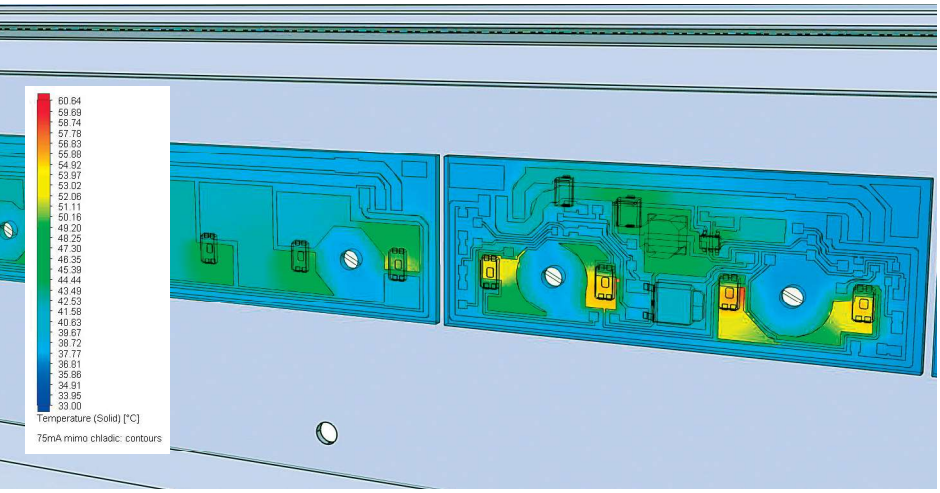


RAMS/LCC

As a result of this analysis we gain all relevant information needed for **RAMS/LCC analysis** (refer also to page No.45 for more details).
SEC LCC analysis gives you the information about all service and maintenance costs needed during the whole lifetime of a train.
Thanks to this SEC is able to find the best ballance between all the lighting performance, reliability and **Total Cost of Ownership (TCO)**.

You can be sure you get the pefect product with high level of quality and reliability.

STRUCTURAL ANALYSIS

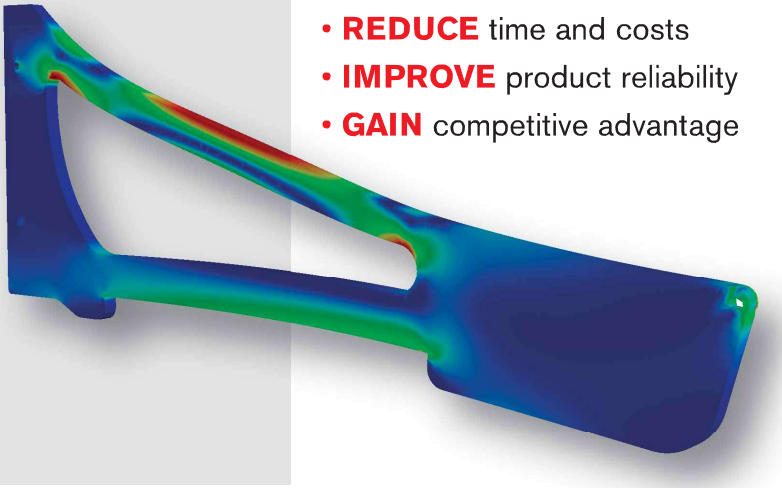
Besides the thermal analysis SEC pays high attention on the **structural analysis,** especially for both luggage racks and ceiling parts. SIMULIA provides us the complete design-integrated simulation capabilities within the CATIA V5 design environment. Our designers use the familiar CATIA user interface to perform analysis directly on their master reference model in CATIA. The combined CATIA Analysis and the SIMULIA Extended Analysis product suites offer us the possibility to accurately size our designs and quickly evaluate the real world performance during the design phase.

Generative Part Structural Analysis

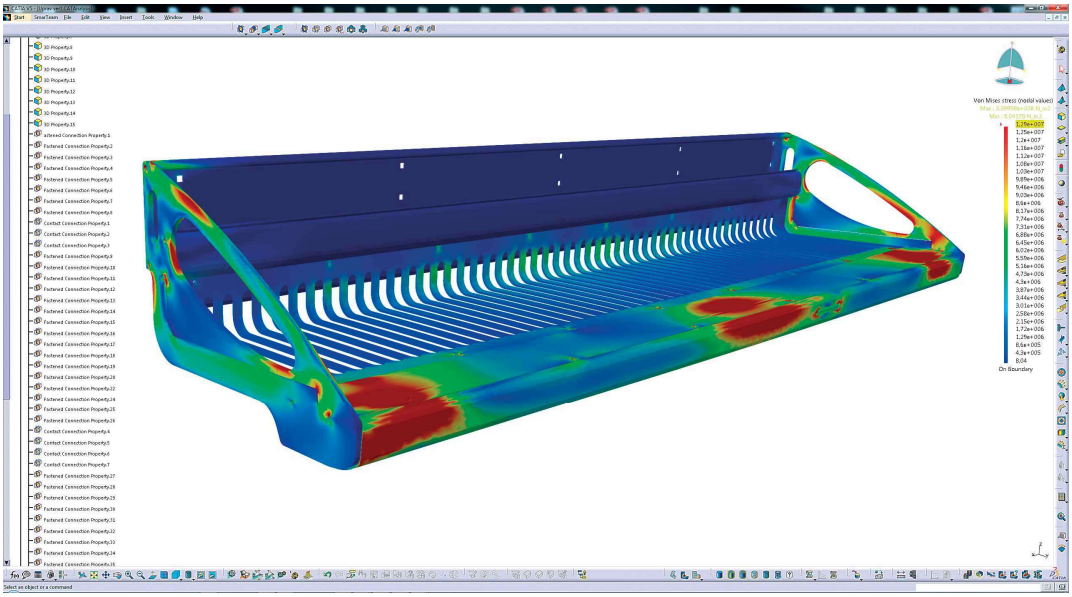
Generative Part Structural Analysis allows us to understand how our designs behave and to accurately calculate the displacements and stresses within the part under a variety of loading conditions. It also allows the vibration characteristics of parts to be assessed by calculating the natural frequencies and the associated mode shapes. Analyses can be performed on volume parts, surface parts and wireframe geometries.

Highlights:

- Allows our designers to more accurately size parts and understand the mechanical behavior of their designs
- Provides rapid and accurate assessment of stress, displacement, and vibration characteristics• Analysis is performed within the CAD environment so the analysis model is fully associative with the CAD geometry and specification
- Tightly integrated with knowledge-based engineering
- Seamless analysis data management within PLM



- **REDUCE** time and costs
- **IMPROVE** product reliability
- **GAIN** competitive advantage



Generative Assembly Structural Analysis

Generative Assembly Structural Analysis extends the capability of Part Structural Analysis, allowing our designers to analyze assemblies as well as individual parts. The analysis of assemblies, including an accurate representation of the way the parts interact and are connected, allows for more realistic and accurate simulation.

Highlights:

- Achieves fast and accurate structural and modal analysis of an assembly
- Uses the assembly constraints and parts material specifications from the design
- Provides a wide range of connections and interactions
- Simulates the effect of bolt tightening and pressure fitting
- Supports assembly of analysis for efficient concurrent engineering

Nonlinear Structural Analysis

Nonlinear Structural Analysis extends the CATIA V5 Analysis capabilities to allow more advanced simulation that includes nonlinear effects, such as large displacements and material nonlinearity. Material plasticity, typical of metals, can be modeled, as can the nonlinear elasticity in hyperelastic materials like rubber. Nonlinear Structural Analysis also provides more advanced contact capability including the automatic creation of contact surfaces based on their geometric proximity.

Highlights:

- Includes the effect of large displacements
- Allows the plastic deformation of materials to be modeled
- Models the nonlinear elasticity of rubber and other hyperelastic materials
- Multi-step analysis allows the effect of multiple sequential loadings to be analyzed
- Provides advanced contact capability including automatic contact detection
- Performs thermal stress analysis when used in conjunction with Thermal Analysis

Electronics Production

ESD PROTECTED AREA

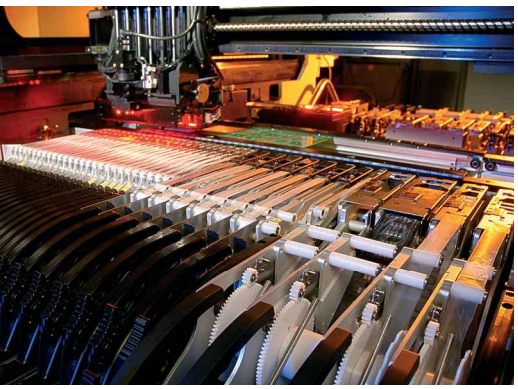
SMT ASSEMBLY

SEC uses 2 SMT electronics production lines. This technolgy ensures a highest level of quality, minimalizes human errors and allows us to manufacture very **sophisticated electronic designs.** The automatic assembly machines Samsung SM320 and SM421 offer all:

- High productivity (16000CPH+21000 CPH)
- high flexibility (components from 0201 up to 55x55mm or connector up to length 72 mm)
- high assembly accuracy to 30microns at 3 sigma for QFP and IC components with the fine pitch

Firma SEC výrába všetky elektronické podzostavy svietidiel vrátane LED modulov na špičkovej SMT technológiach, ktorých srdcom sú **SAMSUNG** osadzovacie stroje. Použitie špičkovej technológie povrchovej montáže dosiek plošných spojov (**SMT**) zabezpečuje **vysokú kvalitu** a opakovateľnosť výrobného procesu, minimalizuje chyby ľudského faktora a umožňuje výrobu i vysoko náročných technických riešení. SMT automaty Samsung SM320 a SM421 ponúkajú:

- vysokú produktivitu (16 000 CPH + 21 000 CPH),
- vysokú flexibilitu (komponenty od 0201 do 55x55 mm, resp. konektory až do dĺžky 72 mm)
- vysokú osádzaciu presnosť až 30 microns pri 3 sigma pre QFP a IC komponenty s jemnou roztečou.



SOLDERING

Lasting reliability of our electronic units is ensured through utilization of the most up to date solder wave technology covered by nitrogen atmosphere by **KIRSTEN.**

PÁJANIE

Dlhodobá **prevádzková spoľahlivosť** vyrábaných elektronických častí svietidiel SEC je zaručená použitím jednej z najmodernejších technológií spájkovania dutou cínovou vlnou v dúsíkovej ochrannej atmosfre od firmy **KIRSTEN.**

RoHS COMPLIANT 2002/95/EC

Electronics Production

ESD PROTECTED AREA

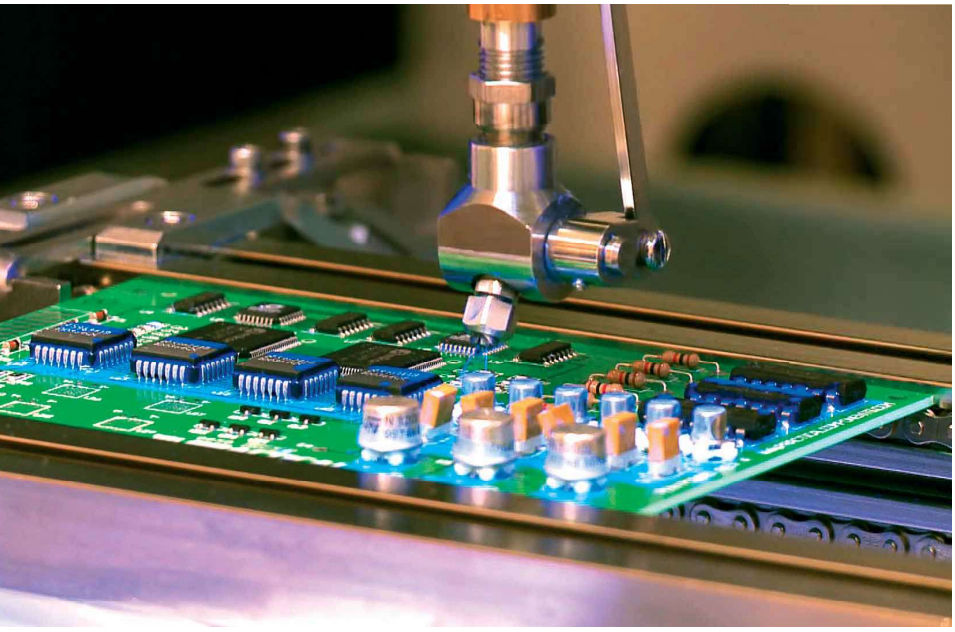
Nordson ASYMTEK

PCB COATING LINE

The coating machine Asymtek SL-940 E is an absolute market leader and number One on the marker in the filed of selective coating of PCB. The device is equipped with both a patented filmcoat applicator for surface coating application with a very exact definition of the application edge and a precise jet applicator for the fine spot application on the areas with high selectivity. For the productivity increase and the possibility of further handling with the coated PCB the device is supplied with the curing oven Asymtek TC-2400 V4 which combines the infra-red heating with the convection evacuation of solvent vapours. Both devices are equipped with the air flow monitoring what prevents the formation of explosive environment and so they ensure a safe operation.

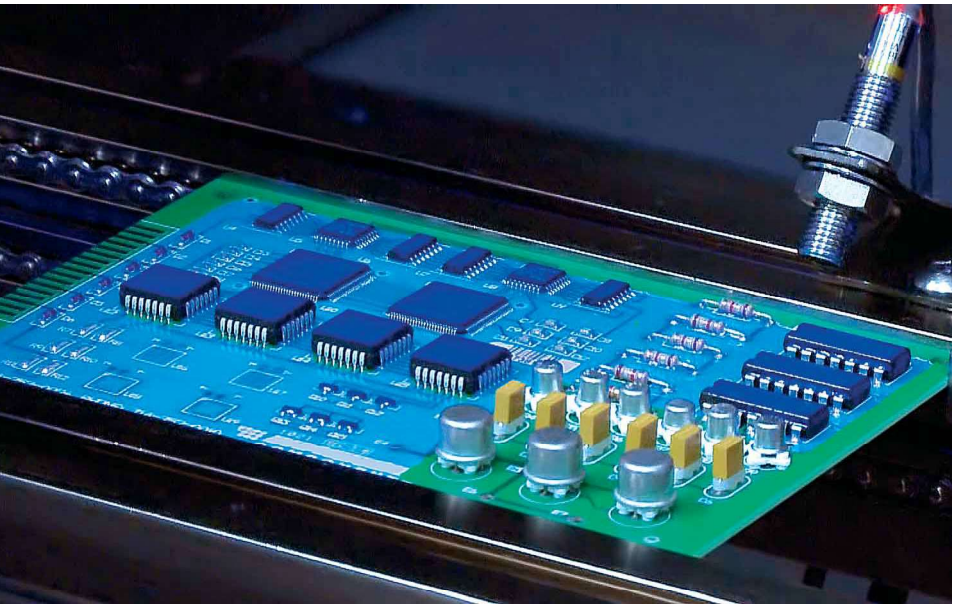
LAKOVACIA LINKA DPS

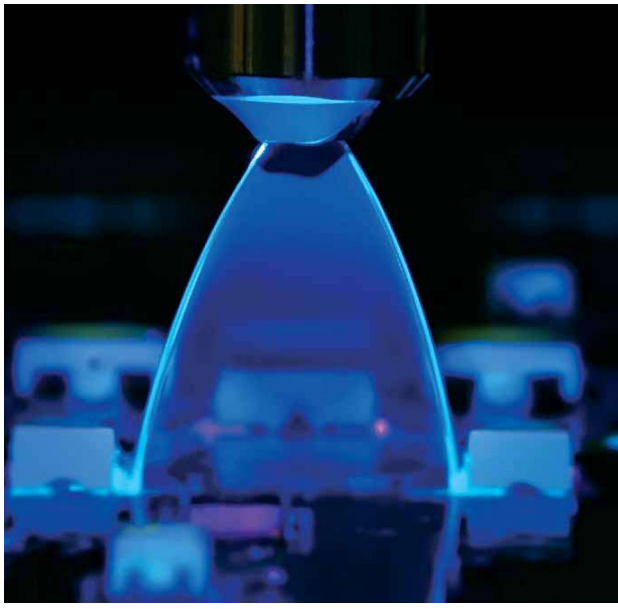
Lakovacie zariadenie Asymtek SL-940 E je absolútnou špičkou a jednotkou na trhu v oblasti selektívneho lakovania DPS. Zariadenie je vybavené patentovaným filmcoat aplikátorom pre plošné nanášanie laku s veľmi presnou definíciou okraja nástreku a precíznym jet aplikátorom pre jemné bodové nanášanie na miestach s vysokou selektivitou. Pre zvýšenie produktivity a okamžitú možnosť ďalšej manipulácie s lakovanými DPS je zariadenie doplnené o vytvrdzovaciu pec Asymtek TC-2400 V4, ktorá kombinuje infračervený ohrev s konvekčnou evakuáciou pár rozpúšťadiel. Obe zariadenia sú vybavené monitorovaním prietoku vzduchu, čím zabraňujú vzniku výbušného prostredia a tak zabezpečujú bezpečnú prevádzku.



Surface Coating FilmCoat Applicator Detail

Detail “FilmCoat” aplikátora pre plošné nanášanie laku





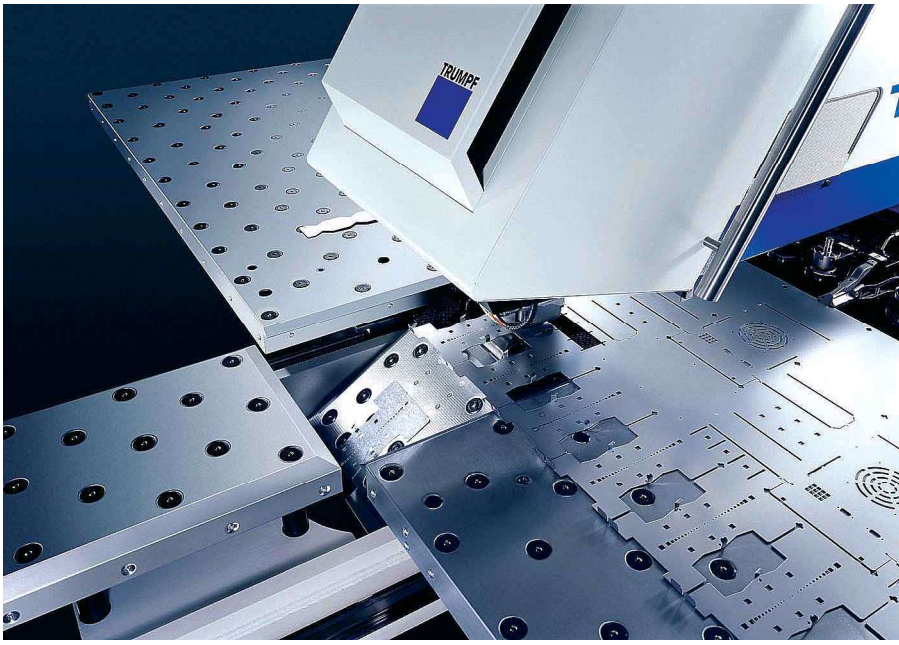
CNC Metal Sheet Processing

CNC PUNCHING

High level of flexibility in the field of **METAL PLATE PROCESSING** has been reached by using of one of the most modern **CNC technology by TRUMPF.** SEC uses the fleet of CNC punching machines which allow us to reach high level of accuracy, speed and flexibility. The working area is **2500x1250mm**, **max sheet thickness 8mm** and max puncing force **220kN.** Tha max puncing speed (E=1mm) 1400/min. Thanks to this we are also able to produce all metal parts according to customers individual requirements.

CNC DIEROVANIE

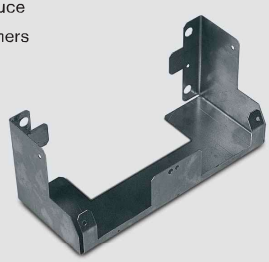
Vysoká flexibilnosť výroby kovových dielov a tým i finálnych výrobkov je zaručená použitím jednej z **najmodernejších CNC technológií na spracovanie plechu** od firmy **TRUMPF.** Firma SEC využíva celú flotilu CNC vysekávacích strojov dosahujúcich vysokú presnosť, rýchlosť a flexibility výroby. Max rozmer pracovnej plochy je **2500x1250mm, materiál do hrúbky max 8mm** a max raziaca sila do **220kN.** Max rýchlosť razenia je až 1400/min (E=1mm). To všetko dáva predpoklad pre výrobu dielov, ale aj kompletných svietidiel aj podľa individuálnych požiadaviek našich zákazníkov.



CNC Metal Sheet Processing

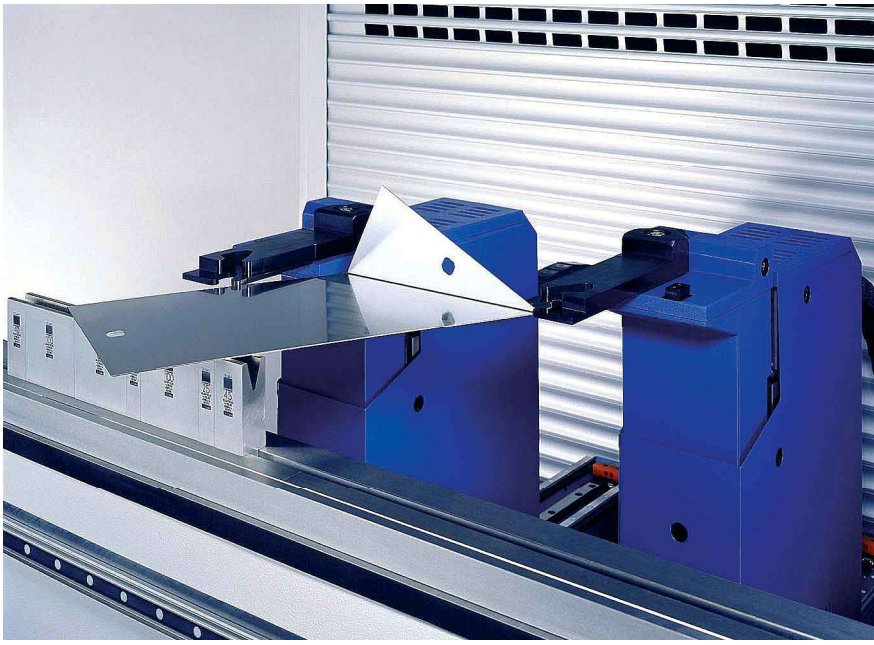
CNC BENDING

All quality, flexibility and produtivity are the most important features we need on a daily base to be able to manufacture all standard products but also the customised ones based on your requirements.
SEC uses **TRUMPF bending machines fleet** which allows us to comply with this goals.
The max bending length is **2500mm** and max press force **800kN.**
Thanks to this we are also able to produce all metal parts also according to customers **individual requirements.**



CNC OHÝBANIE

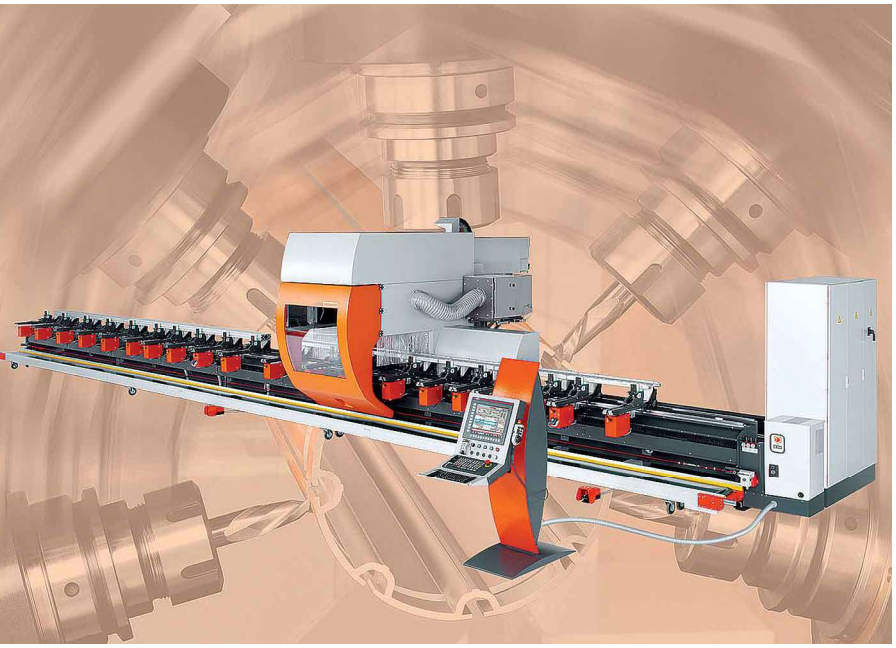
Kvalita, felxibilita a produktivita sú požiadavky, s ktorými musíme denne počítať pri výrobe našich štandardných výrobkov, ale aj tých individuálnch od zákazníkov.
Vďaka flotile CNC ohýbacích strojov TRUMF vieme tieto požiadavky splniť včas a vysokej kvalita.
Max ohýbacia dĺžke je **2500mm** s max silou **800kN.**
To všetko dáva predpoklad pre výrobu dielov, ale aj kompletných svietidiel aj **podľa individuálnych požiadaviek našich zákazníkov.**



All CNC TRUMPF machines are connected via SEC intranet to both **ERP ORACLE and PDM datamagement Smarteam**.
It ensures both high level of flexibility of production and reduces the human error to minimum.
Thanks to this all machines receive always right CNC data based on **validated drawings** which keeps the production flow smoothly running during the shift.

Všetky CNC stroje TRUMPF sú cez SEC intranet priamo napojené na **ERP PRACLE a PDM datamanagement Smarteam softvér**, čo zaručuje súčasne výsokú úroveň flexibility výroby a redukuje možnosť ľudskej chyby operátora na minimum.
Vďaka tomu všetky stroje dostávajú v reálnom čase tie správne CNC dáta **podľa aktuálne platných výkresov výrobkov**, čo zaručuje plynulý chod výroby.

CNC Machining



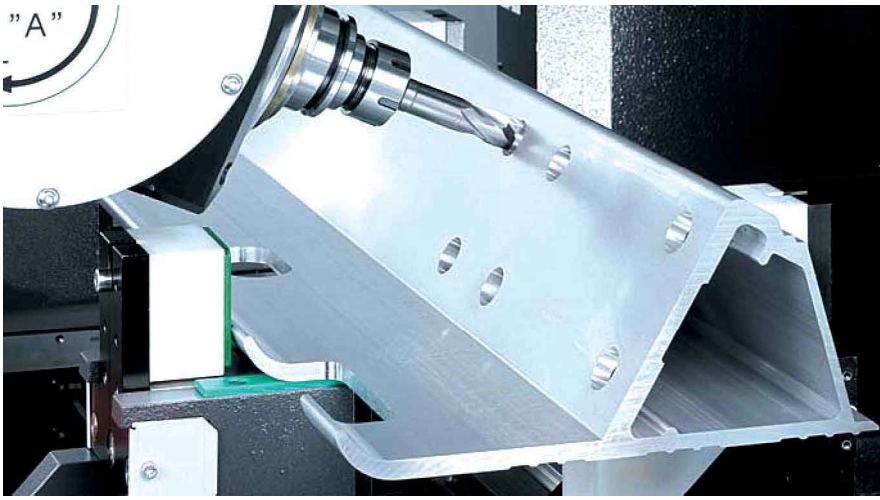
EXTRUDED ALUMINUM PROFILES MACHINING

the **drilling, routing, taping, cutting and notching** of aluminum profiles (up to the **lenght 15m, 600x600mm in section**) is ensured by CNC profile machining centre.

Thanks to this we are able to offer you customised aluminum profiles processing with both **highest accuracy level and highest quality.**

CNC OBRÁBANIE AL PROFILOV

vŕtanie, frézovanie a pílenie hliníkových profilov **do dĺžky max.15m a do prierezu max.600x600mm** pomocou CNC obrábanieho centra. Vďaka tomu je firma SEC schopná Vám poskytnúť riešenia svietidiel alebo samotných hliníkových profilov na mieru **v najvyššej presnosti a kvalite.**



MULTI-TASKING TURNING CENTER

The integration of machining center and turning center gives us unmatched flexibility in a wide variety of parts configurations. From simple turning and milling, to complex multi-axis simultaneous machining, all operations can be completed in one machine. Off-center machining with the Y-axis and milling of angled surfaces with the B-axis greatly increases the range of our applications.

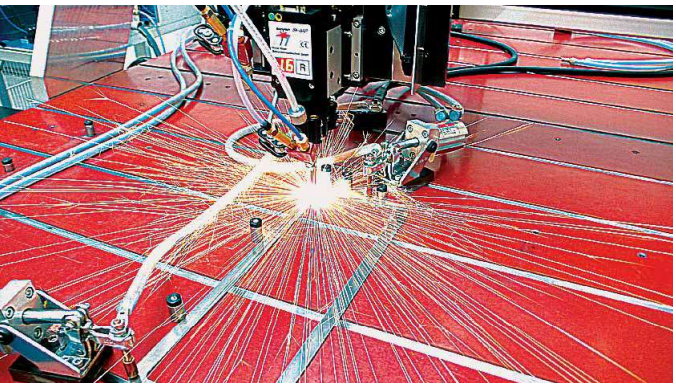
CNC OBRÁBACIE CENTRUM

integrácia obrábacieho a frézovacieho centra nám dáva doteraz nedosiahnuteľnú flexibilitu vo vlastnej výrobe širokého sortimentu dielov pre svietidlá SEC. Od jednoduchého vŕtnia až po komplexné viacosové simultálne obrábanie, všetky takéto operácie zvláda jeden stroj. Navyše ďalšia frézovacia Y-osá hlava pre obrábanie uhlových plôch s B-osou výrazne zvyšuje možnosti technológie a rozsah našich aplikácií.

GALATEK Stud Welding & PowderPainting

SOYER KT-1550
presents highest quality of **CNC capacitor discharge STUD WELDING.** It ensures us the long term perfect joints.

SOYER KT-1550
predstavuje najvyššiu kvalitu v **CNC bodovaní skrutiek**, čo zaručuje perfektnú dlhodobú kvalitu spojov.



PE POWDER COATING
All, **perfect pre-finishing** of metal parts in automatic degreasing line together with modern technology with controlled **electrostatic coating of PE colours guarantees the high quality** and colour tones variability of metal parts coatings.

HPQ CERTIFIED (by DEUTSCHE BAHN)

Die Bahn DB

PRÁŠKOVÁ LAKOVACIE LINKY
Dokonalá predúprava kovových dielov automatickej odmasťovacej linke v súčinnosti s **modernou technológiou riadeného elektrostatického nanášania PE farby** dáva záruku vysokej kvality a variability farebných odtieňov povrchovej úpravy dielov svietidiel.

HPQ Certifikované (od DB)

Die Bahn DB

Laser & CNC Router

LASER MERCURY 609

for **laser cutting of acrylic sheets** with the **highest accuracy level 0,05mm** and **max speed 2000m/s.** Its power 350W is perfect to cut the acryl sheet 10mm thick in 3x2m size. The system includes both automatic loader/unloader and CCD camera which increases its productivity enormously. SEI laser works in tandem with OCÉ UV FlatBed printer (see next page).

LASER MERCURY 609

používaný firmou SEC na rezanie PMMA dosiek na rovinné kryty svietidiel **s presnosťou 0,05mm a rýchlosťou až do 2000m/s.** Maximálna veľkosť PMMA dosky je **2x3m.** S výkonom **350W** si hravo poradí aj s materiálom hrúbky 10mm, ktorá je dostatočná pre všetky aplikácie SEC. Systém je vybavený automatickým nakladaním a vykladaním a CCD kamerou.
V spolupráci so zariadením OCE Arizona (na ďalšej strane) sa tieto dve technológie podieľaju na 100% samostatnosti SEC vo výrobe rovinných plastových krytov svietidiel vrátane závesných tabuliek a piktogramov pre núdzové, informačné a reklamné svietidlá.

3000 SERIES ROUTER

All steel powerhouse designed for large **PC sheet** format **CNC Routing** for SEC lighting fixtures diffusers. The 3000 Series moving gantry design machine capable of processing a unit of material that allows 152mm clearance.

- Rapid transverse of 45,7m/min
- High-speed feedrate of 25,4 m/min
- High speed 32.000 RPM, high power industrial standard spindles
- Control system with advanced industrial oriented features

The above given parameters rank the MultiCam 3000 Series Router best in its class of machinery.

3000 SERIES ROUTER

určený pre **CNC rézovanie veľkoformátových PC polykarbonátových dosiek** na svetelno-činné kryty svietidiel SEC. Vďaka jeho designu je možné frézovať matariál až do hrúbky 152mm.

- rýchlosť posuvu až 45,7m/min
- rýchlosť obrábania až 25,4m/min
- 32000 ot/min, vysokovýkonné priemyselné vretená
- riadiaci systém s rozšírenými priemyselne orientov.parametrami.

Všetky vyššie uvedené parametre zaraďujú MultiCam 3000 Series Router na prvé miesto v jeho triede.

ERP ORACLE System

ORACLE ERP
thanks to the complex ERP system SEC is capable to guarantee the production and delivery of your order on time and both in the right quantity and quality.

ORACLE EPR
Firma SEC je vďaka komplexnému ERP systému dosiahnuť, že objednané produkty vám vyrobíme a dodáme načas, v správnom množstve a kvalite.

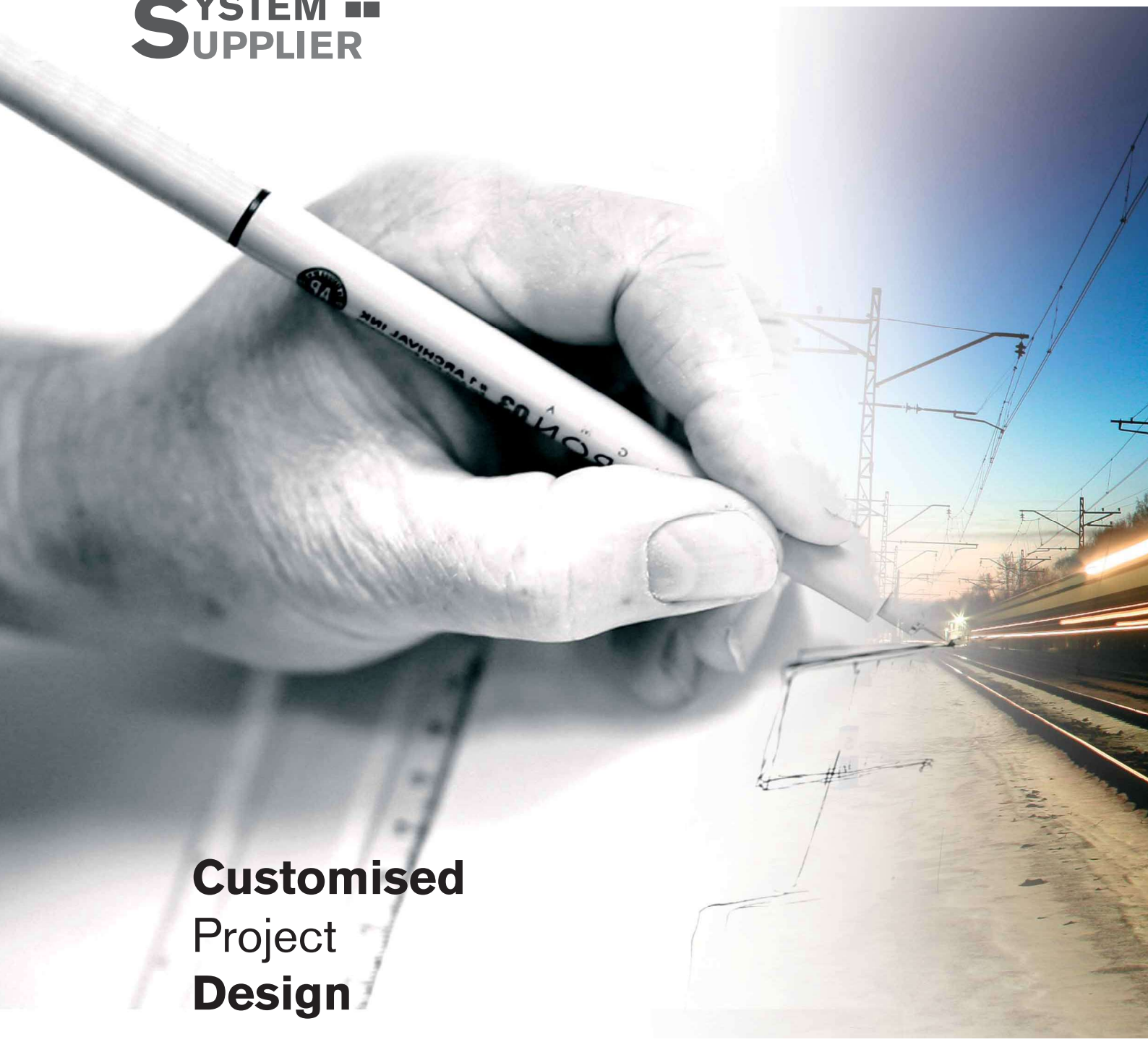
Master Production Schedule (MPS)
Item Master Data (Technical Data)
Bill of Materials (BOM)
Production Resorces Data (Manufacturing Technical Data)
Inventories and Orders (Inventory Control)
Purchasing Management
Material Requirement Planning (SFC)
Capacity Requirement Planning (CRP)
Standard Costing (Cost Control)
Cost Reporting / Management (Cost Control)

100% TESTING & LOGISTICS
Perfect built-up **logistics and information systems** ensure that each component is on the right place in the right time and each product is delivered to you in time in the **highest quality standard.**
Each lighting fixture, before you get it, is being **100% TESTED FOR 120 HOURS.** Within this period all technical parameters are measured in accordance with their technical specification.

TESTOVANIE A LOGISTIKA
Dokonale vybudovaný informačný a logistický systém je zárukou, že každý jeden komponent je včas na správnom meste a každý jeden finálny výrobok je včas a v najvyššej kvalite doručený zákazníkovi.
Na konci výrobného procesu sa sami uisťujeme **100% testom každého svietidla o vysokej kvalite finálneho produktu** skôr ako odchádza k Vám.
Každé svietidlo je zahorované **120 hodín**, počas ktorých sú zmerané parametre v súlade s technickými podmienkami výrobku.

Customised Solutions

SYSTEM SUPPLIER



Customised Project Design

- SEC is the system supplier providing you complex customised solutions with perfectly ballanced performance, costs and energy consumption.
- SEC possess extensive experience in developing and manufacturing customised Lighting & Interior Part solutions for customers all over the world. We offer you cost-effective design cooperation from the very beginning of the project in order to provide you complex solution in compliance with all regulations and your own design ideas.
- We offer you the whole SEC project team including all mechanical engineers, electrical engineers and lighting specialists which make sure you get the perfect product.
- **SEC is professional system supplier for all Lighting & Interior Parts manufacturer where you can find everything under one roof**

• Lighting

- Including dimming
- Including intelligent cotrol

• Luggage Racks

- Including reading lights
- Including seat reservation systems
- Including speakers

• Ceiling

- Including main / side ceiling panels
- Including AL profiles
- Including lighting
- Including speakers

- TECHNOLOGY KNOW-HOW
- ENGINNERING TOOLS
- LIGHTING SIMULATIONS
- THERMAL ANALYSIS
- STRUCTURAL ANALYSIS
- IRIS QUALITY

IRIS Certification

SEC Interior Parts Competences

Plug&Play
Design

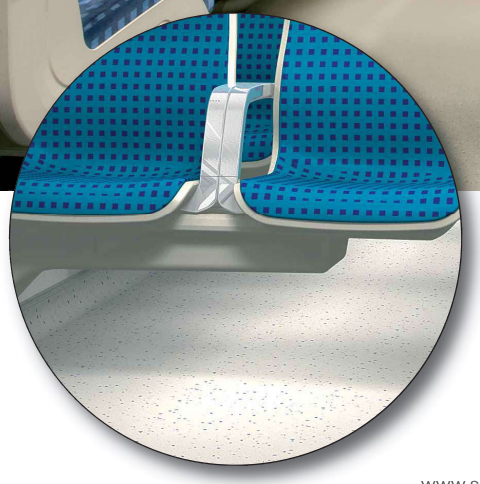
- TECHNOLOGY KNOW-HOW
- ENGINNERING TOOLS
- LIGHTING SIMULATIONS
- THERMAL ANALYSIS
- STRUCTURAL ANALYSIS
- IRIS QUALITY

Luggage Racks

Reading Lights

Seat Reservation System

Underseat Lighting



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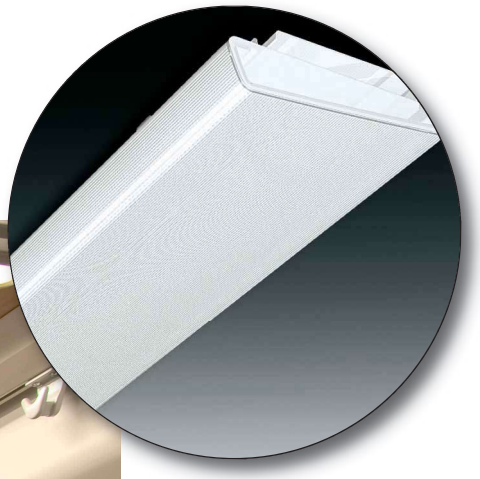
Saloon Lighting



Middle & Side Ceiling

Air Outlet Profiles

Speakers

Plug&Play
Design

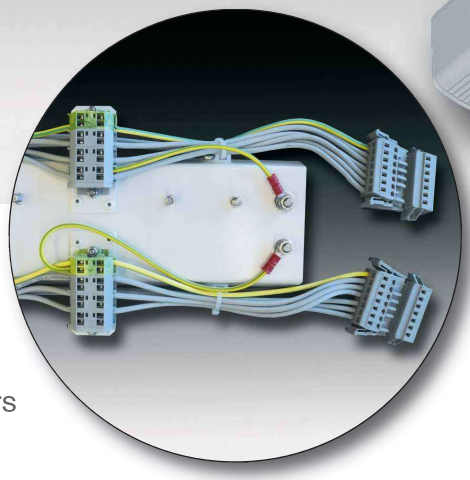
- READING LIGHTS
- SWITCHES
- DIRECT MAIN LIGHTING
- “MOOD” LIGHTING
- SEAT RESERVATION SYSTEM
- SPEAKERS

Reading Lights

Seat Reservation System

Contactless Switch

Wiring and Connectors



SYSTEM SUPPLIER

- SEC provides you the possibility to design and manufacture the luggage rack according to your specification
- SEC integrates all reading lights, main lighting, “mood” lighting, switches, speakers and seat reservation display all together in one complex system which offers you the advantage to get perfectly balanced **“PLUG&PLAY” solution**
- We offer you the whole SEC project team including all mechanical engineers, electrical engineers and lighting specialists which make sure you get the perfect product.
- SEC provides you whole support including structural analysis, thermal management analysis, lighting simulation to make sure you get the product in compliance with all regulations and your own design ideas
- **SEC is professional system supplier for all Lighting & Interior Parts manufacturer where you can find everything under one roof**

Direct Lighting

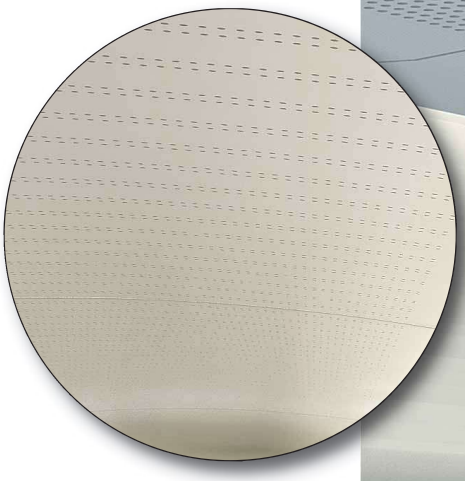
“Mood”Lighting

Speakers

Plug&Play
Design

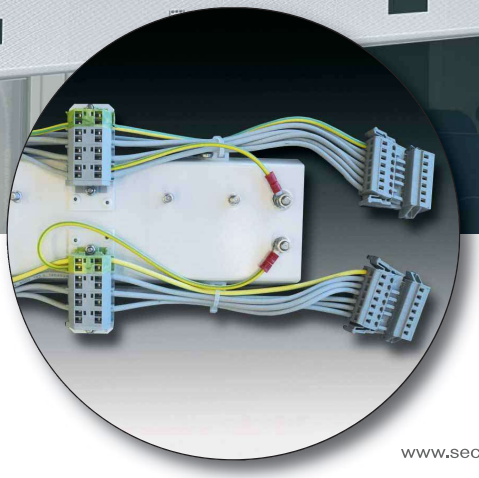
- MIDDLE AND SIDE CEILING PANELS
- FUNCTIONAL AL PROFILES
- MAIN LIGHTING
- INDIRECT LIGHTING
- SPEAKERS
- WIRING

Functional
AL Profiles



MIddle & Side
Ceiling Panels

LED SPOT
Lighting



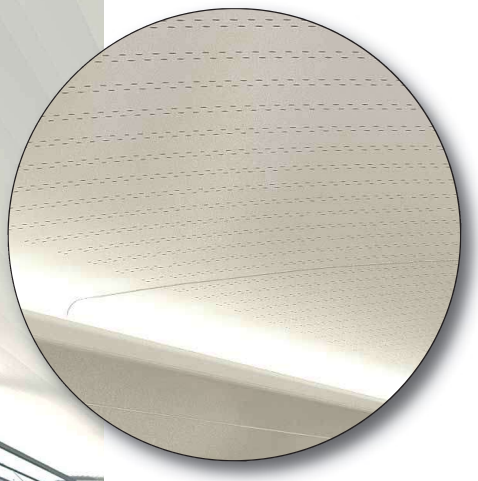
Wiring
and
Connectors

SYSTEM SUPPLIER

- SEC provides you the possibility to design and manufacture the complete ceiling kit according to your specification
- SEC integrates all middle and side ciling panels, main direct lighting, indirect lighting, speakers and complete electrical interfaces together in one complex system which offers you the advantage to get perfectly balanced **"PLUG&PLAY" solution**
- We offer you the whole SEC project team including all mechanical engineers, electrical engineers and lighting specialists which make sure you get the perfect product.
- SEC provides you whole support including structural analysis, thermal management analysis, lighting simulation to make sure you get the product in compliance with all regulations and your own design ideas
- **SEC is professional system supplier for all Lighting & Interior Parts manufacturer where you can find everything under one roof**

Direct Main Lighting

Indirect Lighting



LED SPOT Lighting

Speakers

BONDING : DIN6701 A2

SYSTEM SUPPLIER

Adhesive bonding allows an optimum mix of materials - via intelligent use of adhesives the most suitable materials can be joined. Rail vehicles have become ever lighter due to the use of adhesives. The advantages of adhesive bonding for transport vehicles are higher speeds, lower fuel consumtion, greater comfort and more favorably price reduction. Through the use of adhesives in the rail vehicle SEC has gained a genuine alternative to traditional joining techniques such as riveting and welding.
The reduction in vehicle weight, improved space usage, new design opportunities, less corrosion and easier repairs and disassembly have made adhesive bonding attractive for our products. Lighter weight rail vehicles which can withstand higher loads - this is an objective which SEC achieves using adhesive bonding technology.

SEC is professional system supplier which offer you complex customised solutions

Certificate

The company

SEC s.r.o.

at its location

Jakuba Haška 11, SK- 94901 Nitra

after having successfully verified its suitability was issued a certificate by the certification body on the suitability of performing adhesive bonding on rail vehicles and parts in accordance with DIN 6701.

The company has verified its suitability to perform adhesive bonding on parts within the scope of

Class A2

in accordance of DIN 6701.

The certificate no. TC-K/6701/A2/N/2016/507 was issued on February 18th, 2016, and is valid until December 13th, 2018, according to the details and remarks given.

Certification Body acc DIN 6701 KLEBEN TC TechnologieCentrum Kleben

Dipl.-Ing. Julian Band, Head of Certification Body

SEC LED PHILOSOPHY

SEC aims to sell LED luminaires with single LEDs, LED modules and LED drivers with the best possible quality. We also strive to provide customers with the quality they want, nothing more, nothing less.
By doing this, we provide a good cost/benefit ratio to all our customers.

SEC ponúka LED svietidlá vybavené singel LED, LED modulmi a LED predradníkmi v najvyššej kvalita. Naším cieľom je vždy ponúknuť zákazníkom tú najlepšiu kvalitu. Vďaka tomu Vám prinášame vyvážený pomer cost/benefit, nákladov a zisku vo forme toho správneho svetelného systému pre Váš projekt.

Our engineers are among the world's leading experts on LED technology
We use their expertise to design and manufacture innovative products with low energy consumption and long life. Equally important is our experience and know-how about the design of optics and thermal control, so that the products will perform to standard over a long period of time.

Náš vývojový tím patí k vedúcim expertom v LED techológii
SEC využíva dlhodobé skúsenosti nášho LED vývojového tímu na koštrukciu a výrobu inovatívnych svietidiel s nizkou spotrebou elektrickej energie a dlhou životnosťou. Súčastne je veľmi dôležitá naša skúsenosť a know-how pre návrh optickej sústavy a tepelného manažmentu, ktorá výrazne prispieva k dlhodobo garantovanému výkonu svetelnej sústavy.

QUALITY
SEC's priority is to reach the best paramaters regarding the reliability, efficiency and lifetime and therefore SEC uses only LEDs from established manufacturers CREE, LUMILEDS, OSRAM and SAMSUNG. Our lighting fixtures can be equipped with all LowPower, MidPower and HighPower LEDs up to 7W with the chromaticity temperature of 2600K-10000K.
With the aim to reach the best possible energy balance and reliability and by this saving the service costs, we use only LEDs with guaranteed efficiency up to 200lm/W and lifetime of even more than 100.000h. But LED technology is in dynamic development and its parameters are becoming to be better and better in the near future.

KVALITA
Prioritou firmy SEC je dosiahnutie najlepších parametrov na poli spoľahlivost, účinnosti a životnosti a preto SEC používa len LED od renomovaných svetových výrobcov CREE, LUMILEDS, OSRAM a SAMSUNG. Naše LED svietidlá môžu byť vybavené LED LowPower, MidPower a HighPower až o výkonu 7W/LED a teplotou chromatičnosti od 2600K-10000K.
S cieľom dosiahnúť najlepší pomer spotreby elektrickej energie a spoľahlivosti a úspor servisných nákladov, SEC používa len LED s garantovanou účinnosťou až 200lm/W a životnosťou aj viac ako 100000hod. Ale LED technológia je v dynamickom vývoji a jej parametre sa neustále zlepšujú.

DESIGN
SEC brings on the market new innovative design solutions for LEDs; designs which were until now impossible to design with the common light sources. Thanks to this, you can create innovative solutions, where the light is in harmony with the whole interior.

DIZAJN
SEC prináša na trh nový inovatívny dizajn LED svietidiel, dizajn, ktorý doteraz nebol možný použitím bežných konvenčných svetelných zdrojov. Vďaka tomu Vám ponúkame možnosť vytvorenia inovatívnych riešení vašich projektov, kde sú svietidlá v harmónii s celým interiérom.

LED LIGHT COLOUR CONTROL (BINNING)
Particular attention is given to the colour temperatures and colour rendering qualities of the LED light sources we use. Therefore SEC uses only max 3-STEP MacAdam LED Binning in order to achieve smooth chromaticity along the entire LED lighting system lenght.

LED FARBA SVETLA - BINNING
Veľký dôraz je kladený na teplotu chromatičnosti použitých LED. Preto SEC používa max 3-STEP MacAdam LED binning (výber) tak, aby bola teplota farby svetla použitých LED rovnaká po celej dĺžke LED svetelného systému.

X-TRA EFFICIENCY
SEC lighting fixtures equipped with LEDs reach today the efficiency up to 200m/W in the great range of surrounding temperatures -30°C up to +70°C. For comparison: the T5 tube reaches the efficiency of 104lm/W; however, only in the narrow range of operating temperatures (by 35°C). And with increasing or decreasing temperatures, its efficiency lowers significantly comparing to the LED which efficiency changes only little.

X-TRA ÚČINNOSŤ
SEC LED moduly dosahujú v súčasnosti bežne účinnosť až 200lm/W v celom rozsahu prevádzkovej teploty -30°C up to +70°C. Pre porovnanie, žiarivka T5 dosahuje účinnosť 104lm/W, ale iba vo veľmi úzkom rozsahu okolitej teploty (okolo 35°C). Zvýšením alebo znížením tejto teploty sa prudko mení aj jej účinnosť, pričom pre LED technológii sa táto mení len mierne.

X-TRA LIFETIME / EFFICIENCY
The guaranteed lifetime is min. 70000h, which is 4 times higher than the common T5/T8 fluorescent tubes. However; there are now LONGLIFE fluorescent tubes T5/T8 on the market with lifetime of 60000h. With both solutions, there is a possibility to reach significant reductions regarding the service and maintance costs of the SEC lighting systems. It has also significant impact on LCC analysis.

X-TRA ŽIVOTNOSŤ / ÚČINNOSŤ
Garantovaná životnosť LED je min 70000hod, čo je až 4-krát viac ako bežné T5/T8 žiarivky. Avšak, na trhu sú dostupné aj LONGLIFE verzie žiariviek so životnosťou až do 60000hod.
Každopádne, obe riešenia Vám prinášajú významnú úsporu servisných nákladov, čo má veľký vplyv na LCC analýzu.

LED BINNING

LEDs come in all colour temperatures, but white LEDs are not always white... Because LEDs do not have a full colour spectrum, we must pay special attention to their colour quality and colour rendering capabilities. Otherwise, a lighting installation with visible colour differences may be an outcome.

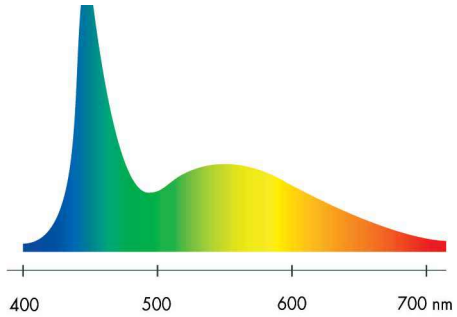
LED svetelné zdroje sú dostupné vo všetkých teplotách farieb, ale biela nie je vždy biela...
Pretože LED nepokrývajú celé spektrum, je nutné klásť dôraz na kvalitu farbu svetla a úroveň koeficientu podania farieb (CRI). V opačnom prípade možu vyniknúť viditeľné rozdiely vo farbe svetla jednotlivých LED.

LED LIGHT COLOUR CONTROL (BINNING)

When LEDs are produced, the production outcome is LEDs with many different colours or colour temperatures. CIE's 1931 colour diagram is used to create a binning structure, i.e. groups of diodes that share the same colour characteristics. The LED suppliers offer different bins to luminaire manufacturers. The fewer bins the higher cost. Some binning systems relate to the human eye's colour sensitivity via a model called MacAdam ellipses. The ellipses are mapped onto the binning structure in the colour diagram and their size corresponds to the LED's colour tolerance. The size is measured in steps. The more steps, the bigger tolerance and the easier it is to spot a difference in colour. Generally, a 3-step ellipse is considered a good colour tolerance.

LED FARBA SVETLA - BINNING

V priebehu výrobného procesu LED zdrojov vznikájú rôzne farby svetla. Preto pre triedenie jednotivých farieb (BINNING) je používaný farebný diagram CIE1931. Binning znamená roztiedenie všetkých LED do "košov" podľa rovnakých farebných charakteristík. Potom výrobcovia LED zdrojov ponúkajú nám, výrobcom svietiiel, rôzne kombinácie BINov (košov). Čím je táto selekcia užšia, tým je cena samotnej LED vyššia. Niektoré binovacie systémy sú postavené na citlivosti a rozoznateľnosti rozdielov farieb ľudským okom - jedná sa o MacAdam elipsy. Elipsy mapujú binovaciu štruktúru v farebnom diagrame a ich veľkosť korešponduje s farebnou teleranciou LED. Ich veľkosť je definovaná v krokoch. Čím viac krokov, tým vyššia tolerancia a tým viditeľnejšia rozdielnosť farieb jednotlivých LED v línii.
Všeobecne, 3-kroková elipsa je považovaná za akceptovatenú toleranciu, ktorá už nie je ľudským okom pozorovateľná.



Colour temperature indicates whether a light source is perceived as warm, neutral or cool white. LEDs may be produced in all colour temperatures, which are defined by the dominating wavelengths. The colour temperature of a LED is characterized by the blue and yellow peaks in the spectrum.

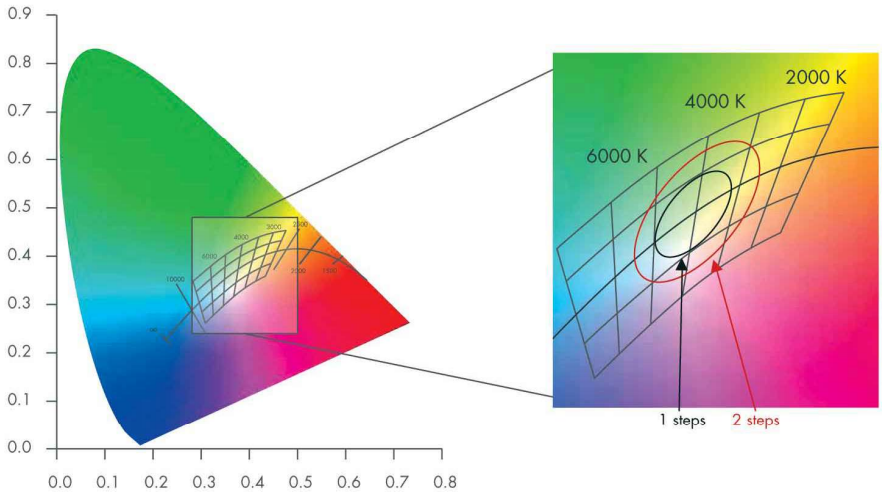
Farba svetla indikuje, či je svetelný zdroj vnímaný ako teplo biely, neutrálny alebo studeno biely. LED zdroje môžu byť vyrobené vo všetkých farbách svetla, tie sú definované dominantnými svetelnými dĺžkami. Farba svetla LED je charakterizovaná modrými a žltými vrcholmi spektra.

MacAdam ellipses vary in size (number of steps) according to the colour variance of the LEDs inside the ellipses. The bigger the ellipse, the more variance (less uniformity)

MacAdam elipsy sú rôznych veľkostí (počet krokov) podľa farebnej variácie LED vo vnútri elipsy.
Čím je elipsa väčšia, tým je variácia vyššia (menšia uniformita farby svetla)

LED array with different colour temperatures for each diode. This may be the result of poor colour control.
SEC solution: All SEC LED luminaires have a colour tolerance (BINNING) of 3 MacAdam steps or better.

LED línia s viditeľne rôznymi farbami svetla pre jednotlive LED. Toto môže byť výsledok, keď sa nekladie dôraz na správny výber a kontrolu chromatičnosti.
SEC riešenie: všetky SEC LED svietidlá majú toleranciu farby (BINNING) na úrovni 3-step MacAdam alebo lepšiu.

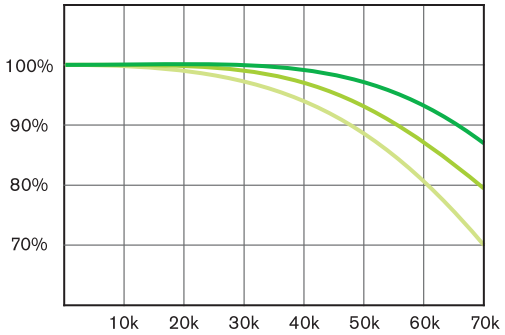


LED LIFETIME

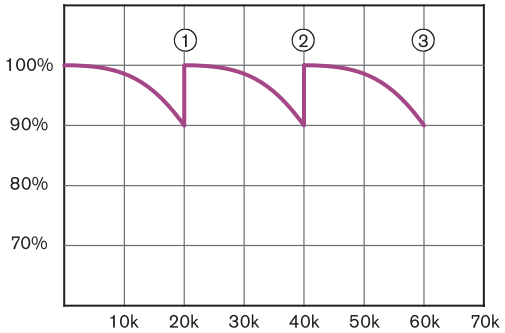
LEDs last longer and do not need to be replaced as often as many conventional light sources. One of the benefits of the LED is its long lifetime. Because it has no movable parts or filaments that may break, LED's can have long lifetimes.
That makes them particularly well suited when the luminaires are not easily accessible for lamp replacements. Thanks to this the service and maintenance costs are lower (LCC analysis).

Životnosť LED je dlhšia a nemusia byť tak často menené ako väčšina bežných svetelných zdrojov. To je jedna z výhod LED - životnosť. To dáva predpoklad ich použitiu napr. v aplikáciach, ktoré sú tažko prístupné počas údržby alebo servisu. Vďaka tomu výrazne klesajú celkové náklady na prevádzku/údržbu svetelného systému, čo sa prejaví v jeho LCC analýze.

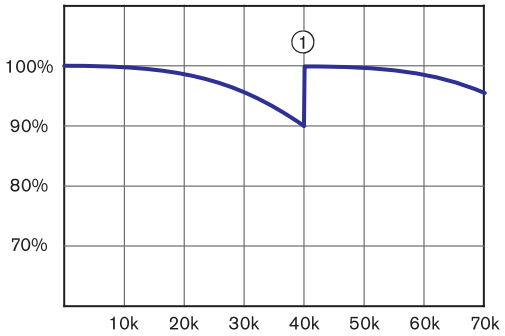
▼ LED



▼ T5



▼ T5/T8 LONGLIFE



We normally define the lifetime of a LED as the time expected for it to drop to 70 % of its initial light output. This measure is called L70. A typical L70 lifetime is 70.000 hours.
In a lighting installation, a fluorescent lamp would be replaced 3,5 times before 70.000 hours operation time is reached. Fluorescent lamps will loose 10% of their light output before they are replaced. The LED, however, does not need to be replaced, but its light output will drop 30% over its lifetime.

Sometimes, the no-name LED driver lifetime is the bottle neck of the system design. If e.g. the driver lifetime is limited to 50.000 hours at the rated ambient temperature, and the LED module lifetime is longer at the same temperature, the lifetime of the complete luminaire is exhausted at 50.000 hours, unless the driver may be replaced.
Therefore SEC pays high attention to achieve the electronic ballast lifetime min 120.000h. Even during the enginnering and design phase we always take care of easy and fast spare part replacement and maintenance. Thanks to this you can be sure you alwas get SEC lighting fixture with low maintenence costs and service friendly design.

Životnosť LED je bežne definovaná poklesom svetelného toku o -30% v porovnaní s počiatočným svetelným tokom. Tento parameter je nazývaný L70. Typická hodnota L70 zodpovedá životnosti 70000hod.

V priebehu týchto 70000hod by bola bežná žiarivka vymenená až 4-krát, pričom pokles jej svetelného toku pri výmene je okolo 10%. Svetelný zdroj LED, aj keď ešte funkčný po 70000hod prevádzky, ale jeho svetelný tok klesá až o -30%.

Životnosť LED svietidla nie je len vecou LED samotných. Veľa-krát je problém samotný "no-name" LED elektronický predradník. Ak je jeho životnosť deklarovaná len na 50000hod, tak celková životnosť celého svietidla je tým limitovaná.
Preto SEC kladie veľký dôraz na dosiahnutie životnosti elektronického predradníka na úroveň min.120000hod. Zároveň, už v priebehu konštrukcie svietidla vývojový tím SEC dbá na to, aby boli všetky jeho diely ľahko a rýchlo vymeniteľné a tým znížené LCC náklady na vašu svetelnú sústavu.

Lumen maintenance curves including number of lamp replacements before 70.000 hours for conventional light sources. T5 fluorescent tubes are normally replaced after 20.000 hours. Long life tubes T5/T8 may last for even longer – even up to 50.000 hours. By the time they are replaced, they have lost about 10% of their initial light output, comparing LED which losts even 30%.
Krivky starnutia ukazujúce počet výmen do 70000hod prevádzky pre LED a bežné svetelné zdroje. Napr. žiarivky T5 majú bežne životnosť 20000hod, i keď je potrebné povedať, že sú v ponuke aj T5/T8 LONGLIFE verzie so životnosťou porovnateľnou s LED, až 50000hod. Pri ich výmene je strata svetelného toku len 10%, pričom LED strácajú až 30%.

LED MAINTENANCE FACTOR

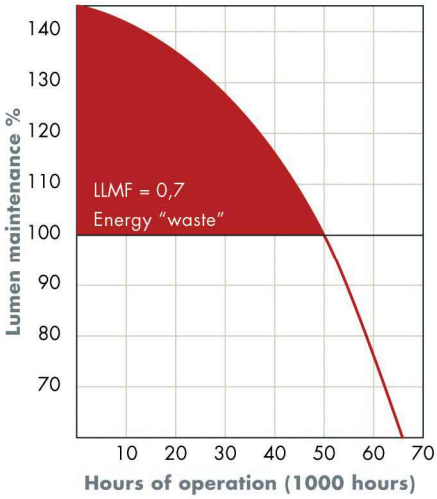
With a lumen maintenance factor of 0,8 lighting installations must be over dimensioned.
Since the definition of LED lifetime is related to L80, the lamp lumen maintenance factor (LLMF) is therefore 0,8. This light loss is countered by adding extra light in the lighting installation's initial phase. SEC always plans for 100% light output as the end of the instalation's lifetime in order to have enough light at the end of life.

Keď berieme do úvahy činiteľ poklesu svetelného toku 0,8 musí byť svetelná sústava LED predimenzovaná. Kedže je definícia LED životnosti založená na parametre L80, činiteľ poklesu svetelného toku LLMF je 0,8. Tento pokles svetelného toku musí byť zahrnutý ako extra +20% navýšenie výkonu pri svetelnej kalulácii projektu. SEC pri svetelnej kalkulácii vždy počíta so 100% svetelným výkonom na konci životnosti svetelného zdroja.

The other factors that contribute to the light installation's maintenance factor (MF) are the light survival factor (LSF), the room surface maintenance factor (RSMF) and the luminaire maintenance factor (LMF). The product of these factors will bring the maintenance factor (MF) down to somewhere between 0,6 – 0,8 depending on application and type of luminaire.
Installations with T5 luminaires with a LLMF of 0,9 will have a high maintenance factor. Whereas LED installations with a LLMF of 0,7 will have a low maintenance factor.

Because of the LLMF of 0,8 for the LED, the lighting installation needs to be over dimensioned by a factor of 25% (1 divided by 0,8). This may lead to a higher energy consumption. Therefore SEC pays special attention to LED lifetime curves and application of SEC intelligent control systems to minimise this factor.

Even nowadays some LEDs have longer lifetimes than L80 50.000 hours. Therefore the LLMF is higher at comparable lifetimes, the lighting installation's maintenance factor is higher and the energy waste is less. For example, with a LLMF of 0,85 instead of 0,7, the over-dimensioning is reduced from 43% to 18%.

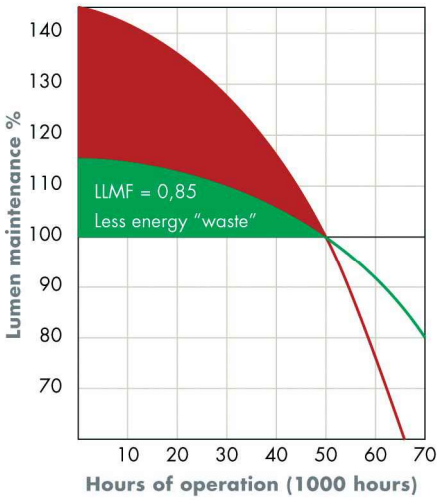


Ďalšie faktory, ktoré prispievajú k činiteľu údržby (MF) sú hlavne "mortalita" svetelných zdrojov (LSF), činiteľ znečistenia priestoru (RSMF) a činiteľ údržby samotného svietidla (LMF). Výsledkom súčinu týchto faktorov je, že výsledný činiteľ údržby (MF) môže klesnúť až na úroveň 0,6-0,8 v závislosti na aplikácii svetelnej sústavy.

Projekt s použitím T5 žiariviek má činitel poklesu svetelného výkonu 0,9 (LLMF) a bude vyšší ako pre rovnaký projekt s použitím LED, kde tento činiteľ má hodnotu len 0,8.

Kedže je LLMF pre LED na úrovni 0,8; nominálny svetelný tok celej sústavy musí byť predimenzovaný o +25% (1:0,8=1,25). Toto vedie k vyššej spotrebe elektrickej energie, a preto SEC kladie dôraz na výber správnych LED s optimálnou životnostnou krivkou a použitím inteligentných riadiacich systémov je možné tento neriaznivý faktor minimalizovať.

Už aj dnes sú dostupné LED na trhu, ktoré majú dlhšiu životnosť ako L=70 50000hod. Vďaka tomu je činiteľ LLMF vyšší a tým aj činiteľ údržby dosahuje vyššie hodnoty pri nižšej úrovni predimenzovania a tým aj nižšej celkovej spotrebe elektrickej energie sústavy. Ak napríklad použijeme LED s LLMF 0,85 namiesto 0,7 ,tak potrebné predimenzovanie je znížené z hodnoty 43% na úroveň 18%.



$$MF = LLMF * LSF * RSMF * LMF$$

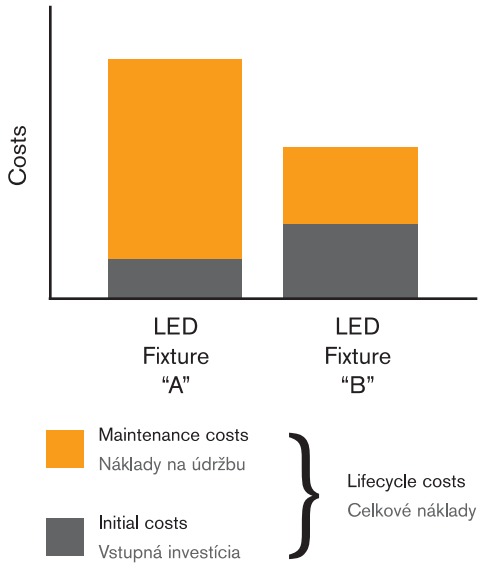
Installed lumen packs as a result of LLMF=0,7 and 0,85. SEC always plans for 100% light output at the end of the instalation's lifetime in order to have sufficient light performance at the end of life. Maintenance factors are used to account for the degradations in lumen output and other factors and the initial light output must be therefore higher.

Inštalovaný svetelný tok LED svietidla ako výsledok LLMF=0,7 a 0,85. SEC pri svetelnej kalkulácii vždy počíta so 100% svetelným výkonom na konci životnosti svetelného zdroja. Činitele údržby a iné ďalšie faktory majú vplyv na to, že svetelný tok svetelného systému pri inštalácii musí byť omnoho vyšší.

TOTAL COST OF OWNERSHIP

Total cost of ownership (TCO) may be lower for LED installations. The introduction of LED has led to a rush among lighting producers, train manufacturers and operators to use the new technology in new and modernised installations.

Celkové náklady na obstaranie a prevádzku (TCO) svetelného systému LED môžu byť nižšie ako v prípade konvenčných svetelných zdrojov. Príchod LED technológie vyvolal "vír" na trhu, medzi výrobcami svietidiel, výrobcami vlakov a železničných operátormi vo výbere a použití novej svetelnej technológie pre nové projekty a modernizácie.



The figure explains the principle of total cost of ownership. The initial investment of the LED installation may be higher, but the LEDs lower energy consumption and maintenance cost may provide a lower total cost over the lifetime of the LED installation

Tento príklad ukazuje princíp celkových nákldov na projekt (TCO). Vstupná investícia môže byť vyššía, ale nižšou spotrebou elektrickej energie and úsporou servisných nákladov môže priniesť celkovo nižšie náklady počas celej životnosti svetelného systému.

However, to make the LED Lighting supplier decision should be done with care. Not all LED lighting suppliers offer you professional LED design. The lower price for the fixture does not have to mean also the lower total costs during the installation's life time.
Therefore, a **total cost of owneship (TCO) approach is crucial**, analysing all:
- investment in luminaires
- energy costs
- maintenance costs (preventive maintenance + corrective maintenance)
- cleaning costs
- others

Also, sensors should be taken into account, since they will reduce energy costs and increase luminaire lifetime further.

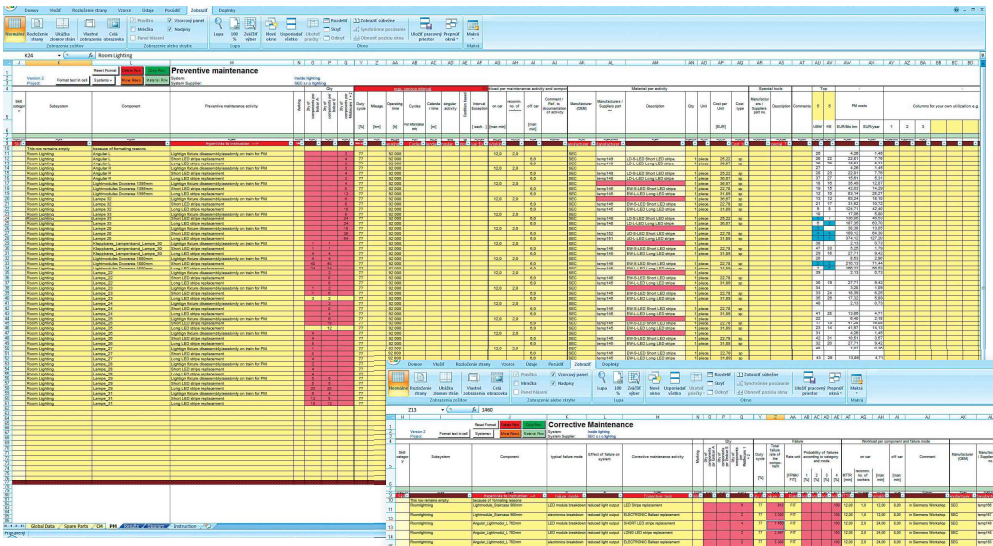
SEC offers solution: We advise our customers to carefully evaluate the payback time of installations with SEC LED versus alternatives. LED technology is being in dynamic development and its parameters are becoming to be better and better.
Ask our team to prepare the LCC analysis for your project.

Výber dodávateľa pre LED svetelný systém je dôležité rozhodnutie. Nie všetci dodávatelia LED svietidiel ponúkajú profesionálne riešenie vhodné pre koľajové aplikácie. Napríklad, nižšie obstarávacie náklady na "bežné" LED svietidlo nemusia znamenať aj nižšie celkové náklady počas celej životnosti vagóna.
Preto je **kľúčový prístup posudzovania celkových nákladov (TCO)**, ktorý zohľadňuje:
- náklady na obstaranie
- spotrebu energie
- náklady na údržbu (preventívna a korektívna)
- náklady na čistenie
- ostatnú údržbu

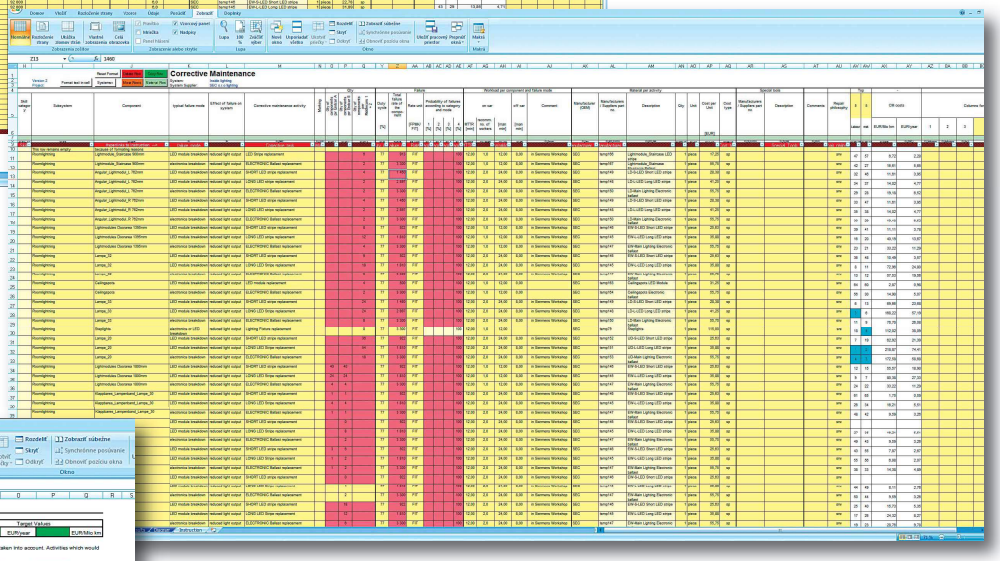
Okrem iného, nemalo by sa zabúdať na možnosť použitia prídavných senzorov (PIR alebo okolitého osvetlenia), ktoré môžu navyše prispieť k úspore elektrickej energie a predĺženiu životnosti.

SEC ponúka riešenie: Odporúčame našim zákazníkom starostlivo vyhodnotiť návratnosť použitia LED svetelnej sústavy v porovnaní s "bežnými" riešeniami. Náš tím Vám ochotne spracuje LCC analýzu, ktorá ukáže vhodnosť použitia tej ktorej verzie vzhľadom na celkové náklady a ich návratnosť v čase.

LCC ANALYSIS

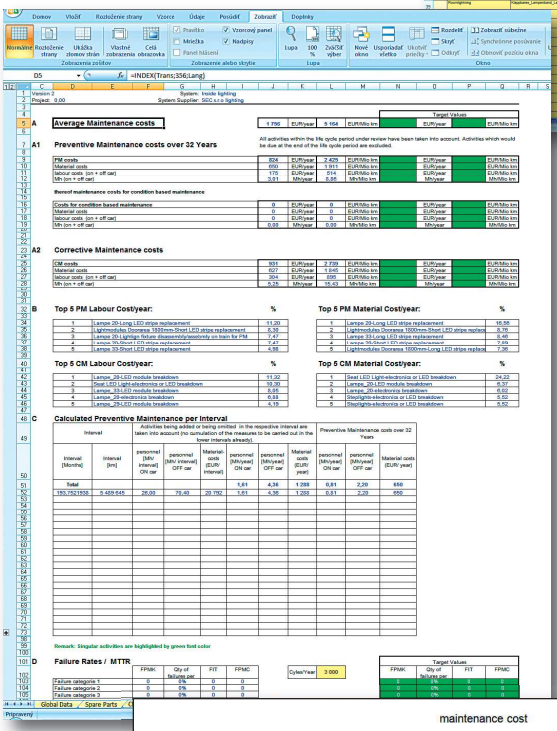


Cost of preventive maintenance



Cost of corrective maintenance

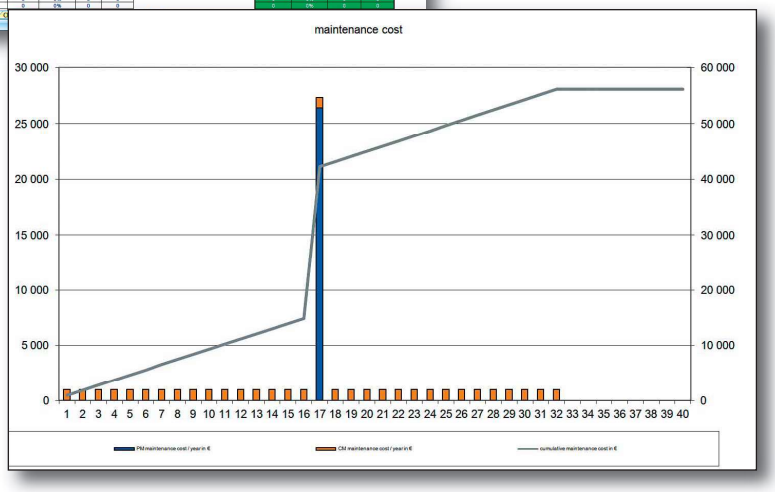
Total Cost Report



Company SEC pays much attention to design of products not only from the technical but also from the costs point of view, what is expressed by the TCO (Total Costs of Ownership) parameter.

The TCO gives valuable information about the product total costs during the whole lifetime of a train set (purchase price + operating costs).In order to specify the value of the TCO, company SEC uses the results of exact simulation methods (lighting simulation, thermal analysis - see pages No.18-20) and the years of the company specialists experience. The results of these analyses create the basis for the LCC analysis and the product TCO specification.

Our team will be glad to process the LCC analysis for you, which will show the suitability of using the specific product solutions with regards to the total costs and their repayment time.



Total cost over the entire life span

Firma SEC kladie veľký dôraz na design svojich produktov nielen z hľadiska technického, ale aj nákladového, čoho vyjadrením je parameter TCO (Total Costs of Ownership). TCO poskytuje cennú informáciu o celkových nákladoch na produkt počas celej životnosti vlakovej súpravy (nákupná cena + prevádzkové náklady).
Pre určenie výšky TCO firma SEC využíva výsledky exaktných simulačných metód (svetelná simulácia, teplotná analýza - pozri str. 18-20) a dlhoročné skúsenosti svojich špecialistov. Výsledky týchto analýz sú základom pre LCC analýzu a stanovenia TCO produktu.

Náš tím Vám ochotne spracuje LCC analýzu, ktorá ukáže vhodnosť použitia možných riešení produktu vzhľadom na celkové náklady a ich návratnosť v čase.

Electronic Ballasts

DESIGN

- **reliable function** in entire range on power supply
- **stabilization** of the **light output** in entire range on power supply
- **reliable start-up** also of fluorescent tube instigated by **low temperatures**
- **resistance to dynamic and static overvoltage**
- **low level of its own interference**
- long time resistance to vibrations and corrosion
- high number of **start-ups per fluorescent tube more than 500.000**
- **MTBF at level min 400.000h**

DESIGN

- **spoľahlivá funkcia** v celom rozsahu napájacieho napätia
- **stabilizácia svetelného toku** v celom rozsahu napájacieho napätia
- **spoľahlivý štart** svetelného zdroja aj pri **nízkych teplotách**
- **ochrana voči** dynamickému a statickému **prepätiu**
- garantovaný počet **zapaľovacích cyklov** (min 500000 pre žiarivku)
- **MTBF na úrovni min 400000hod**

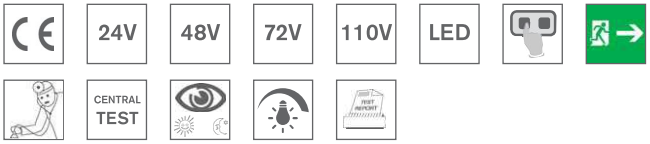
EN COMPLIANCE

SEC electronic ballast are made in compliance with all:

SÚLAD S NORMAMI

SEC elektonické predradníky sú konštruované tak, aby sĺňali predpísané normy:

- **EN50311:2003, EN50155:2007, UIC555-1:1984, IEC60571:2012, EN61347-1:2008, EN61347-2-3:2011, EN61347-2-13:2006, EN62384:2006** (unless stated otherwise)



SEC manufactures whole range of LED and fluorecent tube electronic ballasts for DC 24V, 48V, 72V, 110V in 5 different design versions:

1) Electronic ballasts for LED or fluorescent tube (non-dimmable)
2) Electronic ballasts for LED or fluorescent tube with STEP dimming function: preset levels (**SETTING versions**)
3) Dimmable Electronic ballasts **STEPLESS Dimming** (avilable only for LED versions)
3) Dynamic Colour Mixing
5) Intelligent addressable electronic ballast for LED or fluorescent tube with **CENTRALTEST and data BUS communication (LUXMATIC control)**

SEC vyrába celú škálu elektronických predradníkov pre LED alebo žiarivky pre napájacie napätia DC 24V, 48V, 72V, 110V v 5 úrovniach výbavy:

1) Elektronické predradníky bez funkcie stmievania pre LED alebo žiarivky
2) Elektronické predradníky s možnosťou 2-úrovňového stmievanie pre LED alebo žiarivky (SETTING verzie)
3) Elektronické predradníky s plynulým stmievaním (len pre LED)
4) Dynamické miešanie farieb
5) Inteligentné adresovateľné predradníky pre LED alebo žiarivky s funkciou CENTRALTEST a centrálnou komunikáciou (LUXMATIC systém)

1 Standard electronic ballast / CVS

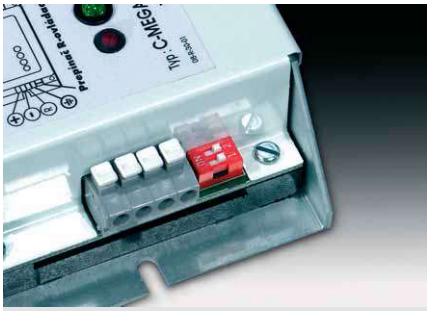
- No communication / No diagnostic / No Dimming
- bez komunikácie / bez diagnostiky / bez stmievania

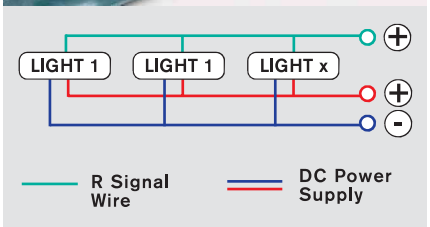
1) Electronic ballasts with fixed power (no dimming function) without any communication, without AUTOTEST / CENTRALTEST functions:
- Power 1W-36W (LED) or fluorescent tubes 8W-36W T5/T8
- Constant output current or voltage (LED versions)
- SELV (LED versions)

1) Elektonické predradníky s pevným výkonom bez funkcie stmievania, bez funkcie AUTOTEST/CENTRALTEST:
- Výkon 1W-36W (LED) alebo 8W-36W žiarivky T5/T8
- Konštantný prúd alebo napätie na výstupe (LED)
- SELV (LED verzie)

2 Setting Feature

- Dimming in steps / Emergency Lighting Scene
- krokové stmievanie / Núdzové osvetlenie





2) Electronic ballasts with STEP dimming function: preset levels (SETTING versions)

- **SETTING** function: STEP dimming controled by control voltage wire input (eg 24V positive or negative logic). 2 Levels are possible, 100% and another one defined by customer (eg 30%)
- **EMERGENCY/STANBY:** STEP dimming like SETTING option described above but controled by logic wire input or even combination of more inputs (eg 24V positive or negative logic). If there is an additional optional DIP Switch even 4 another dimming levels are possible to be preset during the installation (eg door area 70%, corridor 50%, toilet 30%, etc.) in order to save the battery energy but to be in compliance with EN132727
- Control signals can be definied by customer in range 16V-150V

2) Elektronické preadníky s možnosťou 2-úrovňového stmievania (STEP Dimming) na predvolené úrovne (SETTING verzie)

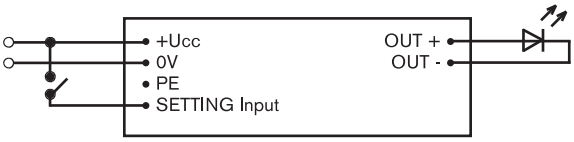
- **SETTING** funkcia: 2-úrovňové stmievanie riadené logickým napäťovým signálom na signálnom vstupe predradníka (napr prítomnosť napätie 24V v pozitívnej alebo negatívnej logike). Štandardne sú možné 2 úrovne osvetlenia, 100% plný výkon a ďalšia, ktorá je definovanaá zákazníkom, napr 30% pre núdzové osvetlenie.
- **EMERGENCY/STANBY**: jedná sa o nadstavbu SETTING, kde je možné nadefinovať viacero hladín osvetlenia logickou kombináciou viacerých signálnych napäťových vstupov alebo pridaním DIP prepínača, ktorým je možné počes montáže nadefinovať rôzne hladiny osvetlenia v prípade napäťového signálu na vstupe (pozitívna alebo negatívna logika je možná) a tým prednastaviť rôzne osvetlenie napr v STANDBY alebo núdzové osvetlenie podľa pozície svietidla vo vozidle (napr 70% nástupný priestor, 50% koridor, 30% sedadlá a pod), tak aby boli splnené požiadavky EN13272 a zároveň sa minimalizovala spotreba elektrickej energie z batérií vozidla.
- Logický napäťový signál môže byť v rozsahu 16V-150V

Electronic ballast terminals
Prípojné svorky predradníka:

- +Ucc
- 0V
- PE

OUT + •
OUT - •

2-levels STEP Dimming by voltage logic control input
2-úrovňové stmievanie pomocou logického napäťového riadiaceho signálu na vstupe



Electronic ballast diagram with basic SETTING dimming feature
Príklad elektronického predradníka so základným SETTING stmievaním

Electronic ballast terminals
Prípojné svorky predradníka:

- +Ucc
- 0V
- PE
- SETTING Input

OUT + •
OUT - •

- +Ucc
- 0V
- PE
- STANDBY Input
- EMERGENCY Input

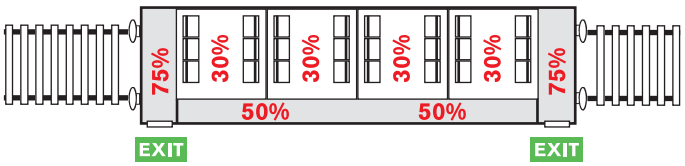
OUT + •
OUT - •

- +Ucc
- 0V
- PE
- STANDBY Input
- EMERGENCY Input

OUT + •
OUT - •

DIP 1 2

Emergency mode SETTING Dimming Example in a Train Car
Príklad nastavenia rôznych úrovní núdzového osvetlenia



3 Stepless Dimming

- Input Control Signal either 0-10V, 0-10mA or PWM
- riadiaci signál 0-10V, 0-10mA alebo PWM

3) LED Electronic ballasts controlled by either by control input 0-10V or current loop 0-10mA or PWM

- Stepless dimming function in range 5%-100% controlled eg by input control signal 1-10V or current loop 0-10mA or PWM
- Additionaly control inputs can be used, eg EMERGENCY Input which ensures immediate change of the light output according to electronic ballast controller memmory parameter or DIP Switch preset level in order to comply with EN13272 during emergency mode
- Control input signals and another customised control inputs can be in range 16-150V according to cutomer specification

Electronic ballast terminal
Prípojné svorky predradníka:

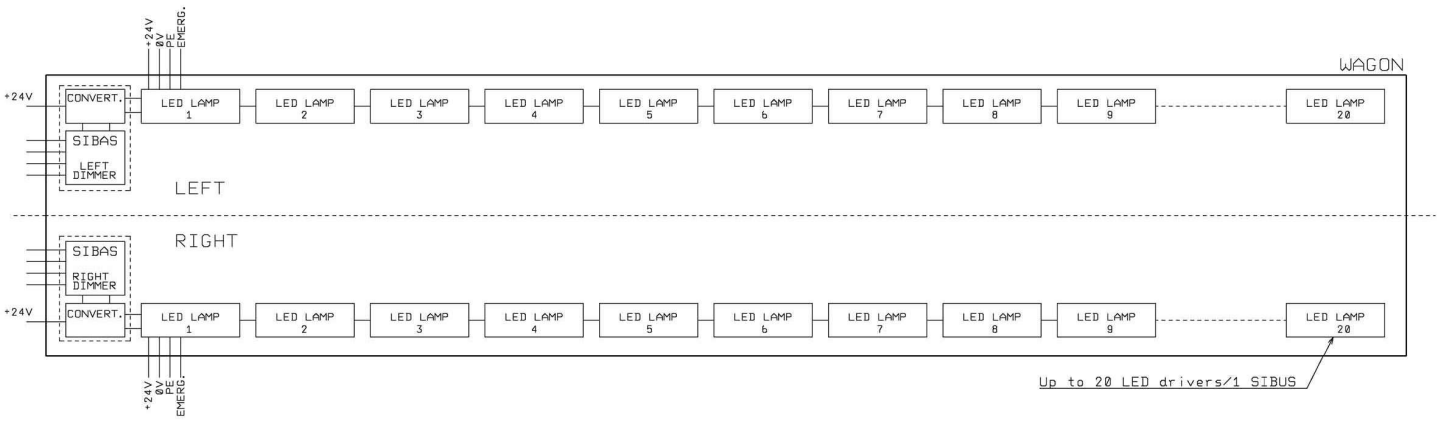
• +Ucc	OUT + •
• 0V	OUT - •
• PE	
• +PWM / 1-10V / 1-10V / 1-10mA	
• - PWM / 1-10V / 1-10mA	

3) LED elektronické predradníky riadené vstupným signálom 0-10V alebo prúdová slučka 0-10mA alebo PWM

- Plynulá funkcia stmievania v rozsahu 5%-100% riadená vstupným signálom napr. 1-10V
- Prídavné riadiace vstupy môžu byť použité, napr vstup "NÚDZOVÝ REŽIM", ktorý zabezpečí okamžitú zmenu hladiny osvetlenia podľa prednastaveného parametra v programe predradníka alebo podľa DIP prepínača na predradníku tak, aby v prípade núdze boli splnené požiadavky podľa normy EN13272 bez ohľadu na to, aká hladina osvetlenia bola nastavená predtým
- Vstupné úrovne riadiacich signálov a iné zákaznicky definované riadiace vstupy môžu byť v rozsahu 16-150V

• +Ucc	OUT + •
• 0V	OUT - •
• PE	
• STANDBY Input	
• EMERGENCY Input	
• +PWM / 1-10V / 1-10mA	DIP 1 2
• - PWM / 1-10V / 1-10mA	

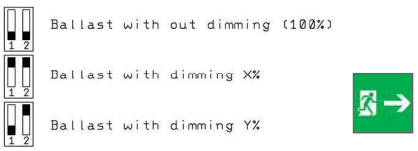
Example of electrical diagram for Stepless dimmable LED lighting fixtures controlled by 1-10V control signal and EMERGENCY control input signal
Príklad schémy zapojenia plynule stmievateľného svetelného systému riadeného signálom 1-10V a EMERGENCY vstupným signálom



LED DRIVER DETAIL:

EMERGENCY INPUT: 0V = EMERGENCY MODE
24V = NORMAL LIGHTING MODE

DIP SWITCH DETAIL FOR EMERGENCY MODE:



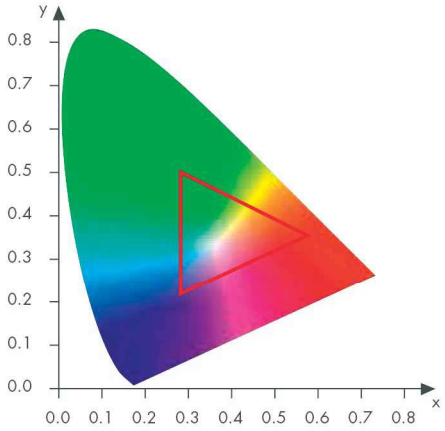
CONVERT. SIGNAL CONVERTER 0-20mA/SEC STANDARD FOR DIMMING

X%= customised emergency lighting output level set-up in order to achieve eg 5lux on the floor
Y%= customised emergency lighting output level set-up in order to achieve eg 40lux in threshold door area

X%= nastavenie výkonu tak, aby sa dosiahlo napr. 5lx na podlahe
Y%= nastavenie výkonu tak, aby sa dosiahlo napr. 40lx v priestore dverí

4 Dynamic Colour Mixing

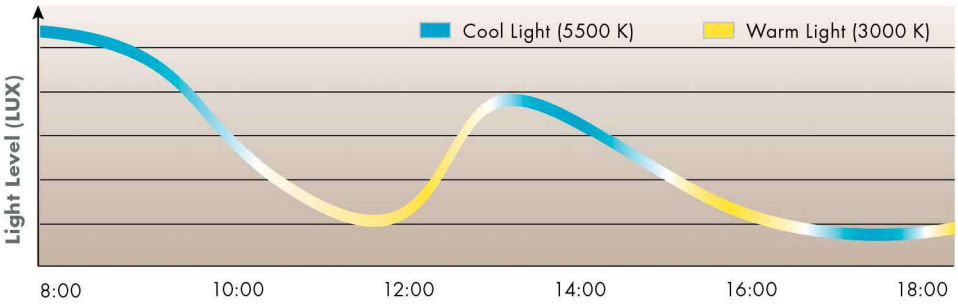
• Tune a LED luminaire's colour
• nastavenie farby svetla LED svietidla



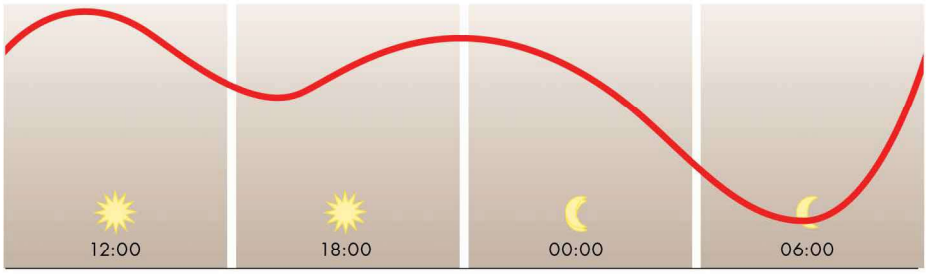
When mixing the colour from three light sources at the vertices of a triangle, all the colours inside the triangle maybe composed.

Since the LED is an electronic component, it may easily be controlled by intelligent electronic ballast (CVS). One of the possibilities is to tune a LED luminaire's colour for example by mixing the light from red, blue and green diodes (RGB). The result is either coloured light or white light with different colour temperatures.
Another example might be an application of cool and warm light LEDs mixing and smooth transition resulting in different light atmosphere scenarios.
Besides creating a nice environment, tuneable light can be used for healthpurposes. All human beings have an internal watch - controlled by the daylight. Bodily functions and performance vary over day time and we name this our circadian rhythm (circadian = circa one day). Cool and warm coloured light may affect whether you feel awake or drowsy. Therefore, lighting with cool colour temperatures is suitable to be used in an areas and time for working/reading when concentration is needed. And warm colour temperatures are used when relaxation is wanted.
SEC offers you the possibility to always create a smooth and pleasant lighting scene for your project.

Vďaka inteligentným SEC elektronickým predradníkom je možné LED riadiť nielen výkonovo. Ďalšou z možností je nastavenie farby svetla, napr. mixovaním RGB LED alebo mixovaním belych LED s rôznou teplotou chromatičnosti.
Výsledkom je buď svetlo vo farebnom tóne alebo biele svetlo s rôznou teplotou chromatičnosti. Okrem možnosti vytvorenia príjemných svetelných scén je prínosom aj zdravotné hľadisko. Každý z nás má svoje "interné hodiny" riadené denným svetlom. Naše telesné funkcie a výkonnosť sa menia počas dňa. Studeno biele a teplo biele svetlo môžu mať výrazný vplyv na to, či sa cítite unavený alebo plný energie. Preto je studeno biele svetlo lepšie pre priestor a čas, v ktorom sa pracuje / číta, čo vyžaduje koncentráciu. A teplo biele svetlo skôr pre relaxáciu a oddychové miesta.
SEC Vám ponúka možnosť vždy vytvoriť príjemnú svetelnú atmosféru pre váš projekt.



Dynamic lighting : variantion in light levels and colours temperature over the course of the day



Human performance curve over the course of the day: Body and mind are fittest around 10 a.m. At 3 a.m., they reach a low.

5 Central Control & Diagnostics

- Addressable Communication
- adresovateľný komunikačný systém

5) Intelligent addressable electronic ballast with CENTRALTEST and data BUS communication (LUXMATIC)

- It is fully digital addressable lighting systems containing all:
  - lighting fixtures equipped with **addressable electronic ballasts** (SEC scope) communicating with the train car router using our own communication protocol
  - train **CAR ROUTER** collecting the data on the train car level (SEC scope) communicating with Signal Converter
  - **SIGNAL CONVERTER** (SEC scope) ensuring the communication with train control and communication system TCMS (TCMS-scope of the train manufacturer) using customer defined communication protocol
  - **Optional PIR SENSOR** for additional energy savings if there is no passanger presence in the train car
  - **Optional AMBIENT LIGHT SENSOR** for additional energy savings by intelligent dimming based on ambient lighting conditions in the train car
- Communication line is up to 150V protected
- DIP Switch electronic ballast addressing
- There is a possibiliy to control and monitor all lighting fixtures in the lighting system including all features:
  - **ACTIVE DIMMING** ensuring required illumination with **minimum energy consumption** based on ambient lighting level (ambient light sensor can be parallely connected to bus communication)
  - **SERVICE DIAGNOSTICS** ensuring the **fault analysis for the maintenance** in real time including the defect item possitioning information in the train (even down to LED stripe level)
  - **LCC DATA ANALYSIS** ensuring collection of all total operating time, number ON/OFF cycles, failure type statistics, etc.
  - **AUTO OFF FUNCTION** controled by either PIR sensor or preset time (eg reading light operating time can be preset to 30min after activation by the passanger, PIR sensor can be parallely connected to bus communication line) in order **to save the energy consumption**
  - **LIGHTING SCENES** for the creating passanger **pleasant lighting atmosphere** depends on the ambient lighting conditions or time period of day
  - **INTELLIGENT EMERGENCY LIGHTING** ensuring the possibility the **preset individual emergency lighting levels for specific areas** in the train (corridors, exit areas, toiltets, stairs, etc) in **order to save limited battery capacity** but to fullfil EN13272 criteria

Electronic ballast terminals:
Prípojné svorky predradníka:

• +Ucc	OUT + •
• 0V	OUT - •
• PE	
• STANDBY Input	
• EMERGENCY Input	
• DATA	
• DATA	

• +Ucc	OUT + •
• 0V	OUT - •
• PE	LED DIAGNOSTICS •
• STANDBY Input	PWM •
• EMERGENCY Input	
• DATA	
• DATA	

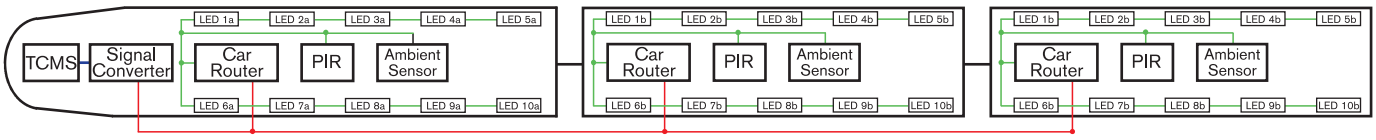
Optional PIR Sensor

5) Inteligentný adresovateľný elektronický predradník pre CENTRALTEST systém s dátovou komunikáciou LUXMATIC

- Je určený pre digitálny adresovateľný svetelný systém pozostávajúci z:
  - LED svietidiel s **adresovateľným predradníkom**, ktorý komunikuje s CAR Routrom v každom vagóne súpravy (dodáva SEC)
  - **Car Routra**, ktorý komunikuje a zbiera dáta z jednotlivých svietidiel vo vagóne a je pripojený na centrálny Signal Converter
  - **Signal Convertera**, ktorý zbiera dáta z jednotlivých Car Routrov a komunikuje s centrálnym riadiacim a monitorovacím systémom vlaku TCMS (TCMS- dodávka výrobcu vlaku) podľa vopred dohodnutého komunikačného protokolu
  - **Prídavného PIR senzora** pre dodatočné úspory energie v prípade neprítomnosti pasažiera vo vagóne
  - **Prídavného AMBIENT Light senzora** pre dodatočné úspory energie inteligetným stmievaním na základe okolitých svetelných podmienok vo vagóne
- Komunikačná linka je chránená do 150V
- Adresovanie elektronických predradníkov v jednotlivých svietidlách je pomocou DIP prepínača
- Zabezpečuje riadenie a monitorovanie všetkých svietidiel v sústave s možnosťou:
  - **INTELIGENTNÉ STMIEVANIE** udržujúce stálu hladinu osvetlenia podľa senzora okolitého osvetlenia vo vagóne a tým prispieva **k zníženiu spotreby energie** (AMBIENT senzor môže byť pripojený paralelne k dátovej komunikačnej linke)
  - **SERVISNÁ DIAGNOSTIKA** zabezpečuje chýbovú analýzu pre údržbu v reálnom čase vrátane určenia miesta vzniku poruchy až na úroveň jednotlivého LED modulu
  - **LCC ANAÝZA** : použitím zozbieraných prevádzkových dát ako môžu byť celkový čas prevádzky, počet zapnutí/vypnutí systému, štatistika chybovosti,.... pre detailnú LCC **analýzu životného nákladového cyklu svetelného systému** vo vlaku
  - **AUTO VYPNUTIE** ovládané PIR dodatočným pohybovým senzorom vo vagóne alebo prednastavením času **automatického vypnutia svietidla** (napr. pre čítacie lampy na 30min, aby sa predišlo, že pasažier ho po odchode nevypne). PIR senzor môže byť pripojený paralelne k dátovej komunikačnej linke
  - **VYTVORENIE SVETELNÝCH SCÉN** podľa špecifikácie zákazníka je možne nadefiovať/prednastaviť rôzne svetelné sceny vo vagóne **podľa úrovne okolitého osvetlenia alebo časového úseku dňa** tak, aby boli vytvorené **príjemné svetelná atmosféra pre cestujúcich**
  - **INTELIGENTNÉ NÚDZOVÉ OSVETLENIE** vďake adresovatenosti jednotlicých svietidiel je možné presne **miestne prednastviť rôzne hladiny núdzového osvetlenia** tak, aby sa max. **ušetrila kapacita batérií**, ale aby súčastne boli splnené kritériá normy EN13272. Napr pre koridory 50%, pre východy 75%, pre toalety 30%, a pod.

Example of electrical diagram for 3cars train set addressable digital lighting systm controlled by TCMS and additional sensors

Príklad schémy zapojenia adresovateľného digitálneho svetelného systému riadeného centrálnou riadiacou jednotkou vlaku TCMS a prídavnými senzormi vo vagónoch



TCMS	Train Central Communication and Monitoring System (scope of train manufacturer) Centrálny komunikačný a monitorovací systém vlaku(dodáva výrobca vlaku)
Signal Converter	SEC Signal Converter converting digital signals from TCMS for SEC Car Routers SEC signálny konverter digitálnych signáov z TCMS pre Car Routre
Car Router	Communication unit collecting data / communicating with all LED fixtures and additional sensors Komunikačná jednotka zbierajúca dáta / komunikujúca so všetkymi svietidlami a prídavnými senzormi
PIR	Optional PIR motion detector in the car Prídavný PIR pohybový senzor vo vagóne
Ambient Sensor	Optional AMBIENT LIGHT Sensor in the car Prídavný sezor okolitého osvetlenia vo vagóne

SEC Data Bus between LED fixtures and additional sensors
SEC dátová komunikácia medzi LED svietidlami a senzormi

SEC Data Bus between Signal Converter and Car Routers
SEC dátová komunikácia Signal Converterom a Car Routrami

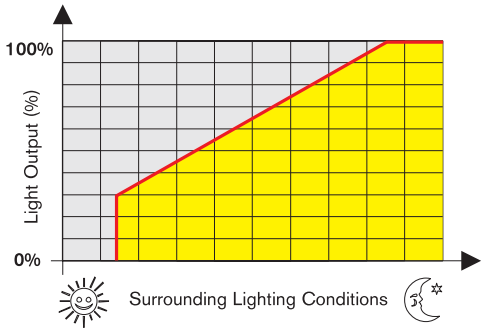
Data Bus between train central control computer TCMS and SEC Signal Converter
Dátová komunikácia medzi centrálnym riadením TCMS and SEC Signal Converterom

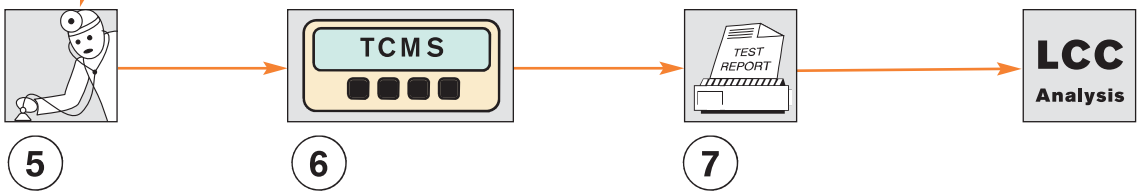
INTELLIGENT CENTRAL CONTROL & MONITORING SYSTEM

Using the addressable LUXMATIC™ lighting system brings new lighting control possibilities for the interior of public transport vehicles.

SEC's unique and innovative solution for the control and status monitoring of lighting systems. The **LUXMATIC™** system **collects and disributes all addressed data** bidirectional way from/to the train control and monitoring system TCMS. **LUXMATIC™** allows all connecting the optional devices such as a PIR movement sensor or AMBIENT light sensor to active automatic dimming and/or passenger-specific dimming/ switching on and off of reading lights, **creating of lighting scenes** of passanger saloon lights (e.g. according to time period during ghe day), and **forecasting of maintenance and service**. Thanks to the **LUXMATIC™** system, the train operator can plan the maintenance in advance, thus **optimising life cycle costs** (LCC).
The **microcomputer constantly monitors** the operational status of the LED modules with a **unique digital method (SEC is only one on the market with progressive digital control)** and automatically puts the electronic ballast into standby mode when a fault is detected in the lamp. The electronic ballast also goes automatically into standby mode when any of the lamp wires become loose, are pulled free, or an intact lamp is pulled from the holders. After the lamp has been replaced, the inverter automatically restarts.

Adaptable active lighting dimming according to the ambient lighting conditions (4), the possibillity to set the individual illumination by passenger (3), reducing of illumination level in the case of power from batteries (1), emergency illumination mode in the case of the feeding system failure persists (2), maintenance central diagnosis of the lighting system (5) test report for LCC analysis (7), controlling the lighting system by the TCMS (6).





LED Electronic Ballast - CONTROLED

Constant Voltage 24V DC/40W/PWM Dimming

- The CONTROLED electronic ballasts (CVS) are designed for the progressive LED light sources for input up to 40W, feeding voltage 24V, 72V or 110V DC (or according to the customer's specification).
- SEC's priority has been to reach the highest reliability of the LED lighting system where the design of the ballast has a great impact on. Therefore there has been a great focus on the design of the ballast in accordance with the LED manufactures. SEC uses all LowPower, MidPower and HighPower LEDs from established manufactures Samsung, Cree, Lumileds or Osram with the efficiency up to **200lm/W and lifetime up to 100.000h**.
- CONTROLED is available in 2 versions:
  - Constant Current Output (DIMMING feature optional)
  - SELV Constant Output Voltage 24V (DIMMING feature optional)

- CONTROLED elektronické predradníky sú určené pre napájanie SEC LED svetelných zdojov do výkonu 40W pre napájacie napätie DC 24V, 72V alebo 110V alebo podľa špecifikácie odberateľa.
- Prioritou firmy SEC bolo dosiahnúť čo najvyššiu spoľahlivosť LED svetelnej sústavy, na ktorú má veľký vplyv design elektronického predradníka, ktorému bola venovaná vysoká pozornosť v súčinnosti s výrobcami LED. SEC používa vysokovýkonné LED od renomovaných výrobcov CREE, Lumileds,Osram a SAMSUNG s účinnosťou až do **200lm/W a životnosťou až 100000 hod**.
- CONTROLED predradníky sú vyrábané v prevedení:
  - Constant Current Output - konštantný prúd
  - SELV Constant Output Voltage - konštantné napätie 24V DC -SELV verzia

Constant Voltage 24V DC/45W

STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

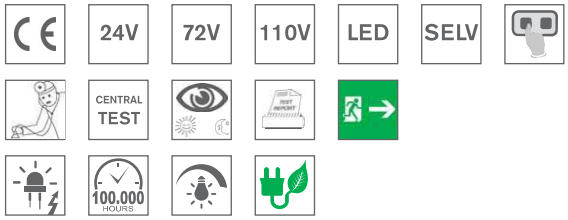
- AL sheet body
- WAGO Terminal block
- Halogen-free wiring RADOX GKW

- Teleso z AL
- WAGO prípojné svorky
- Halogénovo bezpečné vodiče RADOX GKW

OPTIONS / PRÍPLATKY

- SETTING Dimming (eg 10%/100%)- refer to page No.47-51
- Stepless Dimming (PWM or 0-10V or Current Loop 1-10mA) - page No.47-51
- Additional Control Input (eg Emergency Lighting Input Signal)- page No.47-51
- Addressable Central Control LUXMATIC - refer to page No.47-51

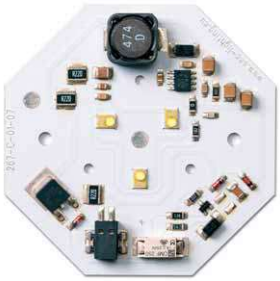
- funkcia SETTING pre stmievanie v krokoch (napr 10%/100%)-viď str.47-51
- plynulé stmievanie riadené PWM alebo 0-10V alebo prúdovou slučkou-str.47-51
- prídavný riadiaci vstup, napr pre "núdzový režim"-viď str.47-51
- pripojenie k adresovateľnému centrálnemu riadiacemu a diagnostickému systému LUXMATIC -viď str.47-51



EN Conformity / Súlad s normami EN

- EN50155:2008
- EN61347-2-13:2006
- EN61347-1:2008
- EN62384:2006
- SELV

LED Electronic Ballasts



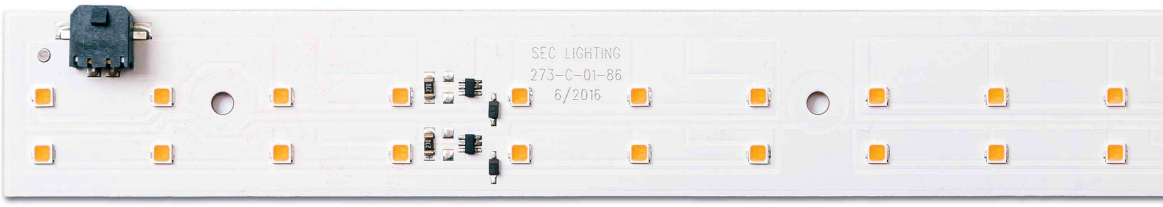
Constant Current 450mA/4W (reading light application)

• SEC CONTROLED Electronic Ballast

SEC CONTROLED electronic ballasts use and refer to the 'know-how' of the longterm verified concept of the electronic ballasts for the fluorescent tubes. All used components are selected with the aim to reach longterm operating reliability and high lifetime and at the same time with the intention to optimalise maintance and reduce the service costs; things that are nowdays expected from the LED lighting systems.

• SEC CONTROLED Electronic Ballast Features

- Power: 1W-40W
- Power Supply: 24V, 36V, 72V, 110V
- 2-4 dimming levels - SETTING option, e.g. 10%/100% (or customised)
- PWM Stepless dimming: 5%-100%
- Addressable electronic ballasts for LUXMATIC system (optional)



DC 24V, 72V or 110V CONTROLED CONSTANT CURRENT

Type	Output Constant Current	Dimming	Power	Size	CentralControl	Order Code
CONTROLED 24V 16-24xLED Setting 50%	0,44A / 0,21A	YES, 50%	45W	217x47x34mm	OPTION	267-B-19-01-00
CONTROLED 24V 6-12xLED 350mA	0,35A	OPTION	15W	220x49x29mm	OPTION	267-B-25-01-00
CONTROLED 24V 2-5xLED Setting 50%	0,61A / 0,3A	YES, 50%	14W	220x49x29mm	OPTION	267-B-35-01-00
CONTROLED 24V 2-5xLED	0,61A	-	14W	220x49x29mm	OPTION	267-B-36-01-00
CONTROLED 110V 6-12xLED	0,56A	OPTION	25W	220x49x29mm	OPTION	267-B- TBD
CONTROLED 110V 16-24xLED	0,47A	OPTION	45W	220x47x29mm	OPTION	267-B-01-55-00
CONTROLED 110V 8-15xLED	0,52A	OPTION	35W	220x47x29mm	OPTION	267-B-01-54-00
CONTROLED 110V 4-7xLED	0,52A	OPTION	18W	220x47x29mm	OPTION	267-B-01-53-00
CONTROLED 110V 1-3xLED	0,5A	OPTION	7W	220x47x29mm	OPTION	267-B-01-52-00
CONTROLED CUSTOMISED	CUSTOMISED	OPTION	CUSTOM.	CUSTOMISED	OPTION	TBD

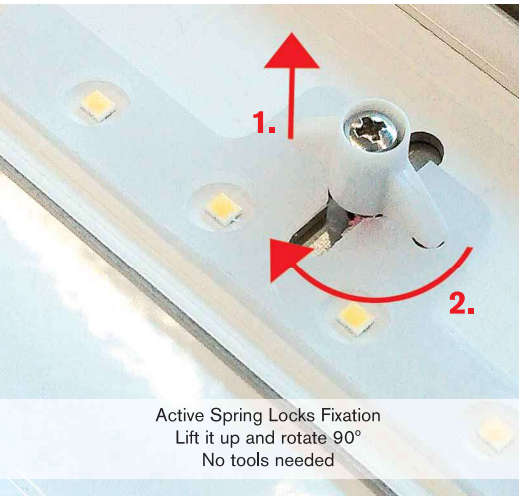
Contact SEC for a up-to-date list of avalilable LED electronic ballasts (drivers) *Kontaktujte SEC pre aktuálny zoznam dostupných LED predradníkov*

DC 24V, 72V or 110V CONTROLED CONSTANT VOLTAGE

Type	Output	Dimming	Power	Size	CentralControl	Order Code
CONTROLED 24V/24V DC	24V DC/ I_{out} max 1,5A	OPTION	40W	229x49x35mm	OPTION	267-B-23-01-00
CONTROLED 110V/24V DC PWM DIM	24V DC/ I_{out} max 1,5A	YES, PWM	40W	243x48x36mm	OPTION	291-B-14-01-00
CONTROLED 110V/24V DC	24V DC/ I_{out} max 1,5A	OPTION	40W	229x48x35mm	OPTION	276-B-01-51-00
CONTROLED-Slim 110V/24V DC	24V DC/ I_{out} max 1,4A	OPTION	35W	239x34x28mm	OPTION	267-B- TBD
CONTROLED-Slim 110V/24VDC PWM DIM	24V DC/ I_{out} max 1,4A	YES, PWM	25W	239x34x28mm	OPTION	267-B- TBD
CONTROLED CUSTOMISED	CUSTOMISED	OPTION	CUSTOM.	CUSTOMISED	OPTION	TBD

Contact SEC for a up-to-date list of avalilable LED electronic ballasts (drivers) *Kontaktujte SEC pre aktuálny zoznam dostupných LED predradníkov*

SEC ProfiLED Modules



Active Spring Locks Fixation
Lift it up and rotate 90°
No tools needed

Description:
- **Up to 100.000 hour lifetime**
- **LED High Efficiency up to 200lm/W**
- **Light output stabilised in the entire power supply range**
- **Light colour 3000K or 4000K (or customised)**
- **LED Binning <3 MacAdam Steps**
- **Colour rendering >90**
- **Energy saving >50%**
- **Complying EN50155, EN45545**
- **Excellent thermal and electrical design**
- **Reduces both service and maintenance costs**
- **Reduces CO_2 emmisions**

Popis:
- **životnosť až 100.000 hod**
- **vysoká účinnosť LED až 200 lm/W**
- **stabilizácie svetelného toku v celom rozsahu napájacieho napätia**
- **farba svetla 3000K alebo 4000K (alebo podľa požiadavky)**
- **LED Binning <3 MacAdam Steps**
- **index podania farieb >80**
- **profesionálny dizajn elektro časti**
- **spĺňa EN50155, EN45545**
- **znižuje servisné náklady na výmenu svetelných zdrojov**
- **znižuje emisie CO_2**

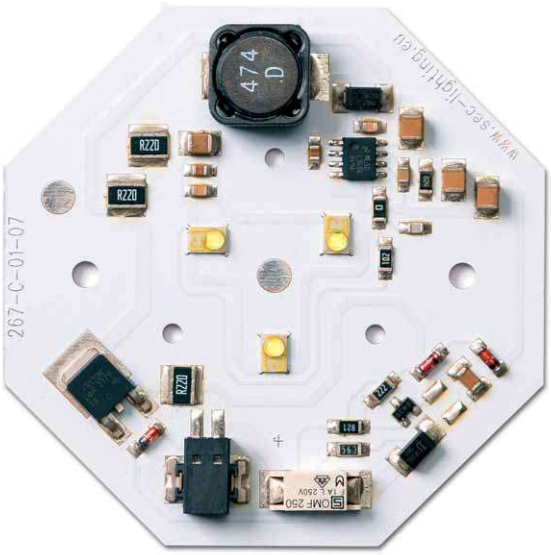
Company SEC offers a wide range of ProfiLED modules dedicated to the luminaire projects with LED lighting sources. All the ProfiLED modules are designed and produced based on the specific requirements of each project so that the modularity requirements are taken into account with the aim to achieve a continuous lighting stripe without any disturbing dark areas and with high uniformity of the luminaire cover illumination.
The ProfiLED modules are produced not only in various lengths but also in various shapes, this makes it possible to create also luminaires of other than the linear shapes, e.g. circle. Company SEC pays a high attention to the lighting system serviceability. Therefore all the models are equipped with the interconnecting connectors (TYCO, MOLEX), what enables to exchange any LED module in the luminaire without the need to change the whole luminaire or to demount the adjacent LED modules. On the level of LED module fixation there are possible solutions, namely fixation by locks which enable to mount/demount the LED module without any tools, just simply by turning the lock in 90° what increases the comfort of the maintenance/service. The lock is equipped with an active spring which ensures a long-time reliable fixation even in the enviroment with presence of high level of vibrations. The ProfiLED modules are produced for the luminaires with the supply voltage 24V, 72V 110V DC (or based on specification). They provide high efficiency, light quality and they strongly contribute to the service costs savings for the lighting source replacement. Their lifetime is up to 100.000 hours.

The SEC ProfiLED LongLife module is especially designed for applications in vehicle interiors where long lifetime, high effectiveness and low maintenance costs are required.

Firma SEC má v ponuke celú sériu ProfiLED modulov, ktoré sú určené pre projekty svietidiel s LED svetelnými zdrojmi. Všetky LED moduly sú navrhované a vyrábané podľa špecifických požiadaviek každého projektu tak, aby boli zohľadnené požiadavky modularity s cieľom dosiahnuť súvislý svetelný pás bez rušivých tmavých miest, s vysokou uniformitou osvetlenia krytu svietidla.
LED moduly sú výrábané nielen v rôznych dĺžkach, ale aj tvaroch, čím je možné vytvoriť svietidlá aj nelineárnych tvarov, napr. kruh. Firma SEC kladie veľký dôraz na servisovateľnosť svetelnej sústavy. Preto sú všetky moduly vybavené prepojovacími konektormi (TYCO, MOLEX), čo umožňuje vymeniť ktorýkoľvek LED modul vo svietidle bez nutnosti výmeny celeho svietidla alebo demontáže susedných LED modulov. K dispozícii sú aj riešenia s použitím fiaxčných "zámkov" na LED moduly, ktoré umožňujú jeho montáž/demontáž bez akéhokoľvek náradia, len jednoducho otočením zámku o 90°, čo ešte zvyšuje komfort údržby/servisu. Zámok je vybavený aktívnou pružinou zaručujúcou dlhodobo spoľahlivú fixáciu aj v podmienkach vysokých vibrácií.
Profi LED moduly sú výrabané pre svietidlá s napájacím napätím 24V, 72V, 110V DC (alebo podľa špecifikácie). Poskytuje vysokú účinnosť, kvalitu svetla a významným prínosom prispievajú k úspore servisných nákladov na výmenu svetelných zdrojov. Ich životnosť je až do 100.000hod.

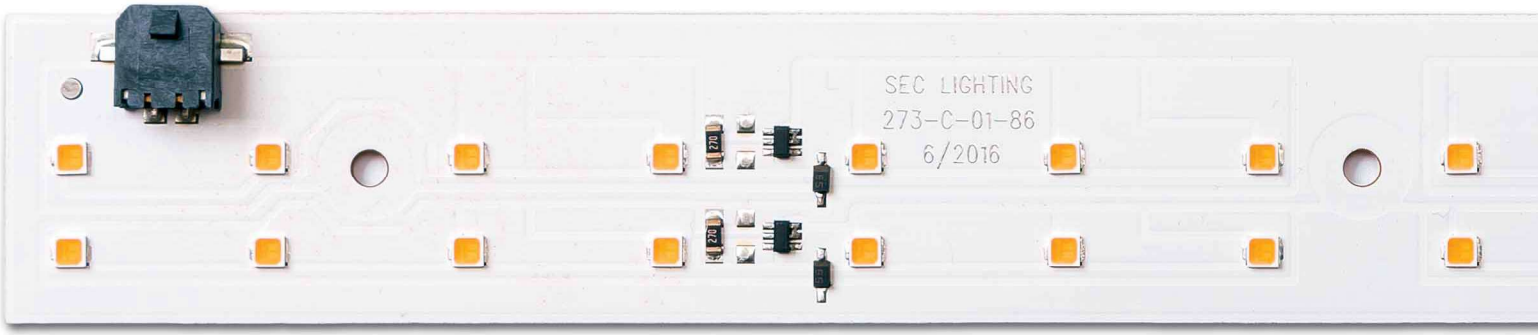
SEC ProfiLED LongLife je špeciálne navrhnutý pre použitie v interiéroch dopravných prostriedkoch, kde je požadovaná dlhá životnosť, vysoká efektivita a nízke náklady na údržbu.

SEC Profi LED Modules



110V DC direct power supply (77-147V DC), Constant current, MOLEX connector, OSRAM LEDs OSLON SSL, < 3 MacAdam Steps

Design	Flexible in length and shape Modular Design Interconnection connectors
Electronics	directly on LED strip external electronic ballast (CVS) is needed
Fixation by	Active spring locks - rotation 90° Screws Clips
Power Supply	24V DC, 72V, 110V DC (or customised)
Light Output	Stabilised in the entire power supply range
Light source	LED 3000K or 4000K (or customised)
LED Binning	< 3 MacAdam Steps
LED Efficiency	up to 200lm/W (OSRAM, CREE, SAMSUNG, LUMILEDS)
Colour Rendering	Ra > 80
Temperature Range	-25°C ...+70°C
Lifetime	up to 100.000h
Railway standard	EN50155 complaint
Fire+Smoke	EN45545 (or customised)



24VDC,Constant current, MOLEX connector, OSRAM LEDs DURIS S5, < 3 MacAdam Steps

Constant current, OSRAM LEDs DURIS S5, < 3 MacAdam Steps

24VDC, Constant current, TYCO connector, OSRAM LEDs DURIS P5, 2BIN selection

77-146VDC, Constant current, Pulse power supply source, MOLEX connector, OSRAM LEDs DURIS E5, Single BIN Selection

Or alternative customised version is available according to customer specification. Contact SEC for a up-to-date list of available LED Modules and suitable electronic ballasts
Alebo verzia podľa špecifikácie odberateľa. Kontakujte SEC pre aktuálny zoznam LED modulov a vhodných predradníkov.

SEC ProLED LongLife Tubes T8

Description:
- **Up to 100.000 hour lifetime**
- **LED High Efficiency up to 200lm/W**
- **Light colour 3000K or 4000K (or customised)**
- **LED Binning <3 MacAdam Steps**
- **Colour rendering >80**
- **Energy saving >50%**
- **Complying EN45545**
- **Excellent thermal and electrical design**
- **Reduces CO_2 emmisions**
- **Reduces both service and maintenance costs**

Popis:
- **životnosť až 100.000 hod**
- **vysoká účinnosť LED až 200 lm/W**
- **farba svetla 3000K alebo 4000K (alebo podľa požiadavky)**
- **LED Binning <3 MacAdam Steps**
- **index podania farieb >80**
- **úspora elekrickej energie >50%**
- **profesionálny dizajn elektro časti a chladiča**
- **spĺňa EN45545**
- **žnižuje emisie CO_2**
- **žnižuje servisné náklady na výmenu svetelných zdrojov**

The ProLED LongLife tube is a new type of LED light source which has been designed by SEC for simple fluorescent tube retrofit. The mechanical design is 100% compatible with regular fluorescent tube applications. You do not need any additional electronic ballast, simply connect it directly to the power supply 24V DC or 110V DC.
It delivers excelent energy effciency, high quality of light, smart maintenance cost reduction, and has a lifetime upto 100.000 hours.

Thanks to the standard lenghts even the fluorescent tube luminares can be upgraded to LED technogy.
SEC ProLED LongLife gives you all benefits of the latest LED lighting while ensuring that you can easily upgrade any T8 fluorescent tube lighting fixture **without replacing the entire luminaire.**

SEC ProLED LongLife is especialy suitable for an environments where there is a need for all extremly long life time, high effciency and low maintenance costs.

Our diffused version has a white semi-opal “milky” PC tube making it suitable for applications where minimal glare is required. The diffusion gives it a fluorescent look while resulting in minimal light loss.
SEC ProLED LongLife is designed for lasting LED lighting solutions.

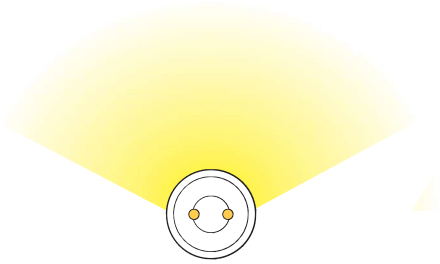
ProLED LongLife je nový typ LED svetelného zdroja, ktorý bol vyvinutý firmou SEC za účelom jednoduchej náhrady za žiarivkový svetelný zdroj. Z mechanického hľadiska je 100% kompatibilný so žiarivkami. Nie je potrebný žiadny elektronický predradník, pripája sa jednoducho priamo k palubnej sieti 24V DC alebo 110V DC.
ProLED LongLife poskytuje vysokú účinnosť, kvalitu svetla a významným prínosom prispieva k úspore servisných nákladov na výmenu svetelných zdrojov. Jeho životnosť je až do 100.000hod.

Vďaka štandardným dĺžkam je možný jednoduchý upgrade bežných žiarivkových svietidiel T8 na LED technológiu pri zachovaní všetkých benefitov LED technológie **bez nutnosti zmeny konceptu alebo výmeny celého svietidla.**

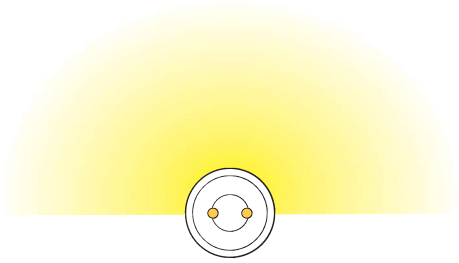
SEC ProLED LongLife je špeciálne navrhnutý pre použitie v interiéroch dopravných prostriedkoch, kde je požadovaná dlhá životnosť, vysoká efektivita a nízke náklady na údržbu.

SEC ProLED vybavené poloopálovým PC krytom zaručujú minimalizáciu nežiadúceho oslnenia. Týmto je dosiahnutý vzhľad pripomínájúci vzhľad klasických žiariviek.
SEC ProLED LongLife je predurčený pre dlhoživotné LED aplikácie.

SEC ProLED Tubes



Light Distribution >120°
Standard flat shaped LED module



Light Distribution >180°
Advanced "V" shaped **TWIN** LED module

Design	Diamater 26mm (equal to fluorescent tube T8)
Length	590mm (retrofit for 18W LL)
	1200mm (retrofit for 36W LL)
Socket	G13
Power Supply	24V DC or 110V DC (or customised)
Light source	LED 3000K or 4000K (or customised)
LED Binning	< 3 MacAdam Steps
LED Efficiency	200lm/W (OSRAM or SAMSUNG)
Lumen/Watt	130lm/W (Clear diffuser versions)
	100lm/W (Opal diffuser versions)
Colour Rendering	Ra > 80
Lighting Distribution	180°
Temperature Range	-25°C ...+50°C (...+70°C for short time)
Lifetime	up to 100,000h
Fire+Smoke	EN45545

T8 ProLED LongLife >120°

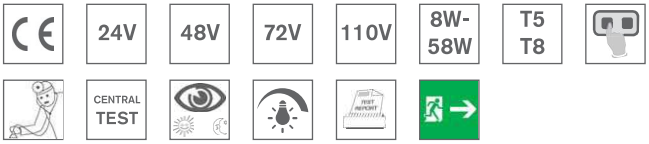
Type	PC Diffuser:	Socket:	Colour	Socket:	Voltage	Power	Fluorescent tube retrofit
ProLED LongLife T8 590mm / clear / 3000K	clear	G13	3000K	G13	24V DC	< 11W	T8 18W/830
ProLED LongLife T8 1200mm / clear / 3000K	clear	G13	3000K	G13	24V DC	< 22W	T8 36W/830
ProLED LongLife T8 590mm / clear / 4000K	clear	G13	4000K	G13	24V DC	< 11W	T8 18W/830
ProLED LongLife T8 1200mm / clear / 4000K	clear	G13	4000K	G13	24V DC	< 22W	T8 36W/830
ProLED LongLife T8 590mm / opal / 3000K	opal white	G13	3000K	G13	24V DC	< 11W	T8 18W/830
ProLED LongLife T8 1200mm / opal / 3000K	opal white	G13	3000K	G13	24V DC	< 22W	T8 36W/830
ProLED LongLife T8 590mm / opal / 4000K	opal white	G13	4000K	G13	24V DC	< 11W	T8 18W/830
ProLED LongLife T8 1200mm / opal / 4000K	opal white	G13	4000K	G13	24V DC	< 22W	T8 36W/830
ProLED LongLife T8 590mm / clear / 3000K	clear	G13	3000K	G13	110V DC	< 11W	T8 18W/830
ProLED LongLife T8 1200mm / clear / 3000K	clear	G13	3000K	G13	110V DC	< 22W	T8 36W/830
ProLED LongLife T8 590mm / clear / 4000K	clear	G13	4000K	G13	110V DC	< 11W	T8 18W/830
ProLED LongLife T8 1200mm / clear / 4000K	clear	G13	4000K	G13	110V DC	< 22W	T8 36W/830
ProLED LongLife T8 590mm / opal / 3000K	opal white	G13	3000K	G13	110V DC	< 11W	T8 18W/830
ProLED LongLife T8 1200mm / opal / 3000K	opal white	G13	3000K	G13	110V DC	< 22W	T8 36W/830
ProLED LongLife T8 590mm / opal / 4000K	opal white	G13	4000K	G13	110V DC	< 11W	T8 18W/830
ProLED LongLife T8 1200mm / opal / 4000K	opal white	G13	4000K	G13	110V DC	< 22W	T8 36W/830

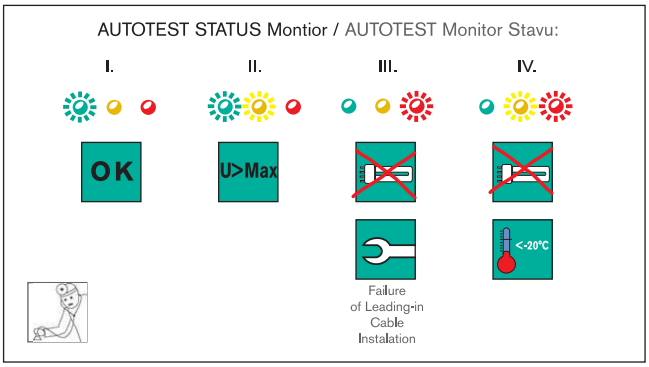
T8 ProLED LongLife TWIN >180°

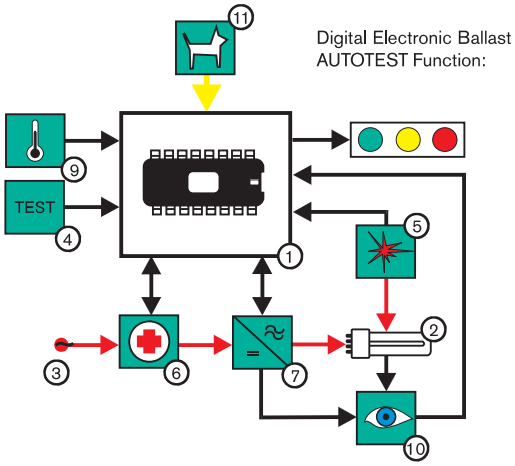
Type	PC Diffuser:	Socket:	Colour	Socket:	Voltage	Power	Fluorescent tube retrofit
ProLED LongLife TWIN T8 590mm / clear / 3000K	clear	G13	3000K	G13	24V DC	< 11W	T8 18W/830
ProLED LongLife TWIN T8 1200mm / clear / 3000K	clear	G13	3000K	G13	24V DC	< 22W	T8 36W/830
ProLED LongLife TWIN T8 590mm / clear / 4000K	clear	G13	4000K	G13	24V DC	< 11W	T8 18W/830
ProLED LongLife TWIN T8 1200mm / clear / 4000K	clear	G13	4000K	G13	24V DC	< 22W	T8 36W/830
ProLED LongLife TWIN T8 590mm / opal / 3000K	opal white	G13	3000K	G13	24V DC	< 11W	T8 18W/830
ProLED LongLife TWIN T8 1200mm / opal / 3000K	opal white	G13	3000K	G13	24V DC	< 22W	T8 36W/830
ProLED LongLife TWIN T8 590mm / opal / 4000K	opal white	G13	4000K	G13	24V DC	< 11W	T8 18W/830
ProLED LongLife TWIN T8 1200mm / opal / 4000K	opal white	G13	4000K	G13	24V DC	< 22W	T8 36W/830
ProLED LongLife TWIN T8 590mm / clear / 3000K	clear	G13	3000K	G13	110V DC	< 11W	T8 18W/830
ProLED LongLife TWIN T8 1200mm / clear / 3000K	clear	G13	3000K	G13	110V DC	< 22W	T8 36W/830
ProLED LongLife TWIN T8 590mm / clear / 4000K	clear	G13	4000K	G13	110V DC	< 11W	T8 18W/830
ProLED LongLife TWIN T8 1200mm / clear / 4000K	clear	G13	4000K	G13	110V DC	< 22W	T8 36W/830
ProLED LongLife TWIN T8 590mm / opal / 3000K	opal white	G13	3000K	G13	110V DC	< 11W	T8 18W/830
ProLED LongLife TWIN T8 1200mm / opal / 3000K	opal white	G13	3000K	G13	110V DC	< 22W	T8 36W/830
ProLED LongLife TWIN T8 590mm / opal / 4000K	opal white	G13	4000K	G13	110V DC	< 11W	T8 18W/830
ProLED LongLife TWIN T8 1200mm / opal / 4000K	opal white	G13	4000K	G13	110V DC	< 22W	T8 36W/830

Or alternative customised version is available according to customer specification. Contact SEC for a up-to-date list of available LED tubes
Alebo verzia podľa špecifikácie odberateľa. Kontakujte SEC pre aktuálny zoznam LED trubíc a vhodných predradníkov.

Fluorescent Tube Electronic Ballasts







1 - 8bit / 16bit Microcomputer
2 - Fluorescent tube
3 - Input voltage
4 - TEST/RESET button
5 - Electronic starter
6 - Overvoltage protection
7 - Electronic ballast
8 - Status monitor
9 - Temperature sensor
10 - Fluorescent tube parameters sensor
11 - "Watch dog"

- The MEGA electronic ballast „family" has been designed for fluorescent tubes all T5, T8 or even compact ones with the power up to 58W in the range of voltage DC 12V, 24V, 48V, 72V or 110V (or customized). C-MEGA has been designed for railway application, A-MEGA type has been designed for Bus&Coach application.
  At the design stage we paid a great deal of attention to extending the service life of fluorescent tubes. Thanks to the microcomputer controll (only for C-MEGA versions), the fluorescent tube lifetime is at least 500.000 ON/OFF which brings high service and maintenance costs savings.

Main characteristics:
- Controlled preheated start-up of the fluorescent tube
- RESTART function in case of fluorescent tube start-up failure (50 times), then automatic switch to STANDBY mode to protect electronics
- Light output stabilization in whole feeding voltage range
- **Dimming SETING function 15/30-100%** (option, refer to page No.47-51)
- AUTOTEST continually tests main parameters of all the fluorescent tube, power circuits, input feeding voltage parameters. The result is displayed by three LEDs (monitor of status). If the measuring parameters are out of limits the electronic ballast stops in order to avoid its damage.
- Fast electronic protection against both pulse and permanent overvoltage

- Elektronické predradníky MEGA boli navrhnuté pre žiarivky T5/T8 alebo kompaktné s výkonom až 58W pre celý rozsah napájacích napätí DC 12V, 24V, 36V, 48V, 72V, 110V (alebo podľa špecifikácie zákazníka). Typová rada C-MEGA je určená pre aplikácie v železničných dopravných prostriedkoch, rada A-MEGA je určená pre autobusy.
  Už počas fázy vývoja sa kládol veľký dôraz na minimálizáciu servisných nákladov počas živosti svetelnej sústavy. Vďaka mikropočítačovému riadeniu (iba verzie C-MEGA) garantujeme min 5000000 zapaľovacích cyklov žiarivky bez nutnosti jej výmeny, čím sa výrazne znížili náklady na údržbu a servis.

Hlavné charakteristiky:
- riadené predhrievanie elektród počas štartu žiarivky
- funkcia RESTART pri neúspešnom štarte žiarivky (max 50x), potom sa predradník vypne a chybu žiarivky signalizuje kombináciou farebných LED diód
- stabilizácia svetelného toku v celom rozsahu napájacieho napätia
- **funkcia stmievania v krokoch SETTING alebo plynule (pozri aj str 47-51)**
- funkcia AUTOTEST kontinuálne testuje hlavné parametre žiarivky, napájacích obvodov a vstupného napätia. Výsledok je zobrazený pomocou 3 farebných LED (status monitor). Ak sú parametre vyhodnotené mimo rozsahu, tak sa predadník vypína, aby predšlo jeho poruche (STANDBY mód)
- rýchla elektronická ochrana proti statickému alebo dynamickému prepätiu

STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

- AL sheet body
- WAGO Terminal blocks
- 3 Colour LEDs Status Monitor (only C-MEGA versions)
- Halogen-free wiring RADOX GKW

- Teleso z AL
- WAGO prípojné svorky
- 3 farebné LED pre identifikáciu poruchovho stavu (iba C-MEGA verzie)
- Halogénovo bezpečné vodiče RADOX GKW

EN Conformity / Súlad s normami EN

- EN50311:2003
- UIC555-1
- EN50155:2008
- EN61347-2-3:2011
- EN61347-1:2008

• SEC AUTOTEST Digital Electronic Ballast

The base of this SEC's unique solution is a **fully digital controlled electronic ballast.**
Thanks to the microcomputer it **continuously monitors** the operational status of all:
- the **fluorescent tube** (if it is too close to its end of lifetime, the electronic ballast turns automatically to the stand-by mode in order to avoid inefficient lighting)
- the **wiring** (it automatically turns to the stand-by mode),
- the short-circuit on the output (it automatically turns to the stand-by mode)
- the **right position** of the fluorescent tube in the sockets (it automatically turns to the stand-by mode),
- the **power supply** (very fast electronic protection against both static and dynamic overvoltage, it automatically turns to the stand-by mode with automatic restart after the power supply correction),
- the **light output level** in order to have exactly the same lighting conditions (stabilization of the light output)

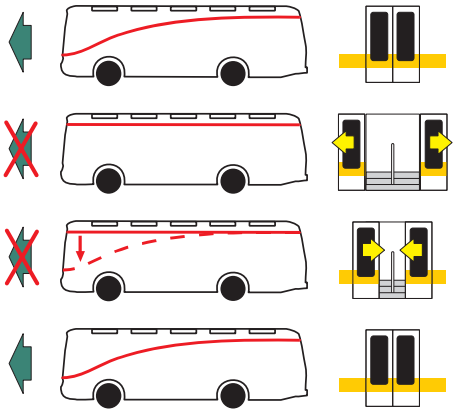
In case of some incorrect status, it automatically turns to the **stand-by mode.** The actual state is **signalised** to the operator by the combination of **3 coloured LEDs** in each lighting fixture. **While the electronic ballast is in the stand-by mode, high voltage in the both terminal blocks and lamp holders is prevented.**

• Restart AUTOTEST Function

This standard function (all C-MEGA electronic ballasts) **automatically restarts the electronic ballast** in case of:
- Pre-heating current of the fluorescent tube is out the range (fluorescent tube failure or broken fluorescent tube socket contact). It restarts for 10 times to start up the fluorescent tube. If it is not succesful it automatically turns to stand-by mode.
- Pre-heating current is OK but operating fluorescent tube current does not reach the required level within 10ms (end of fluorescent tube lifetime or extremely low temperature). It restarts for 50 times to start up the fluorescent tube. If it is not successful it automatically turns to stand-by mode.

The actual state is signalised for the operator by combination of 3 coloured LEDs in each lighting fixture (see previous page).

Example of SETTING Dimming application avoiding the Glare Effect in the Tram or Bus windscreen:
Príklad použitia 2-úrovňového stmievania SETTING na minimalizáciu effektu zrkadlenia osvetlenia v čelnom skle električky alebo autobusu:

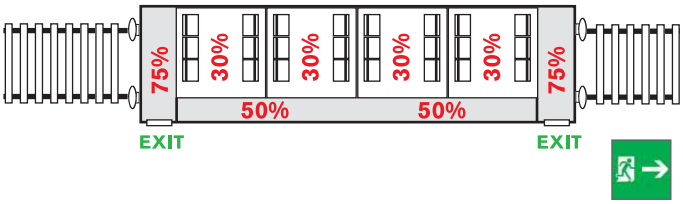


• Dimming Function 15/30-100% SETTING

SEC manufactures also dimmable electronic ballasts in version indexed or even **stepless dimming** for the whole T8, T5 or even LEDs. Unique SEC's dimming digital circuit gentle dimms the fluorescent tube in order to reach its maximum lifetime.

Advantages:
- High efficiency of **dimming** (energy saving)
- **Passenger comfort**
- **Adaptivity** of the whole lighting system based on **surrounding lighting conditions**
- **Emergency lighting** (battery power supply) - refer also to page No.47-51 It allows to preset several lighting levels for individual areas inside of the vehicle (corridor, exit areas,...)
- **Elimination of the glare effect** in the windscreen - the higher level of traffic safety.

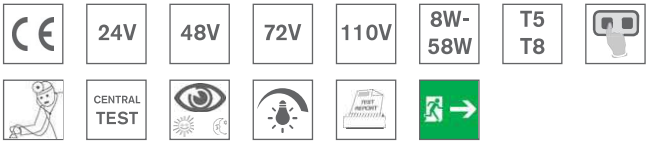
Emergency mode SETTING Dimming Example in a Train Car

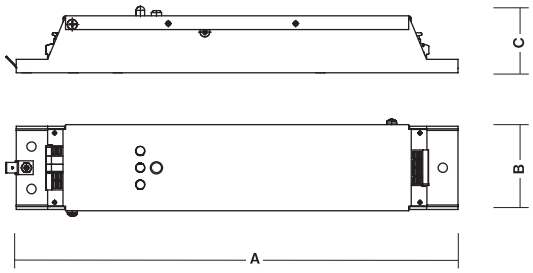


• Pre-Heat Control

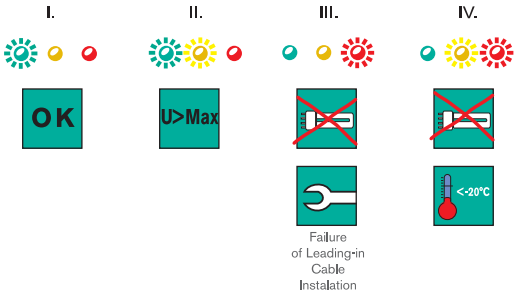
Special SEC's pre-heating circuit based on the unique fully **digital electronic ballast** design ensures controlled pre-heating of the fluorescent tube electrodes in order to reach at minimum **500.000 fluorescent lamp start-ups** in whole range of both operating voltage and operating temperatures.
This special circuit is standard for all SEC electronic ballasts.

C-MEGA R MID





AUTOTEST STATUS Montior / AUTOTEST Monitor Stavu:



- The C-MEGA R MID is digital electronic ballasts for feeding of whole range of fluorescent tubes up to 58W, T5/T8 or even compact ones in the range of voltage DC 24V, 48V, 72V or 110V (or customized).
  C-MEGA R MID has been designed especially for railway lighting application. It is strictly designed according to EN50311.
  At the design stage we paid a great deal of attention to extending the service life of fluorescent tubes. Thanks to the microcomputer controll, the fluorescent tube lifetime is at least 500.000 ON/OFF which brings high service and maintenance costs savings.

Main characteristics:

- Controlled preheated start-up of the fluorescent tube
- RESTART function in case of fluorescent tube start-up failure (50 times), then automatic switch to STANDBY mode to protect electronics
- Light output stabilization in whole feeding voltage range
- Dimming function in steps (SETTING) or stepless in range 30-100% (option, refer to page No.47-51)
- AUTOTEST continually tests main parameters of all the fluorescent tube, power circuits, input feeding voltage parameters. The result is displayed by three LEDs (monitor of status). If the measuring parameters are out of limits the electronic ballast stops in order to avoid its damage.
- Fast electronic protection against both pulse and permanent overvoltage

- Elektronické predradníky C-MEGA R MID sú určené pre napájanie žiariviek T5/T8 alebo kompaktné s výkonom až 58W pre celý rozsah napájacích napätí DC 24V, 36V, 48V, 72V, 110V (alebo podľa špecifikácie zákazníka).
  Typová rada C-MEGA R MID je určená hlavne pre aplikácie v železničných dopravných prostriedkoch, jej design je striktne v súlade s EN50311.
  Už počas fázy vývoja sa kládol veľký dôraz na minimálizáciu servisných nákladov počas živosti svetelnej sústavy. Vďaka mikropočítačovému riadeniu garantujeme min 5000000 zapaľovacích cyklov žiarivky bez nutnosti jej výmeny, čím sa výrazne znížili náklady na údržbu a servis.

Hlavné charakteristiky:

- riadené predhrievanie elektród počas štartu žiarivky
- funkcia RESTART pri neúspešnom štarte žiarivky (max 50x), potom sa predradník vypne a chybu žiarivky signalizuje kombináciou farebných LED diód
- stabilizácia svetelného toku v celom rozsahu napájacieho napätia
- funkcia stmievania v krokoch SETTING alebo plynule (pozri aj str. 47-51)
- funkcia AUTOTEST kontinuálne testuje hlavné parametre žiarivky, napájacích obvodov a vstupného napätia. Výsledok je zobrazený pomocou 3 farebných LED (status monitor). Ak sú parametre vyhodnotené mimo rozsahu, tak sa predadník vypína, aby predišlo jeho poruche (STANDBY mód)
- rýchla elektronická ochrana proti statickému alebo dynamickému prepätiu

STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

- AL sheet body
- WAGO Terminal blocks
- 3 Colour LEDs Status Monitor
- Halogen-free wiring RADOX GKW

- Teleso z AL
- WAGO prípojné svorky
- 3 farebné LED pre identifikáciu poruchovho stavu
- Halogénovo bezpečné vodiče RADOX GKW

EN Conformity / Súlad s normami EN

- EN50311:2003
- UIC555-1
- EN50155:2008
- EN61347-2-3:2011
- EN61347-1:2008

24V DC C-MEGA R MID (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R MID 7-9W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-131	0,3 kg
C-MEGA R MID 18W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-97	0,3 kg
C-MEGA R MID 2x18W/36W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-122	0,3 kg
C-MEGA R MID 36W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-126-01-03	0,3 kg
C-MEGA R MID 36W-1m/24V DC	260x49x39 mm	-	YES	OPTION	08-B-273	0,3 kg
C-MEGA R MID T5 14W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-200	0,3 kg
C-MEGA R MID T5 21W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-201	0,3 kg
C-MEGA R MID T5 2x21W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-205	0,3 kg
C-MEGA R MID T5 24W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-213	0,3 kg
C-MEGA R MID T5 28W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-202	0,3 kg
C-MEGA R MID T5 35W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-203	0,3 kg
C-MEGA R MID T5 39W/24V DC	260x49x39 mm	-	YES	OPTION	08-B-214	0,3 kg

Or alternative customised version is available according to customer specification

48V DC C-MEGA R MID (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R MID 2x18W/48V DC	260x49x39 mm	-	YES	OPTION	08-B-266	0,3 kg
C-MEGA R MID 36W/48V DC	260x49x39 mm	-	YES	OPTION	08-B-267	0,3 kg

Or alternative customised version is available according to customer specification

72V DC C-MEGA R MID (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R MID T8 2x14W/72V DC	260x49x39 mm	-	YES	OPTION	08-B-197	0,3 kg
C-MEGA R MID T8 15W/72V DC	260x49x39 mm	-	YES	OPTION	08-B-142	0,3 kg
C-MEGA R MID T8 2x15W/72V DC	260x49x39 mm	-	YES	OPTION	08-B-148	0,3 kg
C-MEGA R MID 18W/72V DC	260x49x39 mm	-	YES	OPTION	08-B-90	0,3 kg
C-MEGA R MID 36W/72V DC	260x49x39 mm	-	YES	OPTION	08-B-91	0,3 kg

Or alternative customised version is available according to customer specification

110V DC C-MEGA R MID (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R MID 2x9W/110V DC	260x49x39 mm	-	YES	OPTION	08-B-264	0,3 kg
C-MEGA R MID 18W/110V DC	260x49x39 mm	-	YES	OPTION	08-B-128	0,3 kg
C-MEGA R MID 2x18W/110V DC	260x49x39 mm	-	YES	OPTION	08-B-132	0,3 kg
C-MEGA R MID 36W/110V DC	260x49x39 mm	-	YES	OPTION	08-B-120	0,3 kg
C-MEGA R MIDL 18W/36W/2x18W/110V DC	260x50x30 mm	-	YES	OPTION	08-B-196	0,3 kg
C-MEGA R MIDL 2x18W/110V DC	260x50x30 mm	-	YES	OPTION	08-B-192	0,3 kg
C-MEGA R MIDL 36W/110V DC	260x50x30 mm	-	YES	OPTION	08-B-193	0,3 kg
C-MEGA R MIDS 18W/36W/110V DC	260x43x37 mm	-	YES	OPTION	08-B-281	0,3 kg
C-MEGA R MIDS 30W/110V DC	260x43x37 mm	-	YES	OPTION	08-B-282	0,3 kg
C-MEGA R MID T5 14W/110V DC	260x49x39 mm	-	YES	OPTION	08-B-245	0,3 kg
C-MEGA R MID T5 2x14W/110V DC	260x49x39 mm	-	YES	OPTION	08-B-249	0,3 kg
C-MEGA R MID T5 21W/110V DC	260x49x39 mm	-	YES	OPTION	08-B-246	0,3 kg
C-MEGA R MID T5 2x21W/110V DC	260x49x39 mm	-	YES	OPTION	08-B-250	0,3 kg
C-MEGA R MID T5 28W/110V DC	260x49x39 mm	-	YES	OPTION	08-B-247	0,3 kg
C-MEGA R MID T5 35W/110V DC	260x49x39 mm	-	YES	OPTION	08-B-248	0,3 kg

Or alternative customised version is available according to customer specification

C-MEGA R MID

24V DC C-MEGA R MID (SETTING Dimming / SETTING stmievateľné)

Type / Typ	Dimmensions AxBxC:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R MID 18W/24V DC SETTING 30%	260x49x39 mm	30% / 100%	YES	OPTION	08-B-155	0,3 kg
C-MEGA R MID 18W/24V DC SETTING 50%	260x49x39 mm	50% / 100%	YES	OPTION	08-B-194	0,3 kg
C-MEGA R MID 2x18W/24V DC SETTING 30%	260x49x39 mm	30% / 100%	YES	OPTION	08-B-146	0,3 kg
C-MEGA R MID 2x18W/24V DC SETTING 50%	260x49x39 mm	50% / 100%	YES	OPTION	08-B-275	0,3 kg
C-MEGA R MID 36W/24V DC SETTING 30%	260x49x39 mm	30% / 100%	YES	OPTION	08-B-278	0,3 kg
C-MEGA R MID 36W/24V DC SETTING 50%	260x49x39 mm	50% / 100%	YES	OPTION	08-B-140	0,3 kg
C-MEGA R MID 58W/24V DC SETTING 30%	260x49x39 mm	30% / 100%	YES	OPTION	08-B-175	0,3 kg

Or alternative customised version is available according to customer specification

110V DC C-MEGA R MID (SETTING Dimming / SETTING stmievateľné)

Type / Typ	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R MID 18W/110V DC SETTING 30%	260x49x39 mm	30% / 100%	YES	OPTION	08-B-271	0,3 kg
C-MEGA R MID 18W/110V DC SETTING 40%	260x49x39 mm	40% / 100%	YES	OPTION	08-B-268	0,3 kg
C-MEGA R MID 2x18W/110VDC SETTING 30%	260x49x39 mm	30% / 100%	YES	OPTION	08-B-179	0,3 kg
C-MEGA R MID 2x18W/110VDC SETTING 50%	260x49x39 mm	50% / 100%	YES	OPTION	08-B-180	0,3 kg
C-MEGA R MID 36W/110V DC SETTING 30%	260x49x39 mm	30% / 100%	YES	OPTION	08-B-272	0,3 kg
C-MEGA R MID 36W/110V DC SETTING 40%	260x49x39 mm	40% / 100%	YES	OPTION	08-B-269	0,3 kg

Or alternative customised version is available according to customer specification

24V DC C-MEGA X MID (Central Contrl LUXMATIC)

Type / Typ	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA X MID 18W/24V DC	260x49x39 mm	Stepless Dimming	YES	YES	08-B-144	0,3 kg
C-MEGA X MID 2x18W/24V DC	260x49x39 mm	Stepless Dimming	YES	YES	08-B-145	0,3 kg
C-MEGA X MID 36W/24V DC	260x49x39 mm	Stepless Dimming	YES	YES	08-B-139	0,3 kg
C-MEGA X MID 2x18W/36W/24V DC	260x49x39 mm	Stepless Dimming	YES	YES	08-B-147	0,3 kg

Or alternative customised version is available according to customer specification

C-MEGA R LONG

- The C-MEGA R LONG is digital electronic ballasts for feeding of 36W T8 fluorescent tube with the power supply voltage DC 24V or 110V. C-MEGA R LONG has been designed as a customised version complying EN50311 except from its size which has been defined by the customer. At the design stage we paid a great deal of attention to extending the service life of fluorescent tubes. Thanks to the microcomputer controll, the fluorescent tube lifetime is at least 500.000 ON/OFF which brings high service and maintenance costs savings.

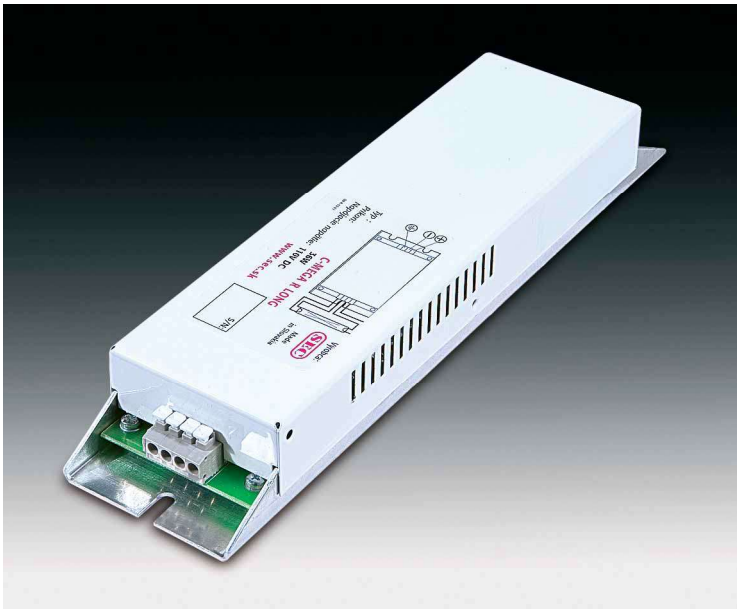
Main characteristics:

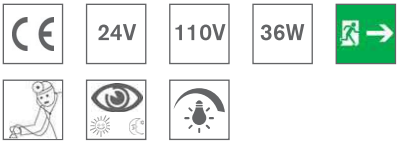
- Controlled preheated start-up of the fluorescent tube
- RESTART function in case of fluorescent tube start-up failure (50 times), then automatic switch to STANDBY mode to protect electronics
- Light output stabilization in whole feeding voltage range
- Fast electronic protection against both pulse and permanent overvoltage

- Elektronické predradníky C-MEGA R LONG sú určené pre napájanie žiariviek T8 36W pre napájacie napätia DC 24V alebo 110V. Typová rada C-MEGA R LONG je určená hlavne pre aplikácie v železničných dopravných prostriedkoch, jej design je striktne v súlade s EN50311 okrem rozmeru, ktorý je podľa špecifikácie pôvodného zákazníka. Už počas fázy vývoja sa kládol veľký dôraz na minimálizáciu servisných nákladov počas živosti svetelnej sústavy. Vďaka mikropočítačovému riadeniu garantujeme min 5000000 zapaľovacích cyklov žiarivky bez nutnosti jej výmeny, čím sa výrazne znížili náklady na údržbu a servis.

Hlavné charakteristiky:

- riadené predhrievanie elektród počas štartu žiarivky
- funkcia RESTART pri neúspešnom štarte žiarivky (max 50x), potom sa predradník vypne
- stabilizácia svetelného toku v celom rozsahu napájacieho napätia
- rýchla elektronická ochrana proti statickému alebo dynamickému prepätiu

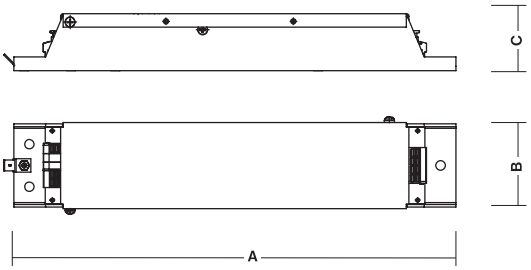




STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

- AL sheet body
- WAGO Terminal blocks
- Halogen-free wiring RADOX GKW

- Teleso z AL
- WAGO prípojné svorky
- Halogénovo bezpečné vodiče RADOX GKW



EN Conformity / Súlad s normami EN

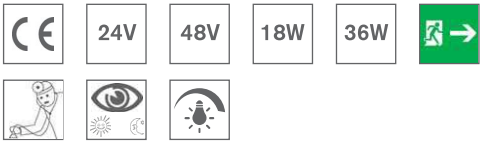
- EN50311:2003 (its size is customised)
- UIC555-1
- EN50155:2008
- EN61347-2-3:2011
- EN61347-1:2008

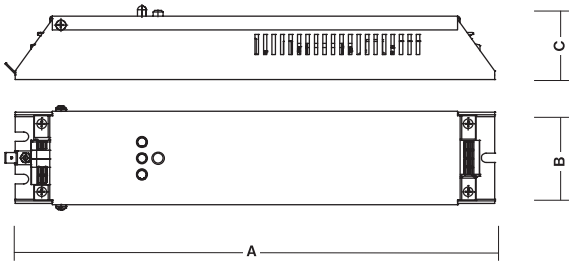
24V/110V DC C-MEGA R LONG (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R LONG T8 36W/24V DC	281x54x55mm	-	-	-	08-B-74	0,3 kg
C-MEGA R LONG T8 36W/110V DC	281x54x55mm	-	-	-	08-B-78	0,3 kg

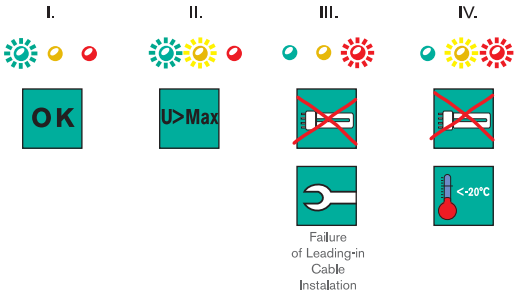
Flourescent Tube Electronic Ballast

C-MEGA R GLOBAL





AUTOTEST STATUS Montior / AUTOTEST Monitor Stavu:



- The C-MEGA R GLOBAL is digital electronic ballasts for feeding of both 36W or 18W T8 fluorescent tubes in the range of voltage DC 24V or 48V. C-MEGA R GLOBAL has been designed especially for railway lighting application. It is strictly design according to EN50311 except from size which is in compliance with UIC555.
  At the design stage we paid a great deal of attention to extending the service life of fluorescent tubes. Thanks to the microcomputer controll, the fluorescent tube lifetime is at least 500.000 ON/OFF which brings high service and maintenance costs savings.

Main characteristics:

- Controlled preheated start-up of the fluorescent tube
- RESTART function in case of fluorescent tube start-up failure (50 times), then automatic switch to STANDBY mode to protect electronics
- Light output stabilization in whole feeding voltage range
- Dimming function in steps (SETTING) 30-50%/100% (option, refer to page No 47-51)
- AUTOTEST continually tests main parameters of all the fluorescent tube, power circuits, input feeding voltage parameters. The result is displayed by three LEDs (monitor of status). If the measuring parameters are out of limits the electronic ballast stops in order to avoid its damage.
- Fast electronic protection against both pulse and permanent overvoltage

- Elektronické predradníky C-MEGA R GLOBAL sú určené pre napájanie žiariviek T8 18W alebo 36W pre napájacie napätia DC 24V alebo 48V (alebo podľa špecifikácie zákazníka).
  Typová rada C-MEGA R GLOBAL je určená hlavne pre aplikácie v železničných dopravných prostriedkoch, jej design je striktne v súlade s EN50311 okrem rozmeru, ktorý je v súlade s UIC555.
  Už počas fázy vývoja sa kládol veľký dôraz na minimálizáciu servisných nákladov počas živosti svetelnej sústavy. Vďaka mikropočítačovému riadeniu garantujeme min 5000000 zapaľovacích cyklov žiarivky bez nutnosti jej výmeny, čím sa výrazne znížili náklady na údržbu a servis.

Hlavné charakteristiky:

- riadené predhrievanie elektród počas štartu žiarivky
- funkcia RESTART pri neúspešnom štarte žiarivky (max 50x), potom sa predradník vypne a chybu žiarivky signalizuje kombináciou farebných LED diód
- stabilizácia svetelného toku v celom rozsahu napájacieho napätia
- funkcia stmievania v krokoch SETTING 30-50%/100% (pozri aj str 47-51)
- funkcia AUTOTEST kontinuálne testuje hlavné parametre žiarivky, napájacích obvodov a vstupného napätia. Výsledok je zobrazený pomocou 3 farebných LED (status monitor). Ak sú parametre vyhodnotené mimo rozsahu, tak sa predadník vypína, aby predišlo jeho poruche (STANDBY mód)
- rýchla elektronická ochrana proti statickému alebo dynamickému prepätiu

STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

- AL sheet body
- WAGO Terminal blocks
- 3 Colour LEDs Status Monitor
- Halogen-free wiring RADOX GKW

- Teleso z AL
- WAGO prípojné svorky
- 3 farebné LED pre identifikáciu poruchovho stavu
- Halogénovo bezpečné vodiče RADOX GKW

EN Conformity / Súlad s normami EN

- EN50311:2003 (size is customised)
- UIC555-1
- EN50155:2008
- EN61347-2-3:2011
- EN61347-1:2008

24V DC C-MEGA R GLOBAL (non-dimmable / nestmievateľné)

Type / Typ	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R GLOBAL 18W/24V DC	284x54x55 mm	-	YES	-	08-B-79	0,4 kg
C-MEGA R GLOBAL 2x18W/24V DC	284x54x55 mm	-	YES	-	08-B-100	0,4 kg
C-MEGA R GLOBAL 36W/24V DC	284x54x55 mm	-	YES	-	08-B-75	0,4 kg

48V DC C-MEGA R GLOBAL (non-dimmable / nestmievateľné)

Type / Typ	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R GLOBAL 36W/48V DC	284x54x55 mm	-	YES	-	08-B-94	0,4 kg

24V DC C-MEGA R GLOBAL (SETTING Dimming / SETTING stmievateľné)

Type / Typ	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R GLOBAL 18W/24V DC SETTING 30%	284x54x55 mm	30% / 100%	YES	-	08-B-81	0,4 kg
C-MEGA R GLOBAL 36W/24V DC SETTING 50%	284x54x55 mm	50% / 100%	YES	-	08-B-89	0,4 kg

48V DC C-MEGA R GLOBAL (SETTING Dimming / SETTING stmievateľné)

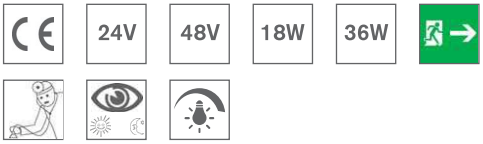
Type / Typ	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R GLOBAL 18W/24V DC SETTING 50%	284x54x55 mm	50% / 100%	YES	-	08-B-129	0,4 kg

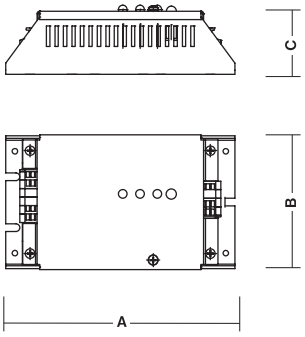
C-MEGA R

- The C-MEGA R is digital electronic ballasts for feeding of whole range of fluorescent tubes up to 36W, T8 or even compact ones in the range of voltage DC 24V, 48V or 110V (or customized).
  C-MEGA R has been designed especially for railway lighting application. It is strictly designed according to EN50311 except from its size which is customised designed.
  At the design stage we paid a great deal of attention to extending the service life of fluorescent tubes. Thanks to the microcomputer controll, the fluorescent tube lifetime is at least 500,000 ON/OFF which brings high service and maintenance costs savings.

Main characteristics:

- Controlled preheated start-up of the fluorescent tube
- RESTART function in case of fluorescent tube start-up failure (50 times), then automatic switch to STANDBY mode to protect electronics
- Light output stabilization in whole feeding voltage range
- **Dimming function in steps (SETTING) or stepless in range 30-100%** (option, refer to page No.47-51)
- AUTOTEST continually tests main parameters of all the fluorescent tube, power circuits, input feeding voltage parameters. The result is displayed by three LEDs (monitor of status). If the measuring parameters are out of limits the electronic ballast stops in order to avoid its damage.
- Fast electronic protection against both pulse and permanent overvoltage



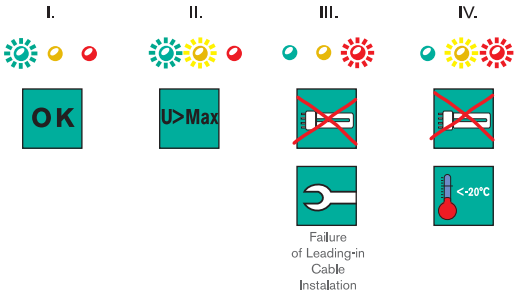


- Elektronické predradníky C-MEGA R sú určené pre napájanie žiariviek T8 alebo kompaktné s výkonom až 36W pre celý rozsah napájacích napätí DC 24V, 48V alebo 110V (alebo podľa špecifikácie zákazníka).
  Typová rada C-MEGA R je určená hlavne pre aplikácie v železničných dopravných prostriedkoch, jej design je striktne v súlade s EN50311 okrem veľkosti, ktorá je podľa špecifikácie pôvodného zákazníka.
  Už počas fázy vývoja sa kládol veľký dôraz na minimálizáciu servisných nákladov počas živosti svetelnej sústavy. Vďaka mikropočítačovému riadeniu garantujeme min 5000000 zapaľovacích cyklov žiarivky bez nutnosti jej výmeny, čím sa výrazne znížili náklady na údržbu a servis.

Hlavné charakteristiky:

- riadené predhrievanie elektród počas štartu žiarivky
- funkcia RESTART pri neúspešnom štarte žiarivky (max 50x), potom sa predradník vypne a chybu žiarivky signalizuje kombináciou farebných LED diód
- stabilizácia svetelného toku v celom rozsahu napájacieho napätia
- **funkcia stmievania v krokoch SETTING alebo plynule (pozri aj str. 47-51)**
- funkcia AUTOTEST kontinuálne testuje hlavné parametre žiarivky, napájacích obvodov a vstupného napätia. Výsledok je zobrazený pomocou 3 farebných LED (status monitor). Ak sú parametre vyhodnotené mimo rozsahu, tak sa predadník vypína, aby predišlo jeho poruche (STANDBY mód)
- rýchla elektronická ochrana proti statickému alebo dynamickému prepätiu

AUTOTEST STATUS Montior / AUTOTEST Monitor Stavu:



STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

- AL sheet body
- WAGO Terminal blocks
- 3 Colour LEDs Status Monitor
- Halogen-free wiring RADOX GKW

- Teleso z AL
- WAGO prípojné svorky
- 3 farebné LED pre identifikáciu poruchovho stavu
- Halogénovo bezpečné vodiče RADOX GKW

EN Conformity / Súlad s normami EN

- EN50311:2003 (size is customised)
- UIC555-1
- EN50155:2008
- EN61347-2-3:2011
- EN61347-1:2008

24V DC C-MEGA R (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R 18W/24V DC	135x75x37mm	-	YES	-	08-B-169	0,3 kg
C-MEGA R 2x18W/24V DC	135x75x37mm	-	YES	-	08-B-138	0,3 kg
C-MEGA R 2x18W/36W/24V DC	135x75x37mm	-	YES	-	08-B-59	0,3 kg
C-MEGA R 24W/24V DC	135x75x37mm	-	YES	-	08-B-124	0,3 kg
C-MEGA R 25W/24V DC	135x75x37mm	-	YES	-	08-B-149	0,3 kg

48V DC C-MEGA R (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R 18W/48V DC	135x75x37mm	-	YES	-	08-B-153	0,3 kg
C-MEGA R 25W/48V DC	135x75x37mm	-	YES	-	08-B-93	0,3 kg
C-MEGA R 36W/48V DC	135x75x37mm	-	YES	-	08-B-64	0,3 kg

110V DC C-MEGA R (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R 18W/110V DC	135x75x37mm	-	YES	-	08-B-158	0,3 kg
C-MEGA R 24W/110V DC	135x75x37mm	-	YES	-	08-B-130	0,3 kg
C-MEGA R 36W/110V DC	135x75x37mm	-	YES	-	08-B-65	0,3 kg

24V DC C-MEGA R (SETTING Dimming / SETTING stmievateľné)

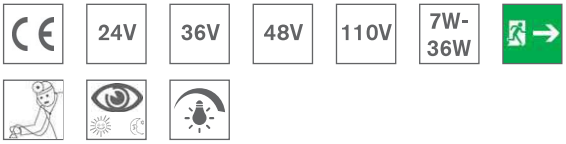
Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R 18W/24V DC SETTING 4 Levels*	135x75x37mm	30%/50%/75%/100%	YES	-	08-B-80	0,3 kg
C-MEGA R 36W/24V DC SETTING 4 Levels*	135x75x37mm	30%/50%/75%/100%	YES	-	08-B-83	0,3 kg
C-MEGA R 2x18W/24V DC SETTING 30%	135x75x37mm	30%/100%	YES	-	08-B-137	0,3 kg
C-MEGA R 36W/24V DC SETTING 35%	135x75x37mm	35%/100%	YES	-	08-B-136	0,3 kg
C-MEGA R 36W/24V DC SETTING 50%**	135x75x37mm	50%/100%**	YES	-	08-B-87	0,3 kg
C-MEGA R 36W/24V DC SETTING 50%***	135x75x37mm	50%/100%***	YES	-	08-B-72	0,3 kg

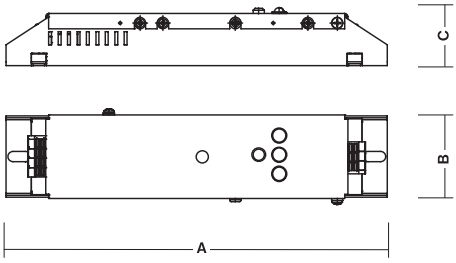
** it is equipped by DIP Switch for Dimming Level Preset*
*** Negative Logic*
**** Positive Logic*

48V DC C-MEGA R (SETTING Dimming / SETTING stmievateľné)

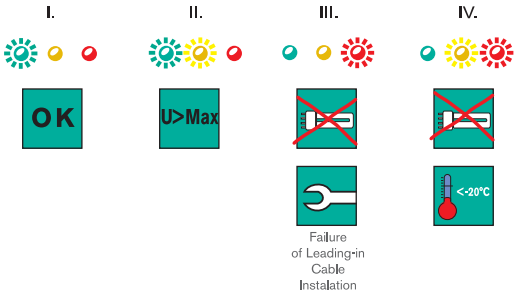
Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R 18W/48V DC SETTING 30%	135x75x37mm	30%/100%	YES	-	08-B-162	0,3 kg

C-MEGA R SLIM





AUTOTEST STATUS Montior / AUTOTEST Monitor Stavu:



- The C-MEGA R SLIM is digital electronic ballasts for feeding of whole range of fluorescent tubes up to 36W, T8 or even compact ones in the range of voltage DC 24V, 36V, 48V or 110V.
  C-MEGA R SLIM has been designed especially for railway lighting application. It is strictly designed according to EN50311 except from its size which is customised designed.
  At the design stage we paid a great deal of attention to extending the service life of fluorescent tubes. Thanks to the microcomputer controll, the fluorescent tube lifetime is at least 500,000 ON/OFF which brings high service and maintenance costs savings.

Main characteristics:

- Controlled preheated start-up of the fluorescent tube
- RESTART function in case of fluorescent tube start-up failure (50 times), then automatic switch to STANDBY mode to protect electronics
- Light output stabilization in whole feeding voltage range
- **Dimming function in steps (SETTING) or stepless in range 30-100%** (option, refer to page No.47-51)
- AUTOTEST continually tests main parameters of all the fluorescent tube, power circuits, input feeding voltage parameters. The result is displayed by three LEDs (monitor of status). If the measuring parameters are out of limits the electronic ballast stops in order to avoid its damage.
- Fast electronic protection against both pulse and permanent overvoltage

- Elektronické predradníky C-MEGA R SLIM sú určené pre napájanie žiariviek T8 alebo kompaktné s výkonom až 36W pre celý rozsah napájacích napätí DC 24V, 36V, 48V, 110V.
  Typová rada C-MEGA R SLIM je určená hlavne pre aplikácie v železničných dopravných prostriedkoch, jej design je striktne v súlade s EN50311 okrem veľkosti, ktorá je podľa špecifikácie pôvodného zákazníka.
  Už počas fázy vývoja sa kládol veľký dôraz na minimálizáciu servisných nákladov počas živosti svetelnej sústavy. Vďaka mikropočítačovému riadeniu garantujeme min 5000000 zapaľovacích cyklov žiarivky bez nutnosti jej výmeny, čím sa výrazne znížili náklady na údržbu a servis.

Hlavné charakteristiky:

- riadené predhrievanie elektród počas štartu žiarivky
- funkcia RESTART pri neúspešnom štarte žiarivky (max 50x), potom sa predradník vypne a chybu žiarivky signalizuje kombináciou farebných LED diód
- stabilizácia svetelného toku v celom rozsahu napájacieho napätia
- **funkcia stmievania v krokoch SETTING alebo plynule (pozri aj str.47-51)**
- funkcia AUTOTEST kontinuálne testuje hlavné parametre žiarivky, napájacích obvodov a vstupného napätia. Výsledok je zobrazený pomocou 3 farebných LED (status monitor). Ak sú parametre vyhodnotené mimo rozsahu, tak sa predadník vypína, aby predišlo jeho poruche (STANDBY mód)
- rýchla elektronická ochrana proti statickému alebo dynamickému prepätiu

STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

- AL sheet body
- WAGO Terminal blocks
- 3 Colour LEDs Status Monitor
- Halogen-free wiring RADOX GKW

- Teleso z AL
- WAGO prípojné svorky
- 3 farebné LED pre identifikáciu poruchovho stavu
- Halogénovo bezpečné vodiče RADOX GKW

EN Conformity / Súlad s normami EN

- EN50311:2003 (size is customised)
- UIC555-1
- EN50155:2008
- EN61347-2-3:2011
- EN61347-1:2008

24V DC C-MEGA R SLIM (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R SLIM 18W/24V DC	201x43x30 mm	-	YES	-	08-B-134	0,25 kg
C-MEGA R SLIM T5 14W/24V DC	201x43x30 mm	-	YES	-	08-B-159	0,25 kg
C-MEGA R SLIM 24W/24V DC	201x43x30 mm	-	YES	-	08-B-82	0,25 kg

48V DC C-MEGA R SLIM (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R SLIM 18W/48V DC	201x43x30 mm	-	YES	-	08-B-274	0,25 kg

110V DC C-MEGA R SLIM (non-dimmable / nestmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R SLIM 7-11W/110V DC	201x43x30 mm	-	YES	-	08-B-183	0,25 kg
C-MEGA R T5 14W/110V DC	201x43x30 mm	-	YES	-	08-B-199	0,25 kg
C-MEGA R SLIM 18W/110V DC	201x43x30 mm	-	YES	-	08-B-184	0,25 kg

24V DC C-MEGA R SLIM (SETTING Dimming / SETTING stmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R SLIM 18W/24V DC SETTING 30%	201x43x30 mm	30%/100%	YES	-	08-B-195	0,25 kg
C-MEGA R SLIM 18W/24V DC SETTING 50%	201x43x30 mm	50%/100%	YES	-	08-B-276	0,25 kg

36V DC C-MEGA R SLIM (SETTING Dimming / SETTING stmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R SLIM 36W/36V DC SETTING 30%	201x43x30 mm	30%/100%	YES	-	08-B-176	0,25 kg

48V DC C-MEGA R SLIM (SETTING Dimming / SETTING stmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R SLIM 36W/48V DC SETTING 30%	201x43x30 mm	30%/100%	YES	-	08-B-164	0,25 kg

110V DC C-MEGA R SLIM (SETTING Dimming / SETTING stmievateľné)

Type	Dimmensions:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
C-MEGA R SLIM 18W/110V DC SETTING	201x43x30 mm	50%/100%	YES	-	08-B-70	0,25 kg

A-MEGA MINI

- The A-MEGA MINI is electronic ballast designed for bus/coach application (not suitable for railway applications) for feeding of whole range of fluorescent tubes up to 24W in the range of voltage DC 12V or 24V.

- Elektronické predradníky A-MEGA MINI sú určené pre napájanie žiariviek s výkonom až 24W pre celý rozsah napájacích napätí DC 12V alebo 24V v kolesových dopravných prostriedkov ako sú autobus/LKW (nie sú určené per použitie v železničných dopravných prostriedkoch).

STANDARD ACCESSORIES	ŠTANDARDNÁ VÝBAVA

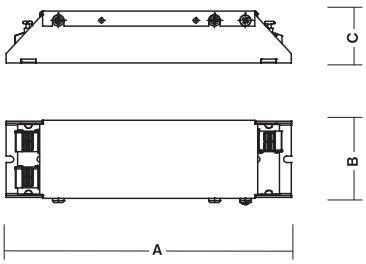
- AL sheet body
- WAGO Terminal blocks
- Halogen-free wiring RADOX GKW

- Teleso z AL
- WAGO prípojné svorky
- Halogénovo bezpečné vodiče RADOX GKW

CE | 12V | 24V | 8W-11W | 13W | 18W | 24W

EN Conformity	Súlad s normami EN

- EN50015:2013
- EN61347-2-3:2011
- EN61347-1:2008



12V DC A-MEGA MINI

Type / Typ	Dimmensions AxBxC:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
A-MEGA MINI 8W/12V DC	151x41x27 mm	-	-	-	08-B-107	0,15 kg
A-MEGA MINI 13W/12V DC	151x41x27 mm	-	-	-	08-B-166	0,15 kg
A-MEGA MINI 18W-24W/12V DC	151x41x27 mm	-	-	-	08-B-105	0,15 kg

24V DC A-MEGA MINI

Type / Typ	Dimmensions AxBxC:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
A-MEGA MINI 8-9-11W/24V DC	151x41x27 mm	-	-	-	08-B-104	0,15 kg
A-MEGA MINI 13W/24V DC	151x41x27 mm	-	-	-	08-B-259	0,15 kg
A-MEGA MINI 18W-24W/24V DC	151x41x27 mm	-	-	-	08-B-103	0,15 kg

A-MEGA BASE

- The A-MEGA BASE is electronic ballast designed for bus/coach or truck/van application (not suitable for railway applications) for feeding of fluorescent tubes up to 36W voltage DC 24V.

- Elektronické predradníky A-MEGA BASE sú určené pre napájanie žiariviek s výkonom až 36W pre napájacie napätie DC 24V v kolesových dopravných prostriedkov ako sú autobus/LKW
(nie sú určené per použitie v železničných dopravných prostriedkoch).

STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

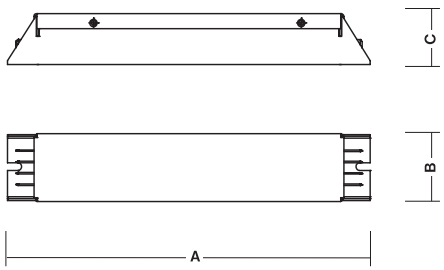
- AL sheet body
- Halogen-free wiring RADOX GKW
- FASTON 6.35x0.8mm

- Teleso z AL
- Halogénovo bezpečné vodiče RADOX GKW
- FASTON 6.35x0.8mm

CE | 24V | 8W | 15W | 36W

EN Conformity / Súlad s normami EN

- ECE 10.04
- EN61347-2-3:2011
- EN61347-1:2008



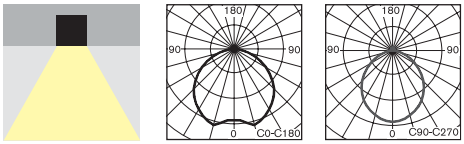
24V DC A-MEGA BASE

Type	Dimmensions AxBxC:	Dimming Level	AUTOTEST	CentralControl	Order Code	Weight
A-MEGA BASE 8W/24V DC	192x41x27 mm	-	-	-	08-B-182	0,2 kg
A-MEGA BASE 15W/24V DC	192x41x27 mm	-	-	-	08-B-185	0,2 kg
A-MEGA BASE 36W/24V DC	192x41x27 mm	-	-	-	08-B-167	0,2 kg

SBB TWINDEX / BOMBARDIER

FUNCTIONAL PANEL

LED SPOT READING MODULE DETAIL



- The functional panel has been developed for SBB Twindex project (BOMBARDIER). It is a part of the luggage rack module.
- It is equipped with both powerful LED reading lights controlled by contactless illuminated switch (infrared sensor remote control) and 18W T8 fluorescent tube main lighting module.
- Electronic ballast meets the latest EN50311 requirements

- Funkčný panel ako súčasť batožinového nosiča bol vyvunutý pre projekt SBB Twindex (BOMBARDIER)
- Obsahuje výkonné LED čítacie lampy ovládané bezdotykovým podsvieteným vypínačom (infračervený snímač pre bezdotykové ovládanie) pre každého pasažiera a hlavným 18W T8 žiarivkovým svetelným modulom.
- Elektronické predradníky spĺňajú EN50311

STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

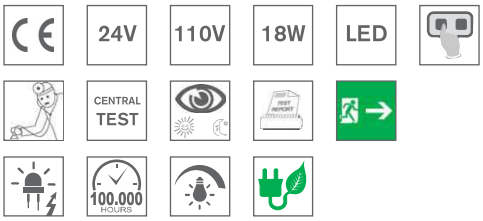
- 1pc or 2pc or 4pcs of READING LIGHTS equipped with LEDs (5000K)
- AL base finished in white polyester powder coat RAL9003
- Diffuser is made of prismatic PC (complying both EN45545 and DIN5510 S4/SR2/ST2)
- Halogen-free wiring RADOX GKW

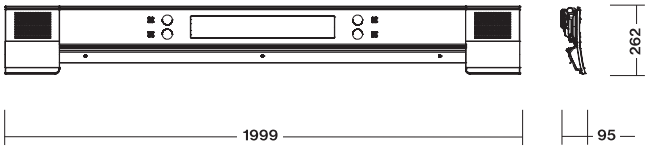
- 1ks alebo 2ks alebo 4ks výkonných čítacích svietidiel vybavených LED (5000K)
- AL základňa v RAL9003
- Prismatický PC difúsor svietidla (spĺňajúci EN45545 a DIN5510 S4/SR2/ST2)
- Halogénovo bezpečné vodiče RADOX GKW

OPTIONS / PRÍPLATKY

- ANNAX seat reservation systems
- Speakers
- Alternative colour surface treatment
- Alternative customised dimmensions
- Alternative LED light colour
- Dimming function 30%-100% (refer also to pages No.47-51)
- Central diagnostics and communication (refer also to pages No.47-51)
- Powerful LED light source instead of 18W fluorescent tube

- ANNAX rezervačný systém
- Reproduktory
- Alternatívna farba svetla pre LED
- Alternatívna farba povrchu
- Alternatívne rozmery modulov
- Stmievanie 30%-100% (pozri aj str.47-51)
- Centrálna diagnostika a komunikácia (pozri aj aj str.47-51)
- Výkonné LED ako zdroj svetla namiesto 18W žiarivky

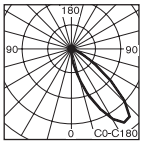


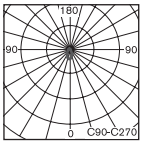


FUNCTIONAL PANEL

Type / Typ	A x B x C mm	Power Supply	Light Source	Dimming	AutoTest	CentralControl
18W T8 MAIN LIGHTING MODULE	650 x 125 x 55 mm	DC 24V, 110V	T8 18W / 3500K	OPTION	OPTION	OPTION
LED SPOT READING LIGHT	see the drawing	DC 24V, 110V	LED 5000K Ra typical 82	OPTION	OPTION	OPTION
CONTACTLESS SWITCH	see the drawing	DC 24V, 110V	-	YES	OPTION	OPTION
FUNCTIONAL PANEL 18W+4xLED	see the drawing	DC 24V, 110V	T8 18W + LED/ 5000K	OPTION	OPTION	OPTION

SBB TWINDEX / BOMBARDIER

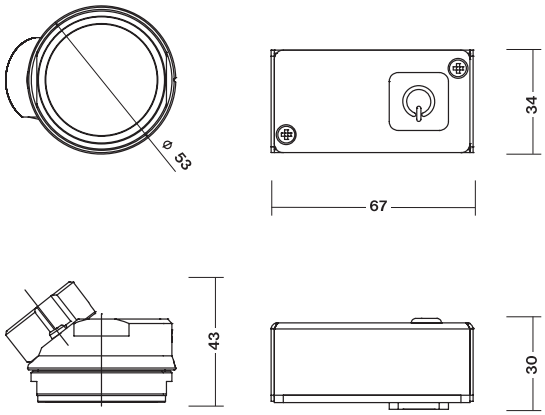




Reading SPOT LED controlled by contactless illuminated switch detail

LED SPOT Reading Light
Čítacia LED lampa

Contactless Illuminated
Switch Module
Bezkontaktný podsvietený vypínač



Luggage rack functional panel integration

Functional panel: LED Reading Lights & Contactless Switch and 18W Lighting fixture

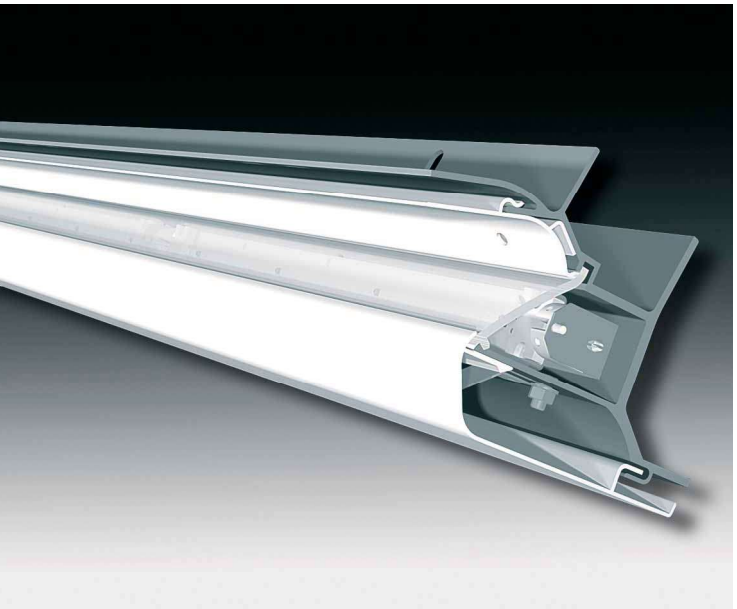
SBB TWINDEX / BOMBARDIER

Typical luggage rack functional panel integration

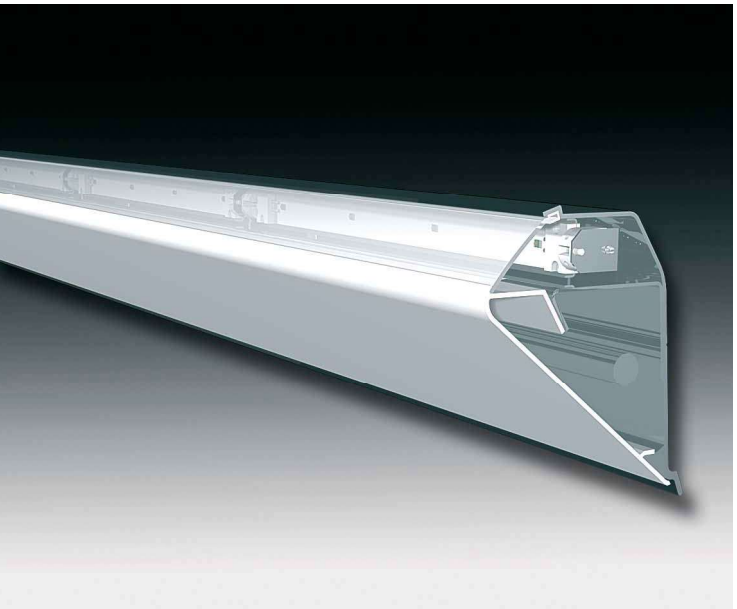
SBB TWINDEX / BOMBARDIER

SBB Twindex Train

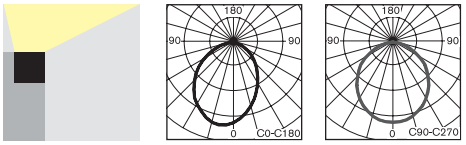
SBB TWINDEX / BOMBARDIER



UPPER DECK



LOWER DECK



- The indirect "inline" LED lighting modules has been designed for SBB Twindex project (BOMBARDIER) for ceiling panels area illumination. They are used on booth upper and lower decks. It provides smooth lighting effect in order to make the room "higher".
- It is equipped with HighPower 3W LEDs (3500K)
- Electronic ballast meets the latest EN50311 requirements
- Easy and fast LED stripe replacement (<1min)
- Integrated WIFI antenna

- Výkonné LED svetelné kontinuálne moduly boli navrhnuté pre projekt SBB Twindex (BOMBARDIER). Ich funkciou je nepriame osvetlenie stropných panelov na oboch poschodiach a tým dosiahnuť effekt "vyššieho priestoru" pre pasažierov.
- Vybavené výkonnými 3W LED svetelnými zdrojmi (3500K)
- Elektronické predradníky spĺňajú EN50311
- Rýchla a jednoduchá výmena LED pásu (<1min)
- Integrovaná WIFI anténa

STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

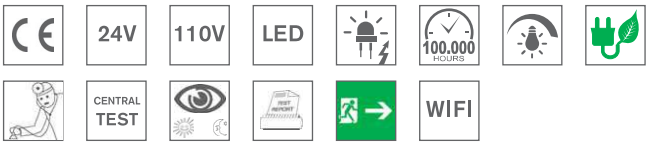
- HighPower LEDs (3500K)
- LED Binning < 3 MacAdam Steps
- Extruded AL profile base
- Diffuser is made by co-extrusion of semi-opal milky colour PC and coloured PC (complying DIN5510 S4/SR2/ST2 and EN45545)
- Halogen-free wiring RADOX GKW

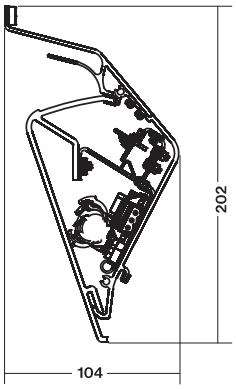
- výkonné 3W LED (3500K)
- LED Binning < 3 MacAdam Steps
- základňa svietidla vyrobená z extrúdovaného AL profilu
- PC difúsor svietidla vyrobený koextrúziou: poloopálový PC + farebný PC kryt (spĺňajúci DIN5510 S4/SR2/ST2 a EN45545)
- Halogénovo bezpečné vodiče RADOX GKW

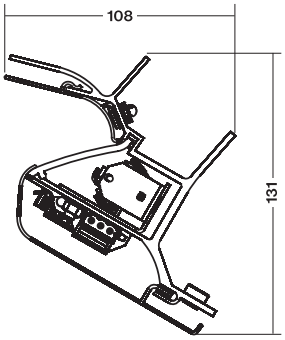
OPTIONS / PRÍPLATKY

- Alternative colour surface treatment
- Alternative customised dimmensions
- Alternative LED light colour
- Dimming function 30%-100% (refer also to pages No.47-51)
- Central diagnostics and communication (refer also to pages No.47-51)

- Alternatívna farba svetla pre LED
- Alternatívna farba povrchu
- Alternatívne rozmery modulov
- Stmievanie 30%-100% (pozri aj str.47-51)
- Centrálna diagnostika a komunikácia (pozri aj str.47-51)





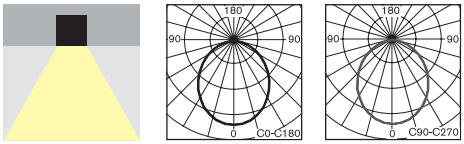


INDIRECT LED LIGHTING MODULE

Type / Typ	LENGTH mm	Power Supply	Light Source	Dimming	AutoTest	CentralControl
4x LED INDIRECT MODULE	330 mm	DC 24V, 110V	4x Power LEDs 3500K	OPTION	OPTION	OPTION
12x LED INDIRECT MODULE	990 mm	DC 24V, 110V	12x Power LEDs 3500K	OPTION	OPTION	OPTION
24x LED INDIRECT MODULE	2000 mm	DC 24V, 110V	24x Power LEDs 3500K	OPTION	OPTION	OPTION
CUSTOMISED LED MODULE	CUSTOMISED	CUSTOMISED	CUSTOMISED	OPTION	OPTION	OPTION

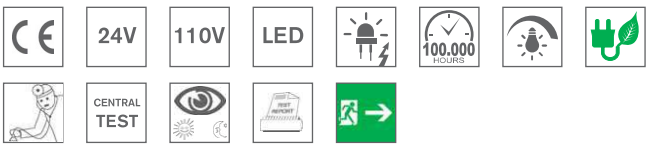
SBB TWINDEX / BOMBARDIER

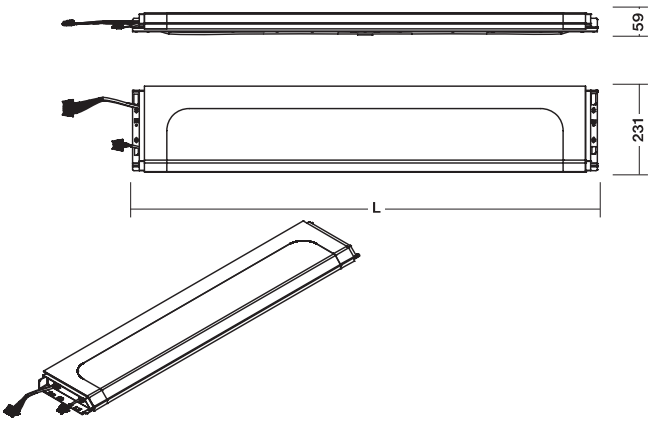
DESIRO-HC EndCar / **SIEMENS**



- DESIRO HC-LED is customized lighting system designed for **SIEMENS-DESIRO-HC project.** It is modular lighting system designed for direct illumination for all EndCars and MiddleCars (Lower Deck and Higher Deck)
- Controlled by SIBAS Siemens Control Unit (Stepless Dimming and 4 levels of Emergency Lighting)
- Thanks to the variable lengths it is possible to create continuous lighting band along the entire vehicle lenght.
- The complete system includes also speakers.
- All fixtures are equipped by SEC LED modules based on OSRAM MidPower LongLife LEDs.
  Thanks to this both the maintenance and service costs are reduced.

- DESIRO-HC-LED je zákaznícky svetelný systém navrhnutý pre SIEMENS-DESIRO-HC projekt. Jedná sa o modulárny systém pre priame osvetlenie
- Napojené na cetrálnu riadiacu jednotku SIEMENS SIBAS na plynulé riadenie stmievania a 4 úrovne núdzového osvetlenia
- Vďaka modulom rôznej dĺžky (vrátane reproduktorov a koncových dielov) je možné vytvoriť "inline" systém po celej dĺžke vagóna
- Svietidlá sú vybavené dlhoživotnými MidPower LED OSRAM, čím sa výrazne zredukovali náklady na údržbu a servisné zásahy





STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

- MidPower 3000K/4000K LEDs 160lm/W OSRAM DURIS S5 type serie
- LED Binning < 3 MacAdam Steps
- SEC LED electronic ballast with Dimming Function
- Central Control
- AL sheet base painted in RAL9003
- Diffuser made of semi-opal milky colour PC complying and EN45545, partly painted with Mankiewicz paint
- Halogen-free "INLINE" wiring
- WAGO I/O connectors

- MidPower LED 160m/W OSRAM DURIS S5 3000K/4000K
- LED Binning < 3 MacAdam Steps
- SEC LED stmievateľný elektronický predradník
- Central Control
- základňa svietidla vyrobená z AL, lakovaná v RAL9003
- difúsor svietidla vyrobený z poloopálového PC spĺňajúci EN45545, čiastočne lakovaný farbou Mankiewicz
- Halogénovo bezpečné vodiče a priebežná kabeláž
- WAGO I/O konektory

OPTIONS / PRÍPLATKY

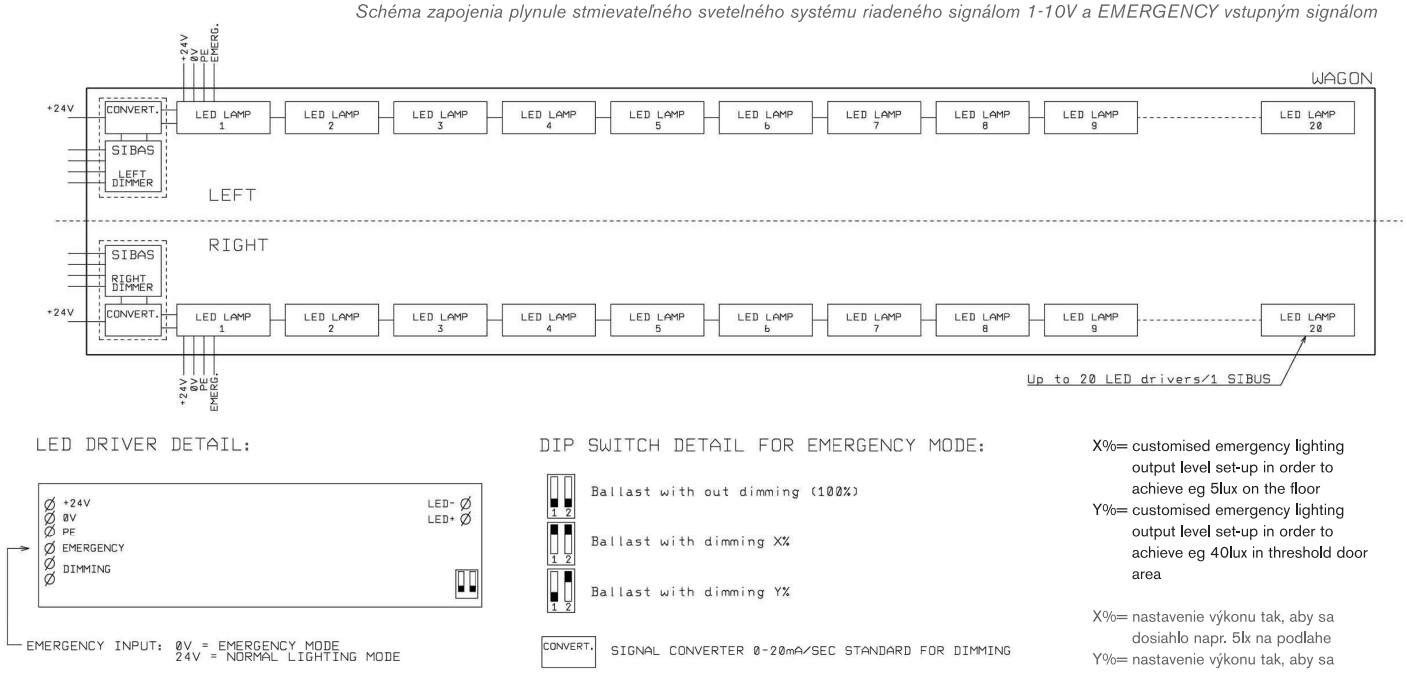
- Alternative colour surface treatment
- Alternative customised dimmensions
- Alternative LED light colour
- Central diagnostics and communication (refer also to pages No.47-51)

- Alternatívna farba svetla pre LED
- Alternatívna farba povrchu
- Alternatívne rozmery modulov
- Centrálna diagnostika a komunikácia (pozri aj str.47-51)

DESIRO-HC-LED (308-B)

Type / Typ	LENGTH mm	Power Supply	Light Source	Dimming	AutoTest	CentralControl
ENDCAR LED	718 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
ENDCAR LED	840 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
ENDCAR LED	817 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
ENDCAR LED	1223 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
ENDCAR LED	932 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
ENDCAR LED	1628 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
ENDCAR LED	1132 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
ENDCAR LED	1674 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
ENDCAR LED	1492 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
ENDCAR SPEAKER MODULE	250 mm	-	-	YES	OPTION	YES
ENDCAR CAMERA MODULE	250 mm	-	-	YES	OPTION	YES
ENDCAR LED - CUSTOMISED	CUSTOMISED	CUSTOMISED	CUSTOMISED	OPTION	OPTION	OPTION

Electrical diagram for Stepless dimmable LED lighting fixtures controlled by 1-10V control signal and EMERGENCY control input signal
Schéma zapojenia plynule stmievateľného svetelného systému riadeného signálom 1-10V a EMERGENCY vstupným signálom



LED DRIVER DETAIL:

DIP SWITCH DETAIL FOR EMERGENCY MODE:

Ballast with out dimming (100%)

Ballast with dimming X%

Ballast with dimming Y%

CONVERT. SIGNAL CONVERTER 0-20mA/SEC STANDARD FOR DIMMING

X%= customised emergency lighting output level set-up in order to achieve eg 5lux on the floor
Y%= customised emergency lighting output level set-up in order to achieve eg 40lux in threshold door area

X%= nastavenie výkonu tak, aby sa dosiahlo napr. 5lx na podlahe
Y%= nastavenie výkonu tak, aby sa dosiahlo napr. 40lx v priestore dverí

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SIEMENS

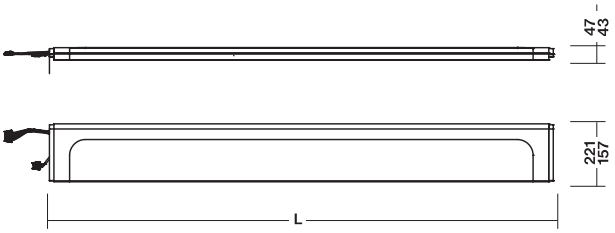
SEC LED Lighting

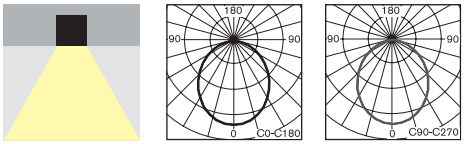
DESIRO-HC - SIEMENS

DESIRO-HC MiddleCar / **SIEMENS**

LED LIGHTING FIXTURE - UPPER DECK

LED LIGHTING FIXTURE - LOWER DECK





- DESIRO HC-LED is customized lighting system designed for **SIEMENS-DESIRO-HC project.** It is modular lighting system designed for direct illumination for all EndCars and MiddleCars (Lower Deck and Higher Deck)
- Controlled by SIBAS Siemens Control Unit (Stepless Dimming and 4 levels of Emergency Lighting)
- Thanks to the variable lengths it is possible to create continuous lighting band along the entire vehicle lenght.
- The complete system includes also speakers.
- All fixtures are equipped by SEC LED modules based on OSRAM MidPower LongLife LEDs.
  Thanks to this both the maintenance and service costs are reduced.

- DESIRO-HC-LED je zákaznícky svetelný systém navrhnutý pre SIEMENS-DESIRO-HC projekt. Jedná sa o modulárny systém pre priame osvetlenie
- Napojené na cetrálnu riadiacu jednotku SIEMENS SIBAS na plynulé riadenie stmievania a 4 úrovne núdzového osvetlenia
- Vďaka modulom rôznej dĺžky (vrátane reproduktorov a koncových dielov) je možné vytvoriť "inline" systém po celej dĺžke vagóna
- Svietidlá sú vybavené dlhoživotnými MidPower LED OSRAM, čím sa výrazne zredukovali náklady na údržbu a servisné zásahy

STANDARD ACCESSORIES / ŠTANDARDNÁ VÝBAVA

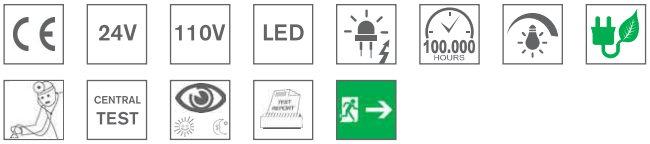
- MidPower 3000K/4000K LEDs 160lm/W OSRAM DURIS S5 type serie
- LED Binning < 3 MacAdam Steps
- SEC LED electronic ballast with Dimming Function
- Central Control
- AL sheet base painted in RAL9003
- Diffuser made of semi-opal milky colour PC complying and EN45545, partly painted with Mankiewicz paint
- Halogen-free "INLINE" wiring
- WAGO I/O connectors

- MidPower LED 160m/W OSRAM DURIS S5 3000K/4000K
- LED Binning < 3 MacAdam Steps
- SEC LED stmievateľný elektronický predradník
- Central Control
- základňa svietidla vyrobená z AL, lakovaná v RAL9003
- difúsor svietidla vyrobený z poloopálového PC spĺňajúci EN45545, čiastočne lakovaný farbou Mankiewicz
- Halogénovo bezpečné vodiče a priebežná kabeláž
- WAGO I/O konektory

OPTIONS / PRÍPLATKY

- Alternative colour surface treatment
- Alternative customised dimensions
- Alternative LED light colour
- Central diagnostics and communication (refer also to pages No.47-51)

- Alternatívna farba svetla pre LED
- Alternatívna farba povrchu
- Alternatívne rozmery modulov
- Centrálna diagnostika a komunikácia (pozri aj str.47-51)



DESIRO-HC-LED (308-B)

Type / Typ	LENGTH mm	Power Supply	Light Source	Dimming	AutoTest	CentralControl
MIDDLE CAR LOWER DECK LED	1917 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
MIDDLE CAR LOWER DECK LED	1133 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
MIDDLE CAR LOWER DECK LED	844 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
MIDDLE CAR UPPER DECK LED	1463 mm	DC 110V	OSRAM LED 3000K	YES	OPTION	YES
MIDDLE CAR SPEAKER MODULE	250 mm	-	-	-	-	-
MIDDLE CAR LED - CUSTOMISED	CUSTOMISED	CUSTOMISED	CUSTOMISED	OPTION	OPTION	OPTION

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