LVX Global – Smart City Solutions

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iciti.

LVX Global

LVX Global is an international technology solutions business that identifies, designs, delivers and manages high value, scalable, replicable social outcomes at the intersection of technology, engineering, and human behavioral science.

With over 30 years' experience and with operations across Australia and subsidiaries in Europe, Asia, and North America, LVX Global is today conceiving, designing, delivering, and managing innovative projects for both government and the private sector.

Smart City and building customers across the world call LVX Global for its engineering and advisory services and with access to owned and licensed technology LVX Global is uniquely placed to provide end-to-end solutions.

LVX Global is passionate about creating a safer, more beautiful, and engaging environment.

Headquartered in Adelaide, South Australia LVX Global will move to the innovation and technology hub of Lot Fourteen from July 2021.

LVX Global – Works with Customers as an End-to-End Partner

LVX understand's the complex challenges and opportunities facing organisations today, and has the skills, capability, and experience to deliver solutions to these.

We have extensive experience in delivering 'end-to-end' engineered technology solutions through our "EPCM+F" Engineer; Procure; Construct; Manage and Fund model. Our team has become a global advisor of choice to product and technology developers and end users, alike, and a specialist consultant to major global advisory firms, government and industry groups.

We start with clients by developing a strategy through asking what are their most significant issues, and biggest opportunities and we help design the plan to implement impactful solutions to increase the efficiency, capability, and pleasure of its users. Our planning process includes working with you on feasibility, funding, design, delivery, communication, and ongoing review.

We bring together a wide range of skill-sets and experience under a forward thinking and agile banner. Our team consists of leaders in their fields and have an expansive network of partners.

For Smart Cities the Smart Lighting is the starting point!

- Street lighting opens up new ways for modern urban planning
- The above-mentioned topics are implemented with built-in sensors
    - by collecting environmental data, creating urban safety, experiential spaces through light management or wireless internet access.

LVX Global – Worldwide Competence - The Team

MANAGEMENT TEAM

Corey Gray
Director, Founder, CEO

Geoff Weir
Chief Financial Officer

Mark Verheyen
Director, President North America

Greg Stirling
Chief Growth Officer

Sanjeewa Jayakody
Chief Technology Officer

Kane Pryzibilla
General Manager – Technology

Dean Jones
General Manager IoT

SH Cho
Managing Director Asia

SALES TEAM EU

Grainne Flynn
Managing Director LVX Europe

Jörg Schneck
GM Business Development

André Karl
Head of Sales D – A – CH

Christina Hoffmann
GM Mktg / Admin

R&D TEAM EU

Matthias Lürkens
GM Connectivity & Standardization

Horst Kremer-Merseburg,
GM Application Solutions

Juraj Matus
GM Innovation

Stefan Gutowsky
Lead Software Developer

LVX Global – Strong Brands under One Roof

Headquarter LVX Global
Adelaide, Australia

Adelaide, Australia

FireM is an IoT Technology enabled engineer-led end-to-end solution that identifies and maps the location of events within a building and interfaces to any fire, security or building management system.

All fire panel 'events' are stored in a common platform on a web application server, where there is easy access to information. In addition, through FireM's real-time system-status dashboards, facility managers can use modern IoT technology to monitor their fire safety assets, reduce risk and better protect their properties. Where FireM is installed, building occupants can download the FireM app and connect to the FireM interface..

www.firem.com.au

Adelaide, Australia

Norman Asset Delivery consults to clients in the resources, property and public infrastructure sectors offering services such as, engineering, project management, design management and authority approvals. With extensive experience and outstanding industry relationships Norman Asset Delivery ensures clients successful delivery of assets including :

- Buildings (commercial, retail, industrial and residential)
- Major housing estates (marinas and golf resorts)
- Water and wastewater infrastructure (private and public roads)
- Underground railways
- Water supply and gas formation water dams

www.normanassoc.com.au

Frankfurt, Germany

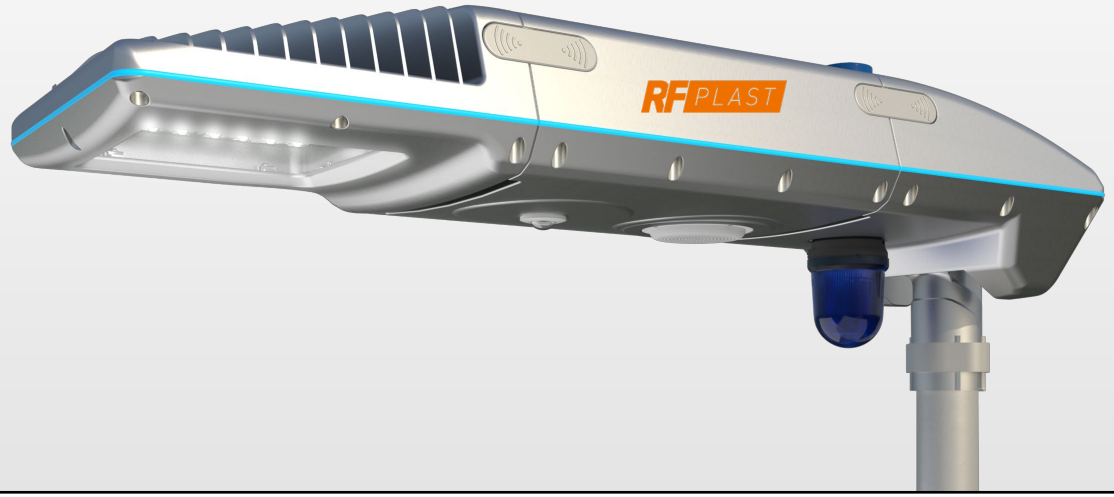
iciti enables your smart city and building opportunities to be realised. With tailored solutions and using open protocol technology iciti uses existing infrastructure to deliver smart communication and control solutions. Significant cost reduction is achieved in installation and further savings are experienced through life with reduced maintenance and energy costs. Your risk is minimised with fewer gateways required, a reduction in the points of failure and a system that is future proof.

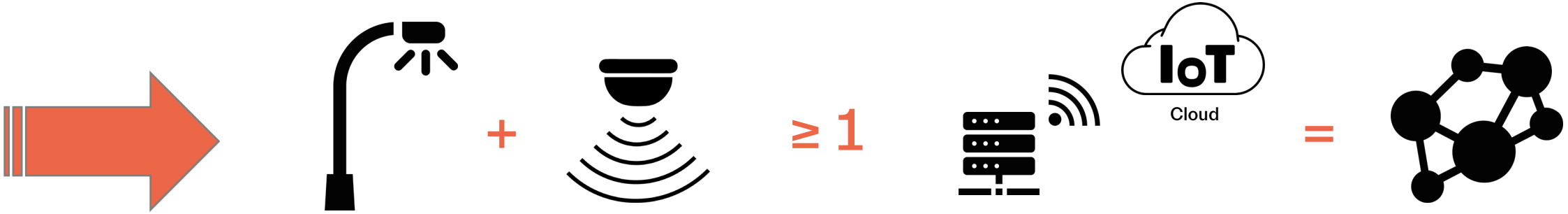
The outcome is all the benefits of smart city infrastructure delivered to your community.

www.icititech.com

iciti – Street Lighting as a Starting Point for Smart City Applications

Use of the
existing infrastructure
of street lighting
for IoT applications





Lighting

Available and networked everywhere

Sensors

Loudspeakers, sensors and beacons connectivity

Edge Controllers

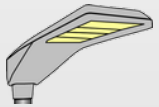
Central control of all IoT applications

Digital Services

Simplify customer processes
Generate customer sales

Communication Platform based on Lighting Infrastructure

- Camera for security
- Signature information
- Smart lighting
- Noise indication & map
- E-charging management
- Smart parking
- Announcement loudspeaker
- Waste management



iciti – Functions

Motion-controlled, demand-responsive light

By using motion sensors, light can be controlled according to need. The movement of people or objects triggers the illuminance over several light points. The light runs along with the movement.

Adaptation of the lighting

Lighting adapted to the weather conditions by intelligent sensor technology increases safety in road traffic.

Lighting management with a system

The individual light points or luminaire groups are controlled via the central system. Stand-alone operation is also possible.

Acquisition of environmental data

Appropriate sensors on the luminaire mast enable precise measurement of various environmental factors in real time.

Waste management

Waste collection on demand is part of modern waste management based on intelligent sensor technology on the luminaire pole.

Public information system

By means of HD-PLC communication, extensive data, such as timetable displays, audio information for the visually impaired or advertising can also be played out on corresponding displays.

Public safety

Camera systems, loudspeakers and emergency call systems, which can be easily integrated on luminaire poles, provide more security in public places and urban spaces.

WiFi hotspots in public spaces

The provision of WiFi hotspots via broadband communication brings real added value to all residents of the city.

Charging stations for electric cars

For charging electric cars, appropriate charging stations could be installed in the lamppost.

Traffic and parking management

Through the use of intelligent sensors, sustainable traffic optimisation can be realised by collecting real-time data. Finding free parking spaces more quickly leads to greater satisfaction among the population.

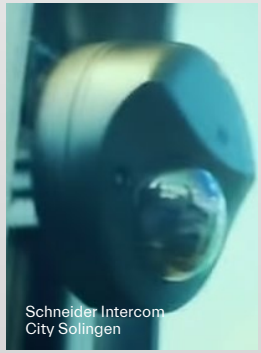
Current Technology Chaos

Where no standardisation exists, IP protocol shows how it works

Smart City

Control Technologies

IP Technologies


Schneider Intercom
City Solingen

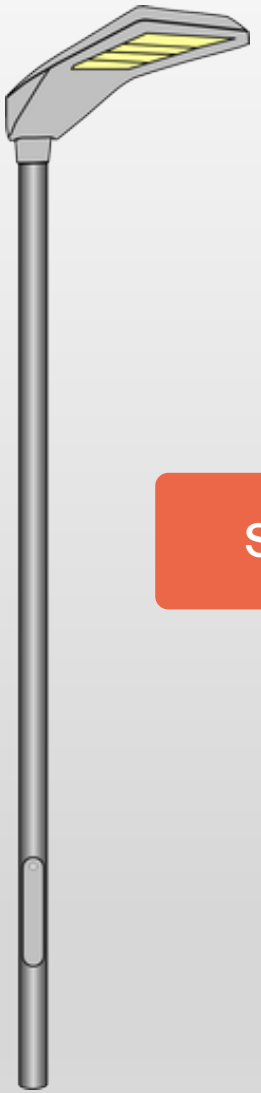
Easy to integrate
W LAN
Camera
Loudspeaker
.....


Selux

City Solingen


Ruckus
City Heringsdorf

Smart City, what does it actually need?



Narrowband technology
PLC, 6LowPan, ZigBee, LTE-NB, LON-RF....
Disadvantage: no standardisation at present

Smart City

Data capture and control → 1 Byte to 254 Bytes per device

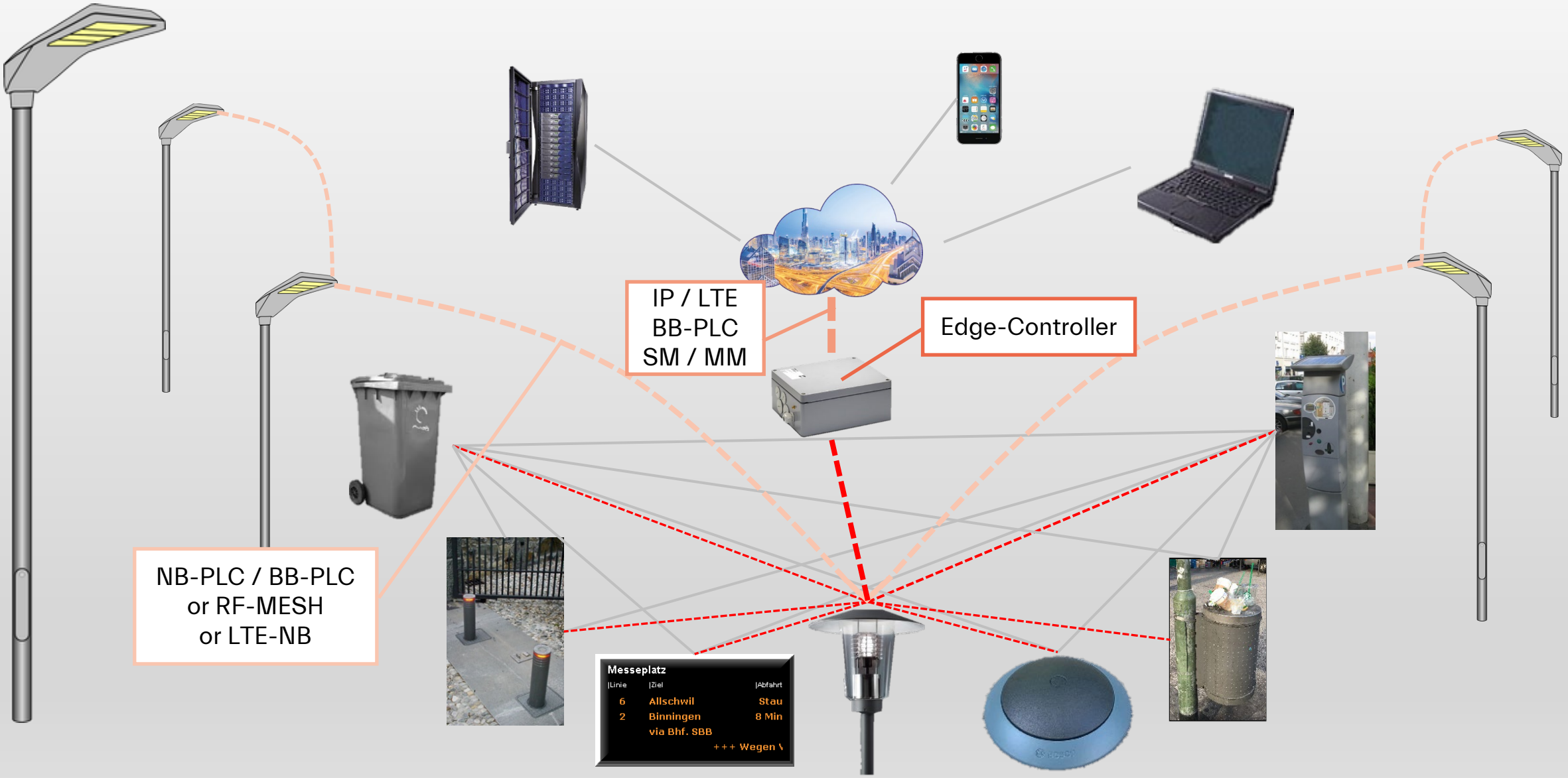
DATA

Multimedia → 100kB Speech
3-5MB HDTV

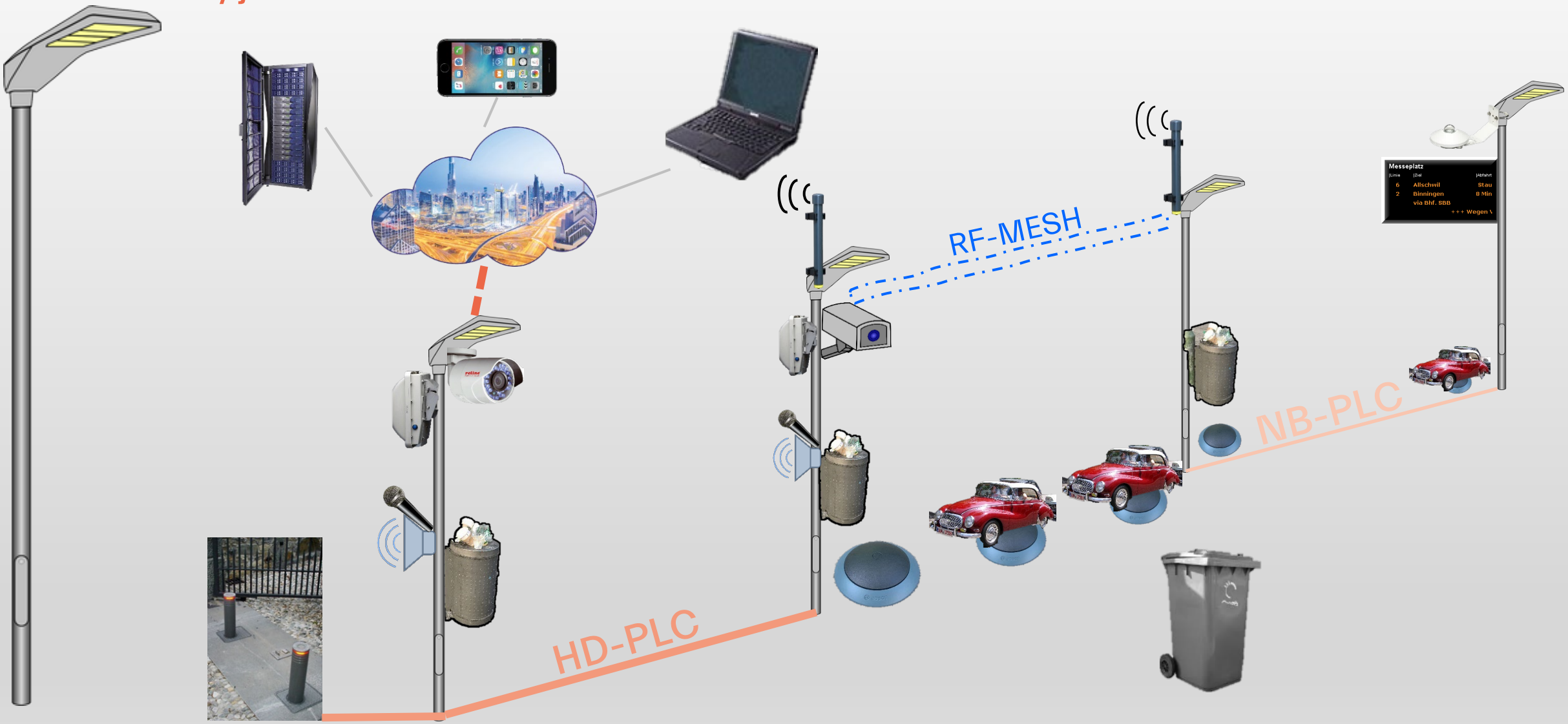
Broadband technology
HD-PLC, WLAN, LTE, 5G
Advantage: the IP protocol is a standard

IoT Systems Today – Device Cloud Connection with Proprietary Communication

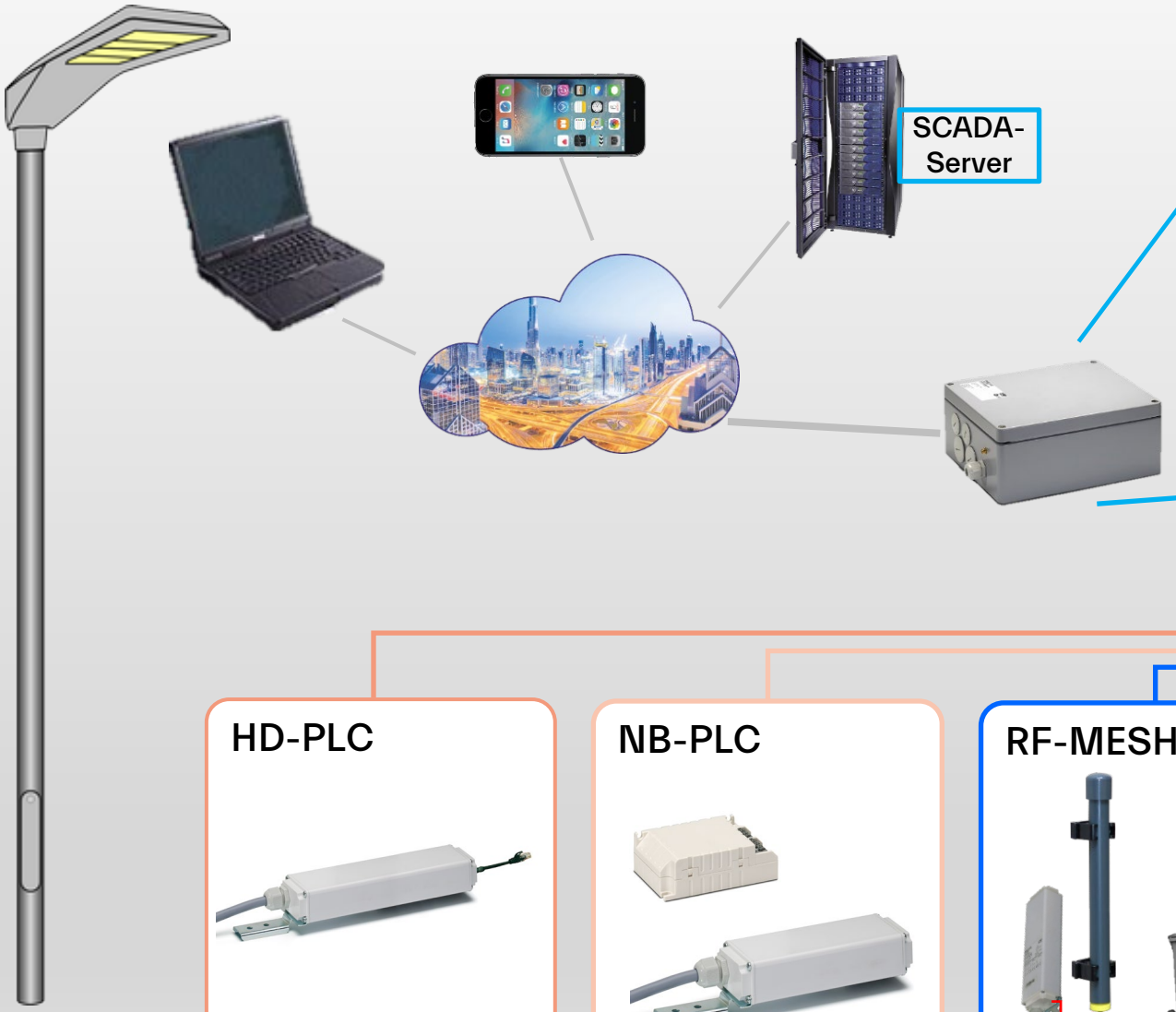
A Better World with IoT, Local Networking, Cloud Connection and Standardisation



LON Protocol – Supports Different Transmission Media but NO Gateway just a “Router out of the Box”

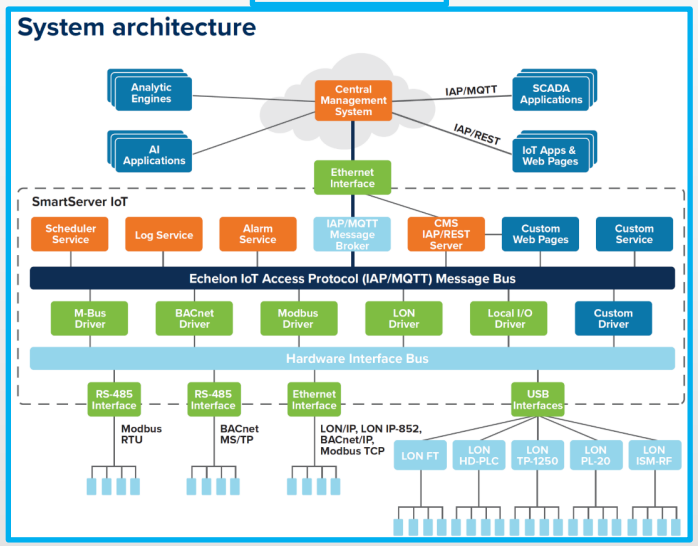


LVX Technology Platform



SCADA-Server

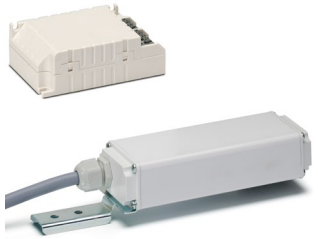
IoT Server



NI BB-PLC | NI NB-PLC | NI RF-MESH | NI Cloud | NI RF-LORA

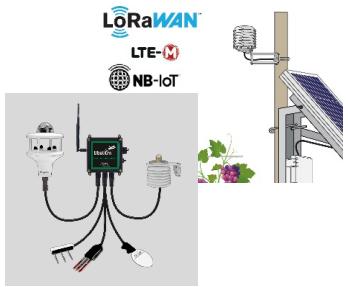
HD-PLC

NB-PLC



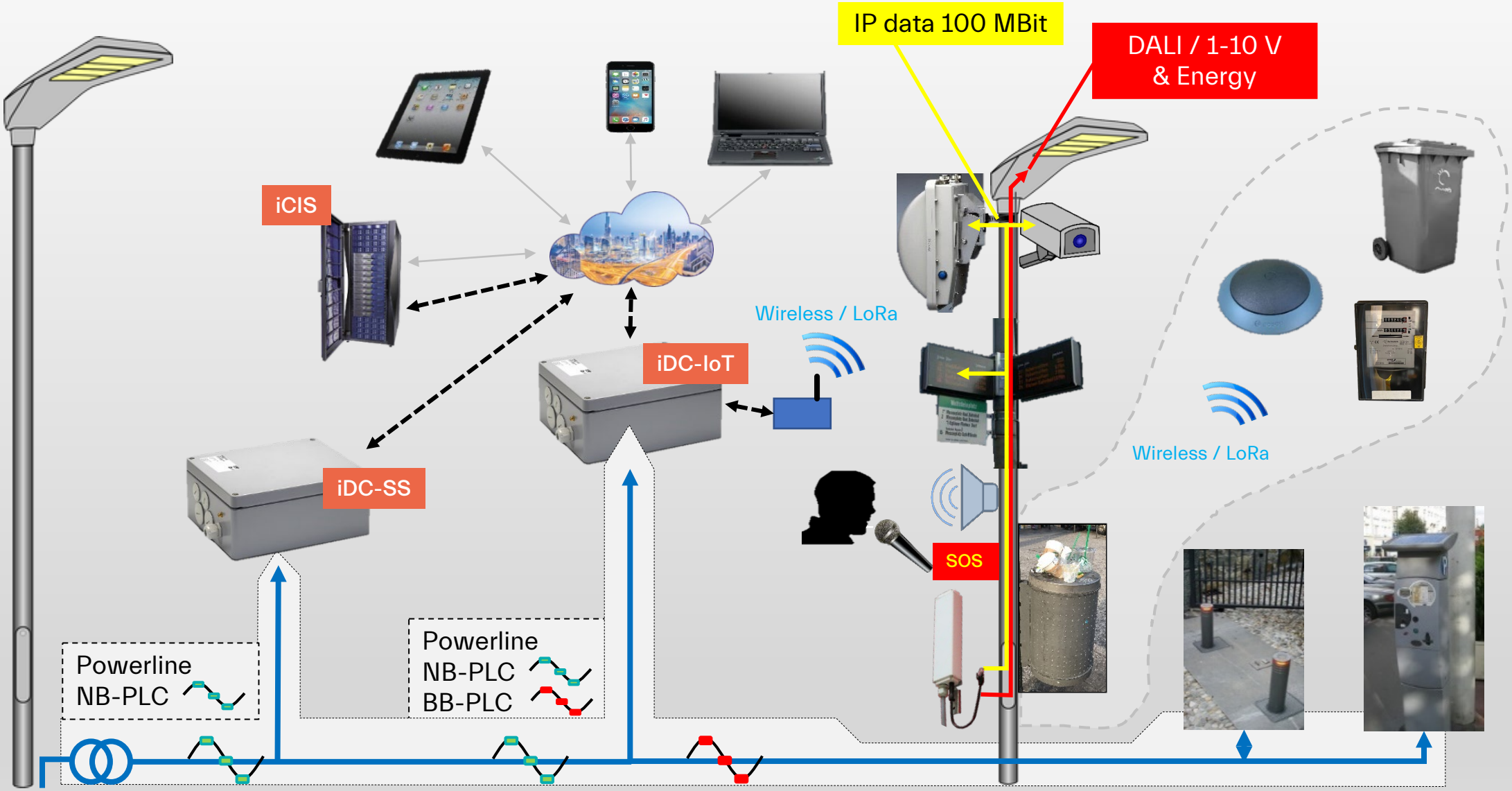
RF-MESH

IP & LTE-NB



LoRa or LoRa with LON formatted data

Typical Smart City Infrastructure

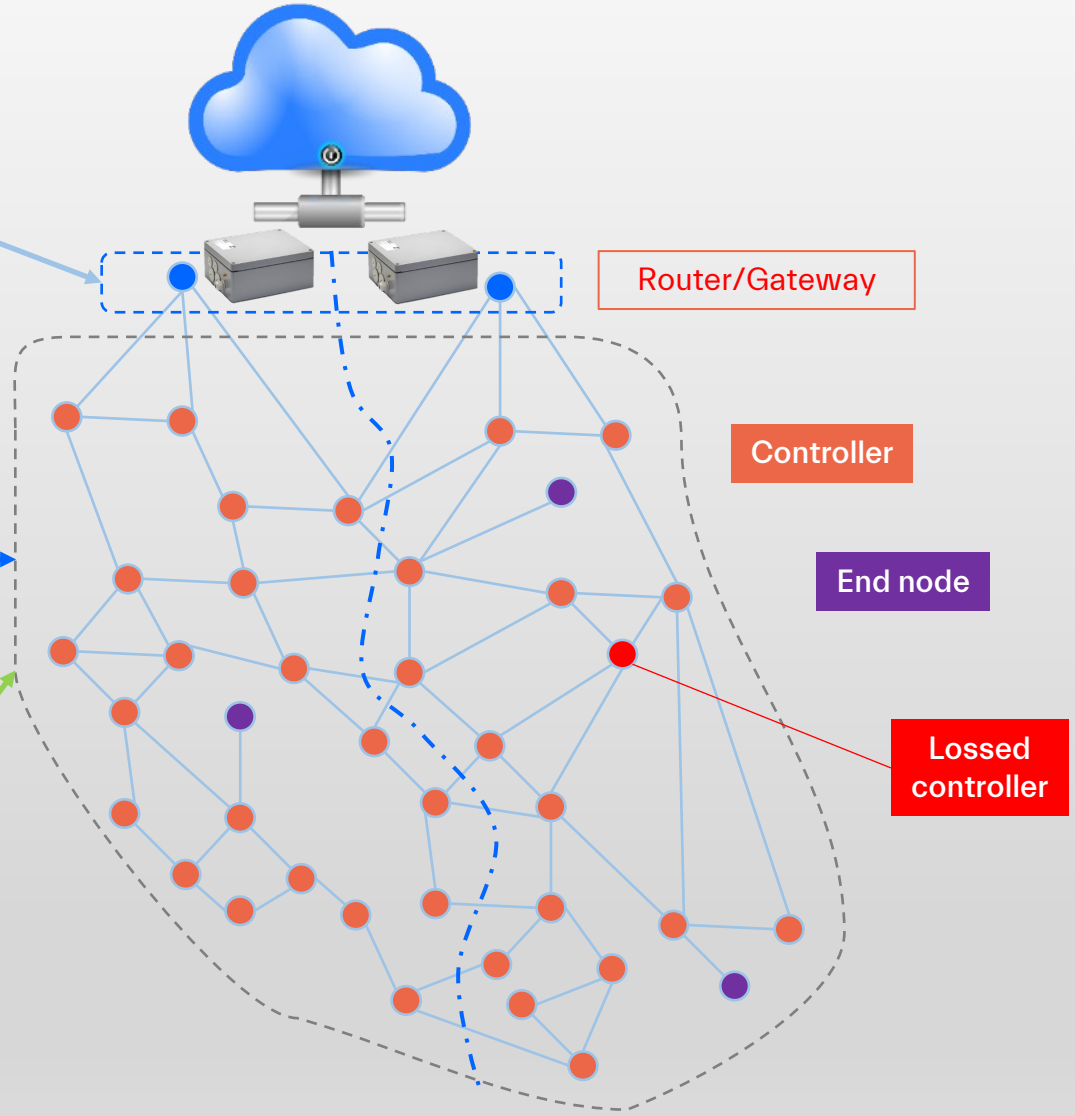


Wireless Mesh Network Requirements

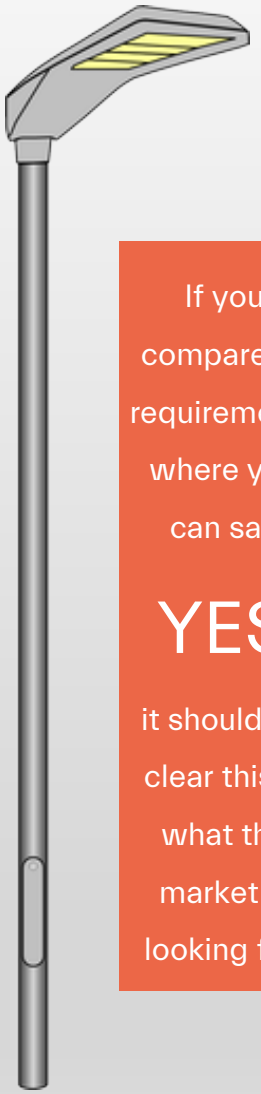
Cloud requirements
- Load balanced
- Routable protocol
- Interoperable

RF-Mesh requirements
- Energy management
- Connection reliability
- Robust against disturb.
- Scalable
- Interoperable
- Self-organised
- End-to-End reliable
- Encrypted
- Localisation / ranging
- Latency / reaction time

Economic requirements
- Huge number of nodes
- Routable protocol
- No recurring cost
- Investment protection



Difference Between Existing Technologies



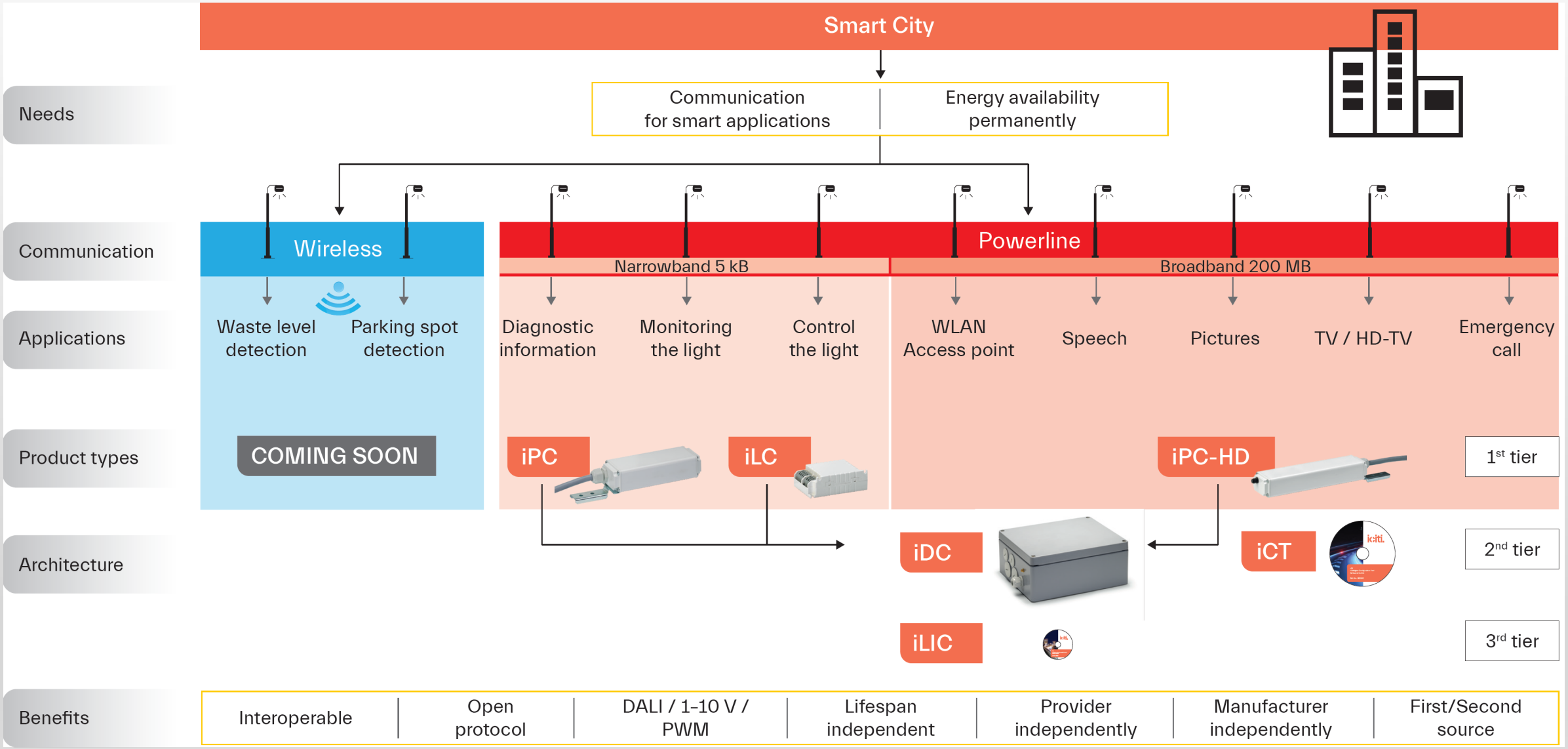
If you compare all requirements where you can say

YES

it should be clear this is what the market is looking for!

		LVX RF-Mesh coming soon	ZigBee	IoT-NB	LoRa / SigFox
	Independent tool for commissioning	**YES**	**NO**	**NO**	**NO**
Cloud requirements	Load balanced	Yes	No	No	No
	Routable protocol	Yes, because it's LON	No	Yes	No
	Interoperable	Yes, EN 14908.xx	No	No / with LON yes	No
RF-Mesh requirements	Energy management	Yes, outside the backbone	Yes	Only LTE-NB	Yes
	Connection reliability	Yes, acknowledgement	Yes	Yes	No
	Robust against disturb.	Yes, as long communication is available	Yes, as long communication is available	Yes, as long communication is available	Yes, as long communication is available
	Scalable	Yes, as thousands of nodes	Max. 65536 / real approx. 100	Yes	Depends on no. of devices
	Interoperable	Yes, because it's LON	No	Only with LON	No
	Self-organised	Yes, it's a "must be"	No	Yes	No
	End-to-End reliable	Yes, it's a "must be"	Yes	Yes	No
	Encrypted	Yes, it's a "must be"	Yes	Yes	Yes
	Localisation / ranging	GPS is included	No	No	No
	Latency / reaction time	Linear, depends on router no. (< 1 sec. over 50 hops)	3 to 5 hops	No, depends on connected devices	Depends on no. of devices
Economic requirements	Huge number of nodes	1000...5000	Real approx. 100	Yes	Yes, processing time grows linearly
	Routable protocol	Yes	No	Yes	No
	No recurring cost	Yes	Yes	No	Yes (LoRa) / No (SigFox)
	Investment protection	Yes, open technology	No	No	No

iciti – Decision Matrix for Smart Cities



iciti – Functions / Features of iciti Products

Functions / Features	1st tier			2nd tier		3rd tier						
Product category	**Luminaire Controller**			**Edge Controller**		**Software**			**Sensor**	**Coupling Unit**	**USB Interface**	**Filter**
Product type	iLC	iPC	iPC-HD	iDC-SS	iDC-IoT	iCT	iLIC	iCIC	iLUX	iCCU	iPL-NI	iPL-FI
On/Off	X	X	X	–	–	–	–	–	–	–	–	–
Dimming	X	X	X	–	–	–	–	–	–	–	–	–
Power reduction	–	iPC-2R	X	–	–	–	–	–	–	–	–	–
Band width	Narrowband 5 kB	Narrowband 5 kB	Broadband 100 MB	Narrowband 5 kB	Narrowband / Broadband / Wireless Mesh	–	–	–	–	–	–	–
IP interface for control	–	–	X	–	–	–	–	–	–	–	–	–
Repeater quantity	5	5	10	–	–	–	–	–	–	–	–	–
Operation with switched lighting cable	X	X	X	–	–	–	–	–	–	–	–	–
Stand-alone operation	X	X	–	–	–	–	–	–	–	–	–	–
Light measurement	–	iLUX	–	–	–	–	–	–	X	–	–	–
Transmission to other networks	iCCU	iCCU	–	iCCU	iCCU (NB-PLC)	–	–	–	–	X	–	–
Subsequent parameterisation + test operation	iPL-NI	iPL-NI	–	–	–	–	–	–	iPL-NI	–	X	–
Connection of the field level to the control center	–	–	–	XML / SOAP	MQTT / RES / OPC-UA	–	XML / SOAP	XML / SOAP and MQTT / RES / OPC-UA	–	–	–	–
Commissioning	iCT	iCT	iCT	iCT	iCT	X	–	–	–	–	–	–
Control, parameterisation, evaluation and display of the lighting system status	–	–	–	iLIC	iCIC	–	X	X	–	–	–	–
Information center for further applications	–	–	–	–	–	–	–	X	–	–	–	–
Filtering network disturbances	iPL-FI	iPL-FI	–	iPL-FI	iPL-FI (NB-PLC)	–	–	–	–	–	–	X
Product status	available	available	available	available	coming soon	available	available	coming soon	available	available	available	available

iciti – Product Portfolio

Luminaire Controller

Luminaire Controllers		Ref. No.
iLC-DALI		187205
iLC-1-10V		187206
iPC-1R		187207
iPC-2R		187208
iPC-HD		187211

Outlook

- iMCU-RF
  intelligent multi-functional luminaire controller
- iCTI-RF
  intelligent hand-held operating device for iMCU-RF

Edge Controller

Edge Controllers		Ref. No.
iDC-ET		188100
iDC-R4G		188101
iDC-MM		188102
iDC-SM		188103
iLIC (Software)		186253
iDC-IoT-IP		200011
iDC-IoT-R4G		200012
iDC-IoT-MM		200013
iDC-IoT-SM		200014
Software for iDC-IOT		
iCIS – intelligent City Information System (min. 100 LP)	1-200 LP	200015
	1-500 LP	200016
	1-1000 LP	200017
	1-2000 LP	200018
	1-5000 LP	200019

Accessories

Accessories		Ref. No.
iR-FT/HD (Router)		187214
iSS-FT (Smart Server)		186991
iSS-PL (Smart Server)		186992
iSS-IOT Pro (Smart Server)		200023
IOX (DI/DO)		200024
IOX (DI/DO + metering)		200025
iPL-NI		186993
iCCU		186345
iPC-HD-C2M		186889
iPC-HD-C7M		186890

iLC

iNTELLIGENT LUMINAIRE CONTROLLER (BUILT-IN)

Developed for use in street lighting and lighting in the vicinity of buildings, the interoperable iLC controls magnetic and electronic operating devices fitted with a 1–10 V, PWM or DALI interface via standardised powerline communication in the C/B band according to CENELEC 50065–1 based on the OLC LonMark® profile.

Standardised data transmission is in accordance with ANSI/CEA and EN. Operation is possible both in the light management system and in stand-alone mode.

Individually programmable and updateable, it performs all the tasks of a modern light management system and thus ensures a high degree of investment protection.

FURTHER ADVANTAGES

- ✓ Luminaires can be switched off when connected to a switched lighting cable
- ✓ Power consumption 1 to 3 W
- ✓ Adjustable control input to suit various tasks
- ✓ Connection of various sensors such as motion sensors, key switches and light sensors
- ✓ 10 dimming levels with individual dimming sequences in stand-alone mode
- ✓ Lighting can be switched on earlier and switched off with a delay with individual dimming sequences
- ✓ Compensation of reduction in luminous flux with freely definable values for lamp service life as well as start and end levels
- ✓ Burning in of high-pressure discharge lamps after lamp replacement
- ✓ 5 years warranty

TYPICAL APPLICATIONS

- ✓ Street lighting and lighting in the vicinity of buildings
- ✓ Car parks, bus stops and railway stations
- ✓ Company premises, warehouses
- ✓ Sports facilities

LVX Global (Deutschland) GmbH
Tannenwaldallee 2
61348 Bad Homburg, Germany
info@icititech.com

iLC Luminaire Controller

Technical Details

Electronic Luminaire Controller 187205	
Type	iLC
Input voltage	110–230 V AC (± 10%)
Mains frequency	50/60 Hz
Power consumption	1–3 W
Communication	Via the power supply line (powerline) in acc. with CENELEC 50065–1
C Band	Primary band 115–135 kHz
B Band	Secondary band 95–115 kHz
Data transfer (USA)	ANSI/CEA 709.1, ANSI/CEA 709.2
Data transfer (Europe)	EN 14908–1, EN 14908–3
Galvanic isolation	No electrical isolation from input to output (as soon as the electronic device is connected to the iLC, the control input ceases to be electrically isolated)
Switching current	4 A (at λ = 0.8)
Switching cycles	50,000 switching operations per function (at λ = 0.8)
Programmable	Yes
Configurable parameters	Yes
High-voltage control input	230 V AC
Switching output luminaire	1 x for connecting one luminaire
Control output electronic operating device	1 x DALI, 1–10 V or PWM: short-circuit proof, suitable for respective ballasts, DALI bus master interface for max. 4 ballasts
Connection terminals	0.5–1.5 mm²
Conductor type of the connection terminals	Single, stranded
Firmware update / parameter configuration	Via powerline
Control and monitoring parameters	Switch on and off, power reduction
Capture of measured data	Voltage, current, power factor, output, energy, temperature, lighting hours with an accuracy of better than 1%
Software interface	Interoperable in acc. with the LonMark® OLC profile, use of network variables and configuration parameters, repeatable
Operating temperature range tc	-25 to +80 °C
Storage temperature range	-25 to +85 °C
Mean time between failure	50,000 h
Humidity	90% non-condensing
Surge voltage protection	4 kV / 1.2 / 50; acc. to EN 61547
Degree of protection	IP20
Protection class	Suitable for luminaires of protection class I and II
Casing material	PC
Dimensions (LxWxH)	93 x 58 x 30 mm
Weight	100 g
Country of origin	Made in Serbia
Custom tariff number	8543 7090

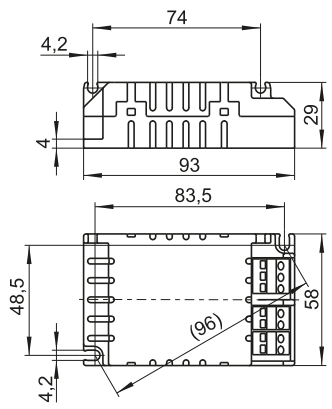
iLC Leuchtencontroller

Technische Daten

Elektronischer Leuchtencontroller 187205	
Typ	iLC
Eingangsspannung	110–230 V AC (± 10 %)
Netzfrequenz	50/60 Hz
Leistungsverbrauch	1–3 W
Kommunikation	Über die Spannungsversorgung (Powerline) gemäß CENELEC 50065–1
C-Band	Primär-Band 115–135 kHz
B-Band	Sekundär-Band 95–115 kHz
Datenübertragung (USA)	ANSI/CEA 709.1, ANSI/CEA 709.2
Datenübertragung (Europa)	EN 14908–1, EN 14908–3
Galvanische Trennung	Keine Potenzialtrennung Eingang zu Ausgang (sobald das elektronische Betriebsgerät an den iLC angeschlossen wird, verliert der Steuereingang seine Basisisolation)
Schaltstrom	4 A (bei λ = 0,8)
Schaltzyklen	50.000 Schaltungen pro Funktion (bei λ = 0,8)
Programmierbar	Ja
Parametrierbar	Ja
Hochvoltsteuereingang	230 V AC
Schaltausgang Leuchte	1 x zum Anschluss einer Leuchten
Steuerausgang elektro-nisches Betriebsgerät	1 x DALI, 1–10 V oder PWM: kurzschlussfest, geeignet für entsprechende Vorschaltgeräte, DALI-Busmaster-Schnittstelle für max. 4 Vorschaltgeräte
Anschlussklemmen	0,5–1,5 mm²
Leiterart der Anschlussklemme	Eindrähtig, feindrähtig
Firmware-Aktualisierung / Parameter-Konfiguration	Über Powerline
Steuer- und Überwachungsparameter	Ein-/Ausschalten, Leistungsreduzierung
Messdatenerfassung	Spannung, Strom, Leistungsfaktor, Leistung, Energie, Temperatur, Brennstunden mit einer Genauigkeit von besser als 1 %
Softwareschnittstelle	Kompatibel mit dem LonMark®-OLC-Profil, Verwendung von Netzwerkvariablen und Konfigurationsparametern, wiederholbar
Betriebstemperaturbereich tc	-25 bis +80 °C
Lagertemperaturbereich	-25 bis +85 °C
Mittlere Betriebsdauer zwischen Ausfällen (MTBF)	50.000 Std.
Luftfeuchtigkeit	90 % nicht kondensierend
Stoßspannungsfestigkeit	4 kV / 1,2 / 50; gemäß EN 61547
Schutzart	IP20
Schutzklasse	Geeignet für Leuchten der Schutzklasse I und II
Gehäusematerial	PC
Abmessungen (LxBxH)	93 x 58 x 30 mm
Gewicht	100 g
Ursprungsland	Hergestellt in Serbien
Zolltarifnummer	8543 7090

iLC Luminaire Controller

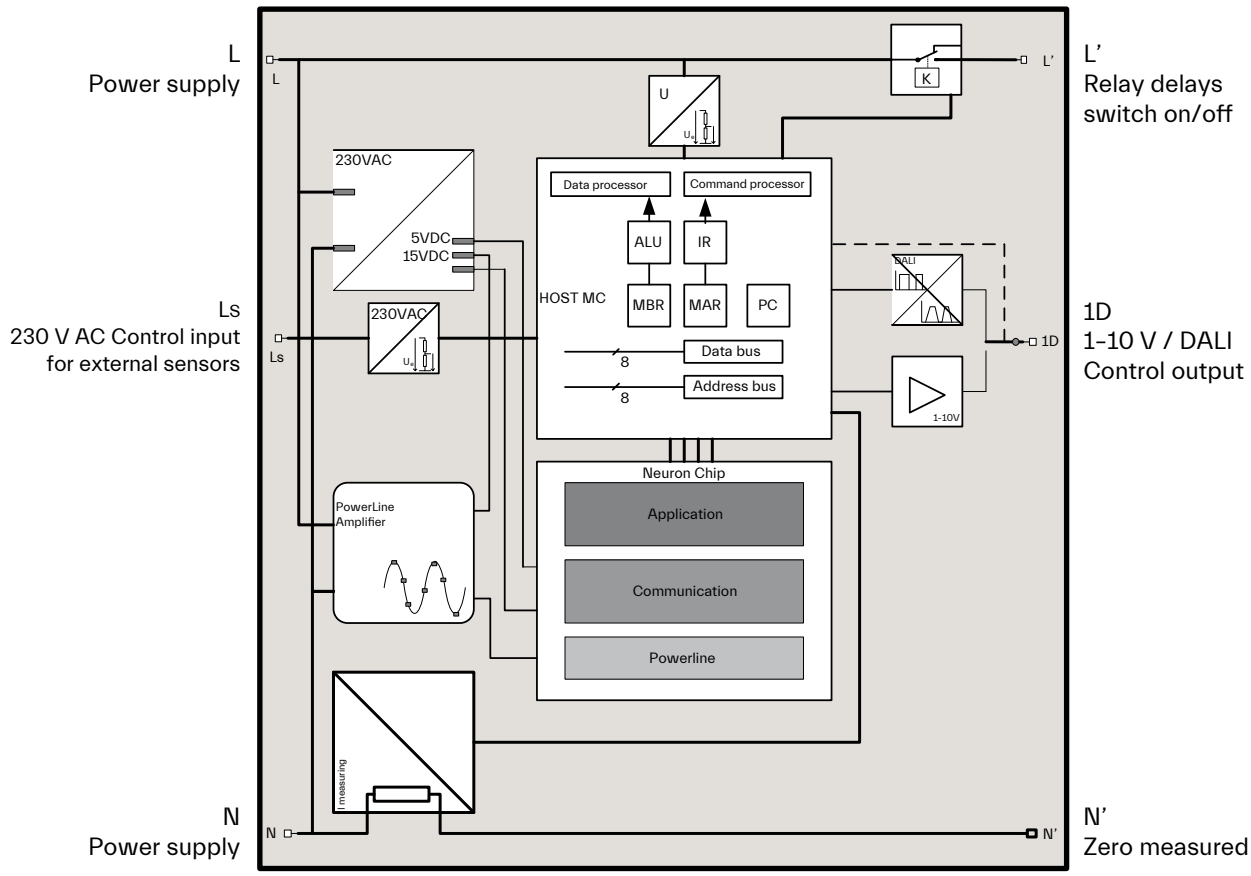
Technical Details



DIMENSIONS

- The luminaire controller is designed for built-in into luminaires.
- The 1–10 V / PWM / DALI output of the built-in luminaire controller enables control of max. 4 electronic operating devices to permit effective control of luminaire groups or, for instance, RGBW LED modules.
- The digital control input ceases to be electrically isolated as soon as an electronic operating devices is connected to the controller.
- The configurable parameters of the applications as well as optional firmware updates ensure a high degree of investment protection.
- Both, OEM and customer-specific versions can be protected against unauthorised distribution with a special software key. Please contact your iciti representative for more information on this function.

BLOCK DIAGRAM



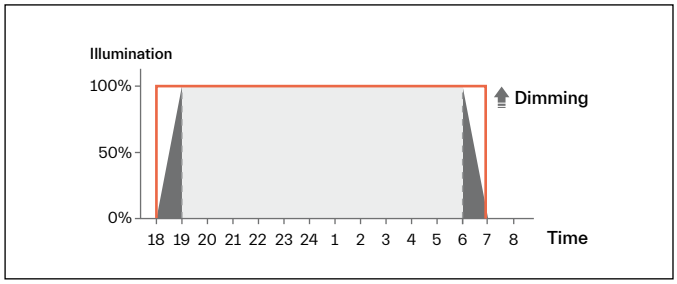
iLC Luminaire Controller

Functions

DOO (Dimmed ON/OFF)

The lighting system can be programmed to ensure the lighting level of luminaires slowly increases to the desired brightness upon being switched on and to dim down within a certain timeframe before switching off.

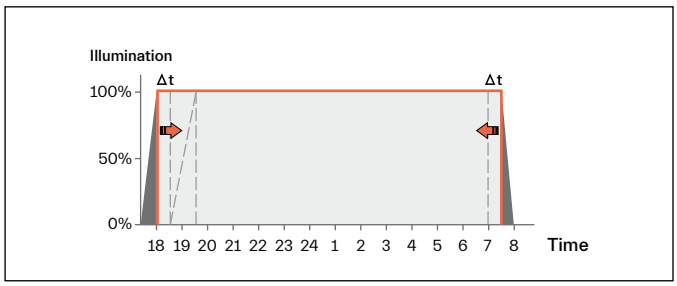
The brightness of luminaires based on LED technology can also be increased slowly up to a defined lighting level immediately after they have been switched on. This function enables a brightness-dimming sequence of max. 36 minutes to be set.



DPC (Delayed Switching for Pedestrian Crossing)

Delayed switching off or early switching on of the lighting in the closer area of pedestrian crossing zones.

For instance, street lighting is typically activated at 40 lux within pedestrian crossing zones, but at a lower lux level in areas outside of this zone. If the cabling infrastructure needed to set up such a system is missing, the iLC controller can emulate a similar effect thanks to its ability to “learn”. Pedestrian crossing zones can be switched for a longer period, whereas the remaining lighting can be switched independently and/or dimmed after a certain “learning” period.



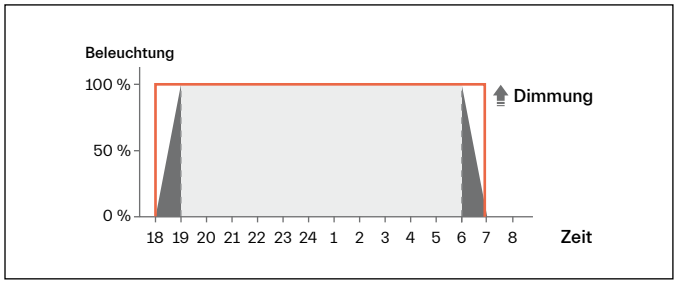
iLC Leuchtencontroller

Funktionen

DOO (Dimmung AN/AUS)

Die Beleuchtungsanlage kann so programmiert werden, dass das Beleuchtungsniveau von Leuchten beim Einschalten langsam auf die gewünschte Helligkeit ansteigt und vor dem Ausschalten innerhalb eines bestimmten Zeitfensters abdimmt.

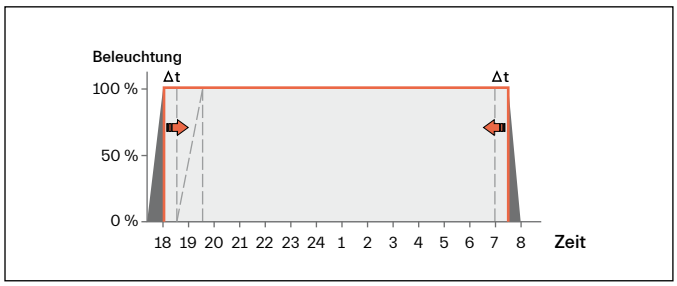
Bei Leuchten mit LED-Technik kann die Helligkeit auch direkt nach dem Einschalten langsam bis zu einem definierten Beleuchtungsniveau erhöht werden. Mit dieser Funktion kann eine Helligkeits-Dimmsequenz von max. 36 Minuten eingestellt werden.



DPC (Verzögertes Schalten für Fußgängerübergang)

Verzögertes Aus- bzw. vorgezogenes Einschalten der Beleuchtung in der näheren Umgebung von Fußgängerüberwegen.

Die Beleuchtung eines Fußgängerüberwegs soll bei typisch 40 Lux geschaltet werden. Außerhalb dieses Bereichs jedoch wird die Beleuchtung erst bei geringeren Lichtstärken geschaltet. Fehlt für eine derartige Steuerung die Verkabelungsinfrastruktur, kann der iLC-Controller ein ähnliches Verhalten aufgrund seiner Lernfähigkeit nachbilden. Der Bereich des Fußgängerüberwegs kann zeitlich verzögert geschaltet werden. Die Restbeleuchtung kann nach einer Lernfunktion unabhängig geschaltet und oder gedimmt werden.

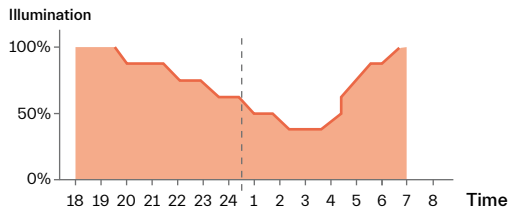


iLC Luminaire Controller

Functions

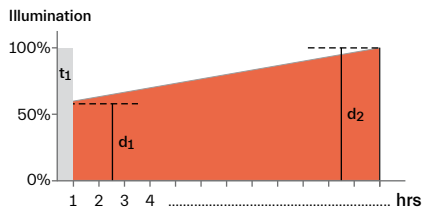
ISD (Intelligent Switching Time Dimming)

A season-specific reference value is derived from the period of time the lighting cable is switched on. In line with this reference value, the controller can manage the lighting system with up to 10 dimming levels and dimming sequences. Accidental (erroneous) configurations that can arise, for instance, during maintenance work, are suppressed by the controller as it ignores short lighting periods of less than 6 hours and long periods of more than 18 hours.



MFF (Maintenance Factor Function)

Lamps age, mirrors and luminaire cover glass become dirty. This unwanted effect is compensated over the service life of the lamp to ensure a constant luminous flux. The effect can be combated by quantifying the expected decrease in luminous flux over the lamp's service life, which helps to save energy costs. This function can also be used to precisely set the luminaire to suit the lighting task if the lighting level would otherwise be too high as a result of a substitute luminaire.



t_1 Period of time during which a high pressure discharge lamp is burned in, i.e. the time during which it must not be dimmed (typically 100 hours).

t_2 Service life of the lamp expressed in x 1000 hours.

d_1 Dimming value at the time of commissioning. The set value is shown in %.

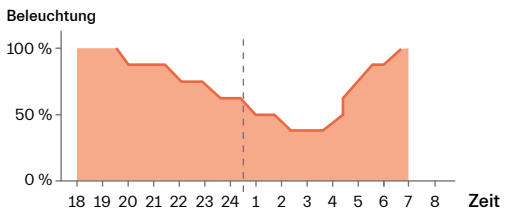
d_2 Dimming value at the end of the lamp's service life. The value is shown in %.

iLC Leuchtencontroller

Funktionen

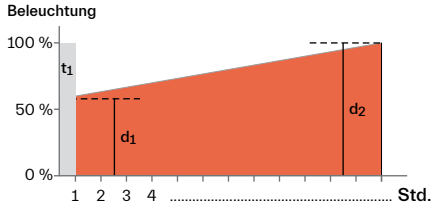
ISD (Intelligente schaltzeitenabhängige Dimmung)

Abgeleitet von der Einschaltdauer des Beleuchtungskabels erfolgt die Bestimmung einer jahreszeitspezifischen Referenzgröße. In Abhängigkeit von dieser Referenzgröße kann die Beleuchtung mit bis zu 10 Dimmleveln und Dimmverläufen über den Controller gesteuert werden. Fehlkonfigurationen, wie sie z. B. bei Wartungsarbeiten entstehen können, unterdrückt der Controller erfolgreich, indem kurze Einschaltzeiten von weniger als 6 Stunden und mehr als 18 Stunden ignoriert werden.



MFF (Wartungsfaktorfunktion)

Leuchtmittel altern, Spiegel sowie Gläser für die Abdeckung der Leuchte verschmutzen. Durch die Aussteuerung über die Leuchtmittellebensdauer wird diesem Prozess entgegengewirkt, so dass ein konstanter Lichtstrom generiert werden kann. Mit der Kenntnis des Lichtstromrückgangs über die Lebensdauer kann der Prozess ausgeglichen und Energiekosten eingespart werden. Gleichfalls ist mit dieser Funktion auch die genaue Einstellung der Leuchte auf die Beleuchtungsaufgabe möglich, wenn ansonsten eine Überdimensionierung aufgrund des Leuchtenersatzes der Fall wäre.



t1 Zeitdauer, innerhalb derer eine Hochdruck-Entladungslampe eingebrannt wird, d. h. nicht gedimmt werden darf (typischerweise 100 Stunden).

t2 Lebensdauer des Leuchtmittels in n x 1000 Stunden angegeben.

d1 Dimmwert zum Zeitpunkt der Inbetriebnahme. Der eingestellte Wert wird in % angegeben.

d2 Dimmwert zum Lebensdauerende des Leuchtmittels. Der Wert wird in % angegeben.

iLC Luminaire Controller

Functions

L_{ST} (Control input)

In addition, using a control input (e.g. with a push button or motions ensor) the system can be switched to a certain lighting level for a freely configurable period of time.

Configuration and Graphic User Interface

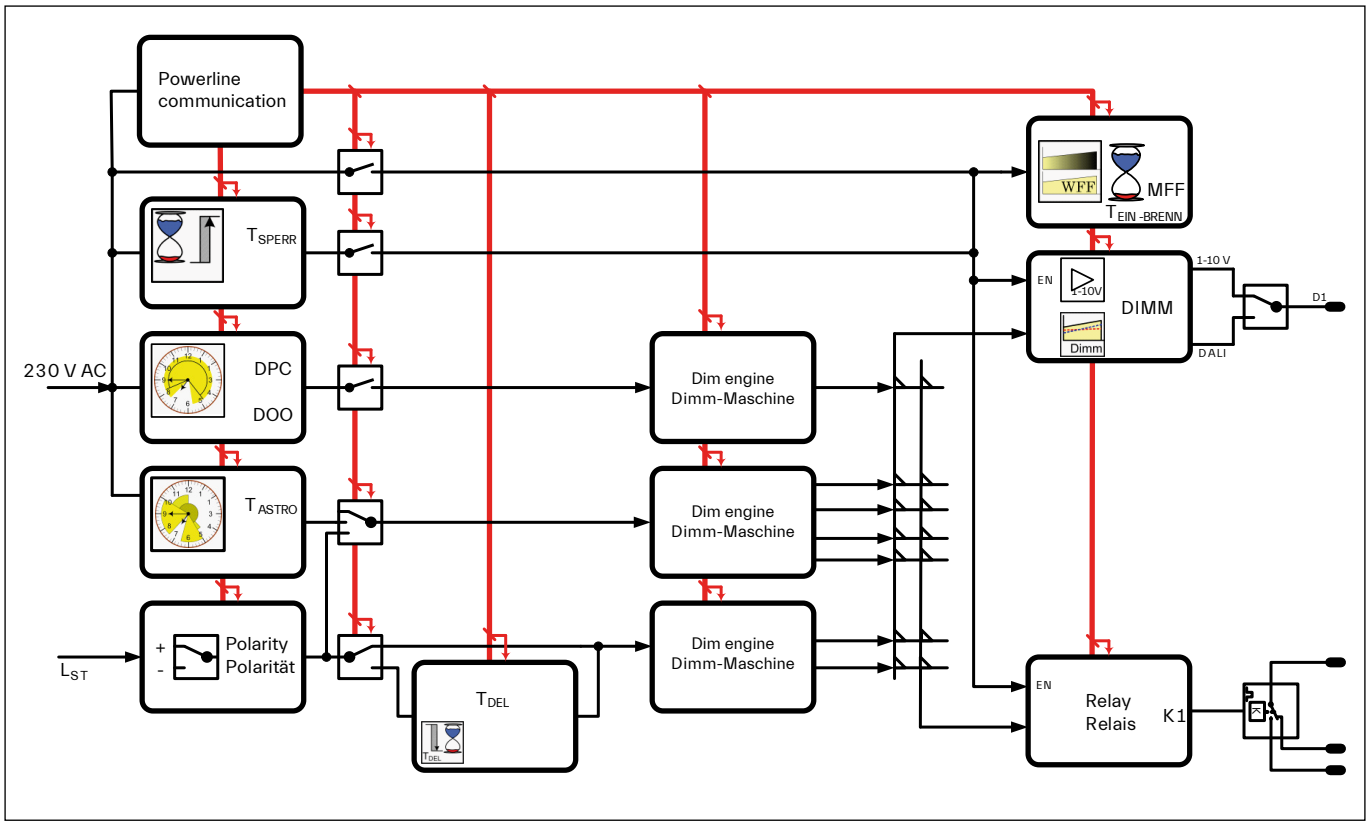
iLC Leuchtencontroller

Funktionen

L_{ST} (Steuereingang)

Zusätzlich kann über einen Steuereingang (z. B. mit einem Taster oder Bewegungsmelder) für eine frei einstellbare Zeit auf ein bestimmtes Beleuchtungsniveau geschaltet werden.

Konfiguration und Bedienoberfläche



If the controller is initially operated without a light management system, the configuration process is undertaken using a programming tool. Despite being a highly complex piece of technology, the controller's intuitive software interface makes it both user-friendly and easy to configure. The GUI enables direct configuration via the powerline.

If the controller is integrated into a light management system, the same functions are available, but the parameters are configured from a central control point and lighting control is web-based. In this case, time control using the "synthetic" midnight is only used as a redundant application.

Soll der Controller zu Beginn ohne ein Lichtmanagementsystem arbeiten, erfolgt die Konfiguration über ein Programmiertool. Trotz hoher Komplexität erhält der Anwender mit einer intuitiven Softwareoberfläche Zugang zur einfachen Bedienung und Parametrierung. Die grafische Bedienoberfläche erlaubt die direkte Konfiguration über Powerline.

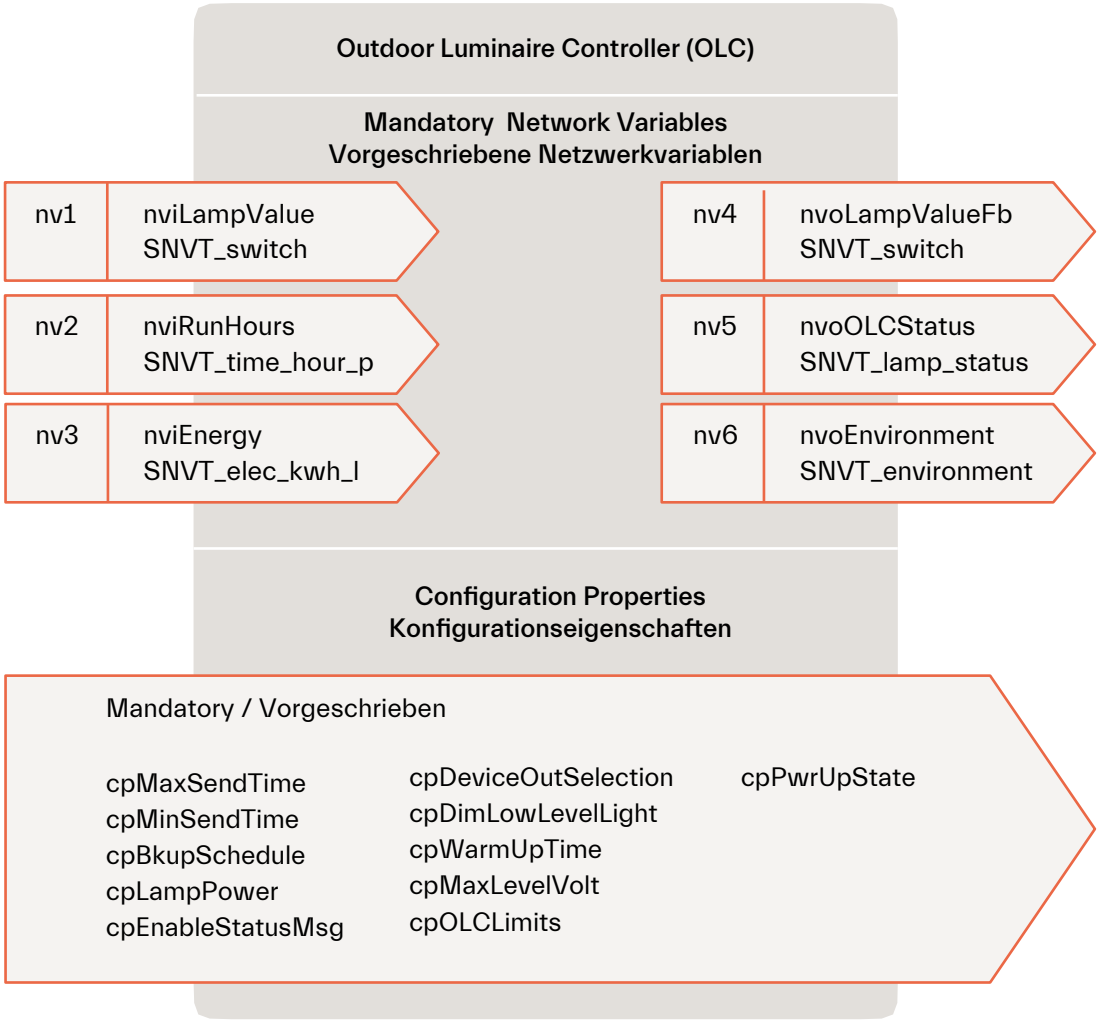
Ist der Controller in ein Lichtmanagementsystem integriert, stehen die gleichen Funktionen zur Verfügung, jedoch erfolgt die Parametrierung aus der Leitzentrale heraus und die Steuerung der Beleuchtung erfolgt online. Die Zeitsteuerung über die synthetische Mitternacht wird in diesem Fall nur als redundante Applikation eingesetzt.

iLC Luminaire Controller

LonMark® OLC Profile

iLC Leuchtencontroller

LonMark®-OLC-Profil



In accordance with the mentioned ANSI and EN specifications, the controller is fitted with an interoperable network interface, which is essential for setting up heterogeneous networks. The definition of the exact data structure for data transfer purposes is fixed in accordance with the LonMark® definition in line with the so-called OLC profile (Outdoor Luminaire Controller). Controllers that are manufactured in line with this standard, even if produced by different manufacturers, can be integrated into a common network. All communication data are completely routable to other medias like FT (Free Topology), wireless or narrow band powerline (PLC).

In Übereinstimmung mit den genannten ANSI- und EN-Spezifikationen ist der Controller mit einer interoperablen Netzwerkschnittstelle ausgestattet, die für den Aufbau heterogener Netzwerke unerlässlich ist. Die Definition der genauen Datenstruktur für den Datentransfer erfolgt gemäß der LonMark®-Definition in Übereinstimmung mit dem so genannten OLC-Profil (Outdoor Luminaire Controller). Nach diesem Standard hergestellte Controller können in ein gemeinsames Netzwerk integriert werden, auch wenn sie von unterschiedlichen Herstellern stammen. Alle Kommunikationsdaten sind vollständig auf andere Medien wie FT (Freie Topologie), drahtlos oder Narrow-Band-Powerline (PLC) routingfähig.

iLC Luminaire Controller

Circuit Diagrams

CONNECTION OF ELECTRONIC BALLASTS WITH A 1-10 V / DALI CONTROL INPUT

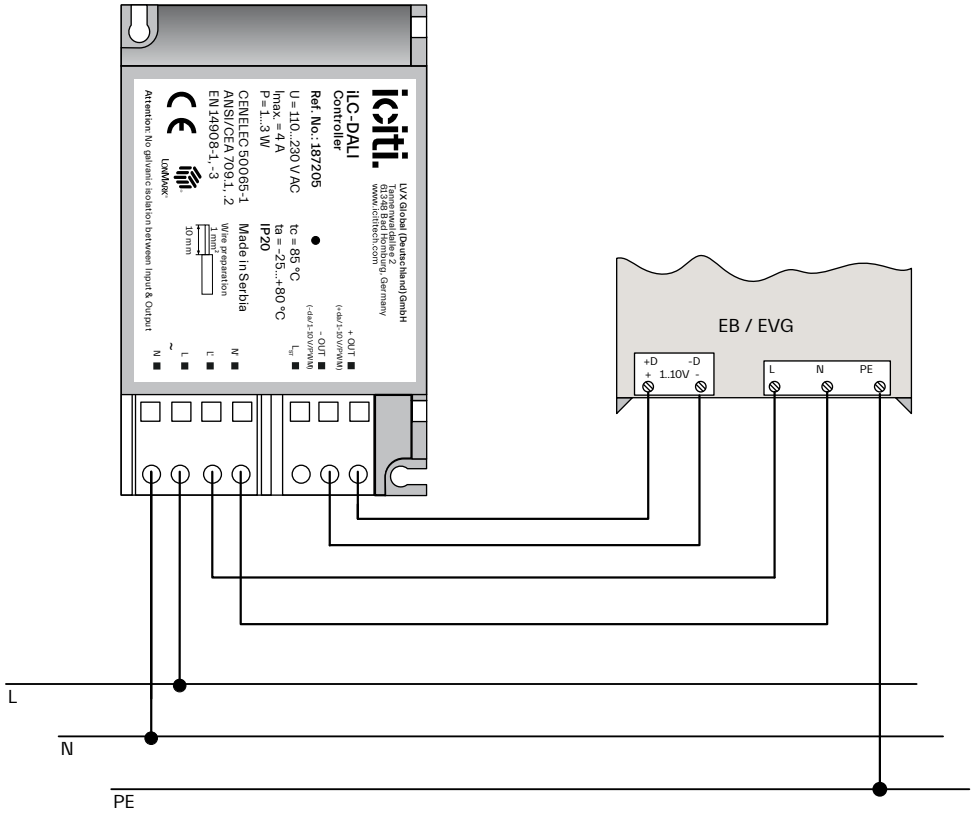
Apart from being able to address all commonly available ballasts, the controller also makes it possible to completely switch off electronic ballasts if connected to a switched lighting cable. This provides luminaires operated with 1-10 V electronic ballasts, in particular, with an important additional function.

iLC Leuchtencontroller

Schaltbilder

ANSCHLUSS ELEKTRONISCHER VORSCHALTGERÄTE MIT 1-10 V- / DALI-STEUEREINGANG

Neben der Ansteuerung von allen gebräuchlichen Vorschaltgeräten erlaubt der Controller auch das komplette Abschalten von elektronischen Vorschaltgeräten bei zugeschaltetem Beleuchtungskabel. Insbesondere Leuchten mit 1-10 V-EVGs erhalten hierdurch eine wichtige Zusatzfunktionalität.



iLC Luminaire Controller

Sales Text

Network-capable, multifunctional, intelligent built-in luminaire controller featuring powerline communication, stand-alone functionality that is suitable for street lighting, lighting in the vicinity of buildings and industrial (high-bay) lighting. The iPC enables control of luminaires operated with standard electromagnetic ballasts (CB, CB ECO) as well as electronic operating devices (EB, LED driver) with a 1–10 V, PWM or a DALI interface. The controller permits control of luminaires if connected to a switched lighting or mains cable. All kinds of sensor can be used with the universal control input. Ballasts with a DALI interface are addressed using a broadcast command, which removes the need for commissioning the electronic ballast. The controller is configurable and updateable. Key parameter values such as voltage, current, output, energy and lighting hours are captured for transfer to a central control point for evaluation. When the controller is operated in stand-alone mode, it is possible to set 10 switching times that are derived on the basis of the daily operating period; individual dimming sequences and dimming levels can be set for each of these 10 switching times. When used in areas outside of pedestrian crossings, this special configuration makes it possible to delay or bring forward the point in time when luminaires are switched on/off. Time offset, dimming sequences as well as dimming levels can be freely defined. The 230 V AC control input permits the superimposed use of up to 10 time-dependent dimming levels and dimming sequences. Furthermore, when used in sensor mode, the holding time for motion sensors can be freely and retriggerably defined.

Text for Invitation to Tender

Powerline-capable controller for integration into luminaires. The iPC enables control of luminaires in street lighting and lighting in the vicinity of buildings that are operated using a switched lighting cable or an unswitched mains cable in combination with a sensor or a control line. Data transfer is undertaken in accordance with the standards ANSI/CEA (709.1, 709.2) and EN (14908–1, 14908–3). The controller communicates using the OLC-LonMark® profile. In line with the LON philosophy and the OLC LonMark® definition, the controller is equipped with the requisite applications to enable control as well as calculation of data and limit values. Luminaires operated with a magnetic ballast, optionally with a power reduction relay, or with an electronic ballast with a 1–10 V, PWM or DALI control input can be connected and addressed. The built-in luminaire controller features a switched output that makes it possible to turn a luminaire of up to 4 A on/off. Used as a bus master during DALI operation, commands are transmitted to electronic ballasts in broadcast mode. In accordance with CENELEC and EN 50065–1, bi-directional LON powerline communication is effected using the C band (115–135 kHz) for primary communications and the B band (95–115 kHz) for secondary communications.

Optionally (configured) individual electronic ballasts can also be addressed via an allocated short address. The controller is suitable for ballasts fitted with a galvanically isolated input, but that lose their basic electrical isolation when connected to the controller.

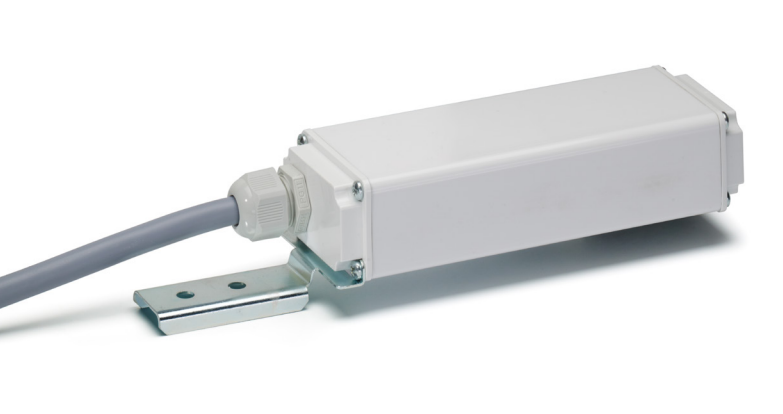
Synchronisable real-time clock. Interoperable software interface, use of network variables and configuration parameters in acc. with LonMark®, control and monitoring parameters: switching on and off, power reduction/dimming, lighting hours, input voltage, current to the ballast/electronic ballast, phase shift cos(phi), calculated power uptake and energy consumption. Configuration and monitoring of limit values for voltage, current, capacitor effect (only with magnetic ballasts). Optionally extendable current measuring range via externally calibrated current converters in steps of 10 A to 100 A. The decline in luminous flux over the lamp's service life can be compensated. Start and end values as well lamp service life values can be freely configured. For new lamps, the entire superimposed dimming function can be switched off in a lamp- and lighting-hour-dependent manner.

During optional stand-alone operation, the dimming level is automatically calculated and tracked, which enables energy-optimised operation via the lamp's lighting hours as well as by adjusting over-dimensioned luminaires to suit specific lighting tasks. When in operating mode, the controller can be connected to a switched lighting cable or an unswitched network cable in combination with a sensor or a control line. Given typical use when connected to a switched lighting cable, the controller "learns" what time it is by itself based on the periods of time it was switched on during the first three days of operation; the detected time of day is then used to derive the real-life switching times. Up to 10 freely configurable times of day are available for setting the EB's dimming values. The switching status of the relay, the dimming value and the dimming sequence is individually configurable on the basis of the time set in the parameters section. The 230 V AC control input can be used to influence the internally calculated switching and dimming function. The control input initiates up to 10 timers that exert superimposed control over the sequence of the relay's switching status, the dimming value as well as the dimming sequence. Per timer, the switching status of the relay, dimming value and dimming sequence can be individually configured.

Electrical specifications: mains voltage 110–230 V AC (±10%), mains frequency 50/60 Hz, nominal current max. 4 A, power consumption 1 W (standby) / 3 W (transmission mode), surge voltage protection 4 kV / 1.2 / 50 in acc. with EN 61547. Measuring accuracy: voltage U_{eff}, current I_{eff}, output P_{eff}, upwards of 1% in acc. with upper range value, energy kWh better than 1%, temperature, phase shift cos(phi) ≤ 0.02°. Climatic conditions: operating temperature -25 °C to +80 °C, storage temperature -25 °C to +85 °C. Polycarbonate plastic casing, dimensions (L/W/H) 93 mm / 58 mm / 30 mm, weight 100 g, degree of protection IP20.

iPC

iNTELLIGENT LUMINAIRE CONTROLLER (POLE BUILT-IN)



Developed for use in street lighting and lighting in the vicinity of buildings, the interoperable iPC controls electronic operating devices fitted with a 1–10 V, PWM or DALI interface via standardised powerline communication in the C/B band according to CENELEC 50065–1 based on the OLC LonMark® profile.

Standardised data transmission is in accordance with ANSI/CEA and EN. Operation is possible in light management systems, in stand-alone, repeating or iMCU emulation mode.

Individually programmable and updateable, it performs all the tasks of a modern light management system and thus ensures a high degree of investment protection.

FURTHER ADVANTAGES

- ✓ Luminaires can be switched off when connected to a switched lighting cable
- ✓ Power consumption 1 to 3 W
- ✓ Adjustable control input to suit various tasks
- ✓ Connection of various sensors such as motion sensors, key switches and light sensors
- ✓ 10 time-dependent, synchronisable dimming levels with individual dimming sequences can be set via control line or the control input in stand-alone mode
- ✓ Lighting can be switched on earlier and switched off with a delay with individual dimming sequences
- ✓ Compensation of reduction in luminous flux with freely definable values for lamp service life as well as start and end levels
- ✓ Burning in of high-pressure discharge lamps after lamp replacement
- ✓ Optionally available with an audio frequency ripple control receiver to enable migration of existing systems
- ✓ 5 years warranty

TYPICAL APPLICATIONS

- ✓ Street lighting and lighting in the vicinity of buildings
- ✓ Car parks, bus stops and railway stations
- ✓ Company premises, warehouses
- ✓ Sports facilities

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Tannenwaldallee 2
61348 Bad Homburg, Germany
info@icititech.com

iPC Luminaire Controller

Technical Details

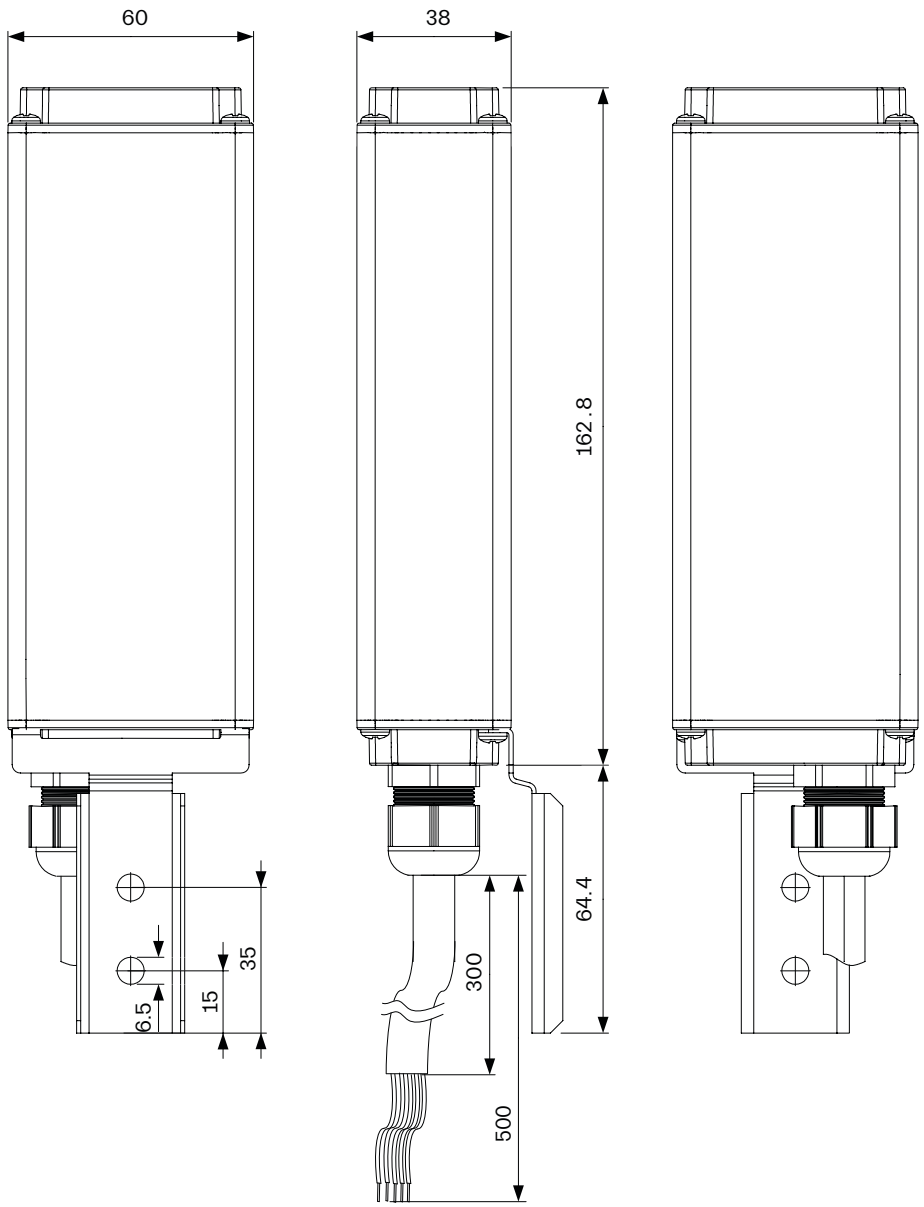
Electronic Luminaire Controller	187207	187208
Type	iPC-1R – 1 Relay	iPC-2R – 2 Relays
Input voltage	110–230 V AC (± 10%)	
Mains frequency	50/60 Hz	
Power consumption	1 to 3 W	
Communication	Via the power supply line (powerline) in acc. with CENELEC 50065–1	
C Band	Primary band 115–135 kHz	
B Band	Secondary band 95–115 kHz	
Data transfer (USA)	ANSI/CEA 709.1, ANSI/CEA 709.2	
Data transfer (Europe)	EN 14908–1, EN 14908–3	
Optional plug-in	Audio frequency ripple control receiver	
Filter frequencies	100 Hz ... 1.7 kHz	
Protocols	On request	
Bit patterns	On request	
Galvanic isolation	No electrical isolation from input to output (as soon as the electronic device is connected to the iPC, the control input ceases to be electrically isolated)	
Switching current	4 A (at λ = 0.8)	
Switching cycles	50,000 switching operations per function (at λ = 0.8)	
Programmable	Yes	
Configurable parameters	Yes	
High-voltage control input	230 V AC	
Switching output luminaire	1 x for connecting several luminaires	2 x for connecting several luminaires
Control output power reduction relay	--	1 x to address an electronic power reduction relay (control current ≤ 10 mA, not protected against short-circuiting)
Control output electronic operating device	1 x DALI, 1–10 V, PWM: short-circuit-proof, suitable for respective ballasts, DALI bus master interface for max. 4 ballasts	
Connection cable	1 mm², length: 500 mm	
Conductor type of the connection terminals	Stranded with ferrule bare end of core	
Firmware update / parameter configuration	Via powerline	
Control and monitoring parameters	Switch on and off, power reduction	
Capture of measured data	Voltage, current, power factor, output, energy, temperature, lighting hours with an accuracy of better than 1%	
Software interface	Interoperable in acc. with the LonMark® OLC profile, use of network variables and configuration parameters, repeatable	
Operating temperature range tc	-25 to +80 °C	
Storage temperature range	-25 to +85 °C	
Humidity	90% non-condensing	
Surge voltage protection	4 kV / 1.2 / 50; acc. to EN 61547	
Degree of protection	IP65	
Casing material	PC	
Dimensions (WxHxD)	60 x 228 x 38 mm	
Weight	400 g	
Country of origin	Made in Serbia	
Custom tariff number	8543 7090	

iPC Luminaire Controller

Dimensions (mm)

iPC Leuchtencontroller

Abmessungen (mm)



The Controller is designed for built-in into the pole. The 1-10 V / PWM / DALI output of the controller enables control of max. 4 electronic operating devices to permit effective control of luminaire groups or, for instance, RGBW LED modules. The digital control input ceases to be electrically isolated as soon as an electronic ballast is connected to the controller. The configurable parameters of the applications as well as optional firmware updates ensure a high degree of investment protection. Both, OEM and customer-specific versions can be protected against unauthorised distribution with a special software key. Please contact your iciti representative for more information on this function.

Der Controller ist für den Masteinbau konzipiert. Der 1-10 V- / PWM- / DALI-Ausgang ist für die Steuerung von maximal 4 elektronische Betriebsgeräte ausgelegt, um Leuchtengruppen oder z. B. RGBW-LED-Module effektiv zu steuern. Werden elektronische Betriebsgeräte an den Controller angeschlossen, wird die Potenzialfreiheit des digitalen Steuereingangs aufgehoben. Parametrierbarkeit der Applikationen und die optionalen Firmware-Updates bieten einen hohen Investitionsschutz. Sowohl OEM als auch kundenspezifische Versionen können über einen speziellen Softwareschlüssel gegen Weitergabe geschützt werden. Für weitere Informationen zu dieser Funktion wenden Sie sich bitte an Ihren iciti-Ansprechpartner.

iPC Luminaire Controller

Main Cable for Supply and Control of Driver and Sensor

CABLE ASSIGNMENT SUPPLY SIDE

According to IEC 60757

Colour	Abbreviations		IEC 60757	Configuration	Special features 187207/187208
Black	SW	sw	BK	L1 Out	
Brown	BR	br	BN	L	
Red	RT	rt	RD	+da/ 1-10 V	Shrinking
Orange	OR	or	OR	LST 110...230 V	Shrinking
Blue	BL	bl	BU	N	
Violett	VI	vi	VT	--	Shrinking
Grey	GR	gr	GY	N' Out	
White	WS	ws	WH	N'/-da/ 1-10 V	Shrinking
Pink	RS	rs	PK	L2 Out	only 187208

IEC = International Electrotechnical Commission

Preassambled cable 10 x 1 mm², oilflex-sheathed cable classic 100, ferrule on bare end of core on connection side.

iPC Leuchtencontroller

Hauptkabel für die Versorgung und Steuerung von Treiber und Sensor

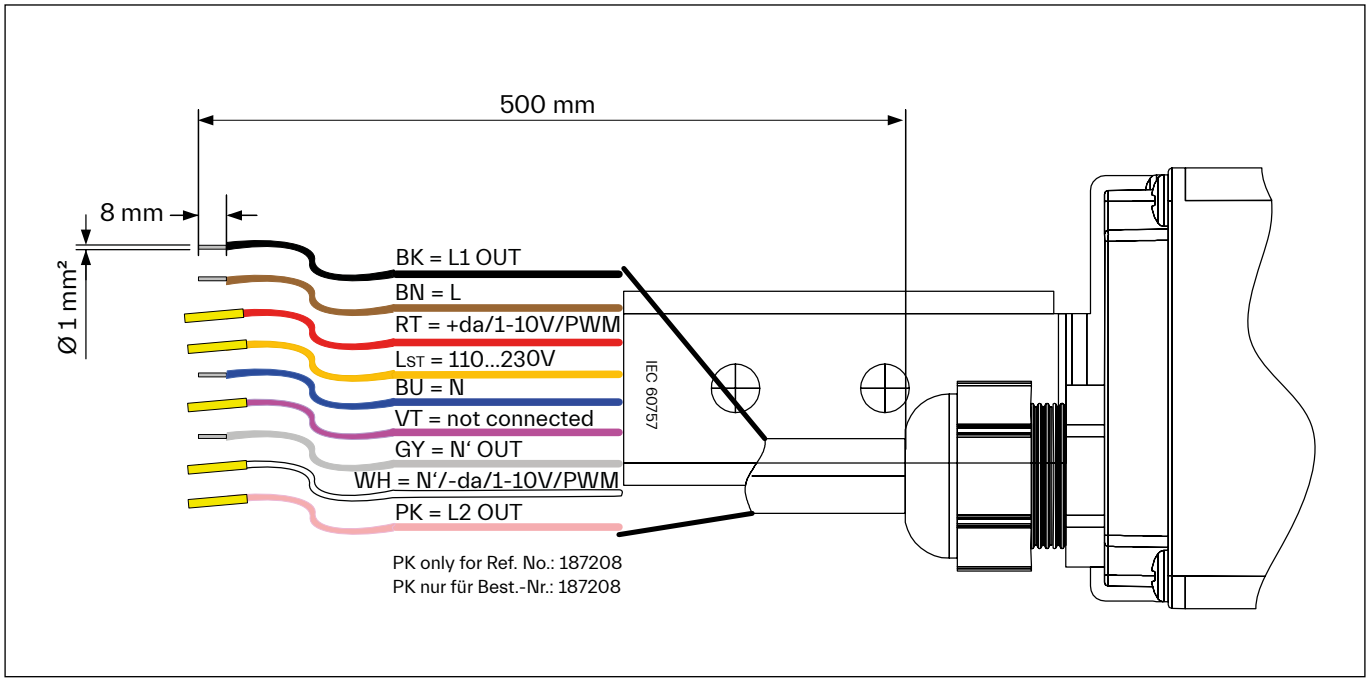
KABELZUORDNUNG ANSCHLUSS VERSORGUNGSSEITE

Gemäß IEC 60757

Farbe	Abkürzungen		IEC 60757	Belegung	Besonderheiten 187207/187208
Schwarz	SW	sw	BK	L1 Out	
Braun	BR	br	BN	L	
Rot	RT	rt	RD	+da/ 1-10 V	abgeschrumpft
Orange	OR	or	OR	LST 110...230 V	abgeschrumpft
Blau	BL	bl	BU	N	
Violett	VI	vi	VT	--	
Grau	GR	gr	GY	N' Out	
Weiß	WS	ws	WH	N'/-da/ 1-10 V	abgeschrumpft
Rosa	RS	rs	PK	L2 Out	nur 187208

IEC = International Electrotechnical Commission

Vorkonfektioniertes Kabel 10 x 1 mm², Ölflex-Mantelleitung Classic 100, anschlussseitig mit Aderendhülsen



iPC Luminaire Controller

Block Diagram

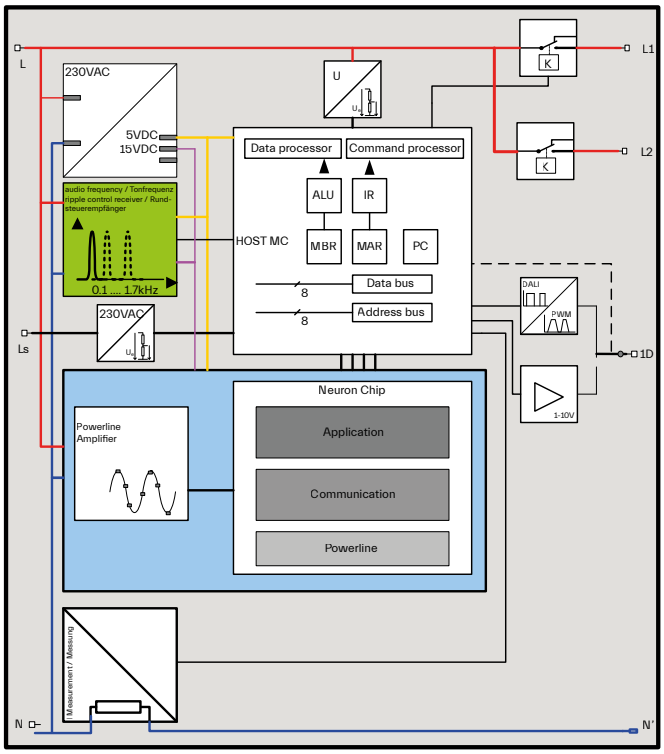
iPC Leuchtencontroller

Blockschaltbild

L
Power supply
Spannungsversorgung

Ls
Control input for external sensors
Steuereingang für externe Sensoren

N
Zero voltage supply
Nullleiter Spannungsversorgung



L1
Relay for first luminaire
Relais für erste Leuchte

L2 (187208)
Relay for second luminaire
Relais für zweite Leuchte

1D
+da / 1-10V / PWM control output
+da / 1-10V / PWM Steuerausgang

N'
Zero measured
Null gemessen

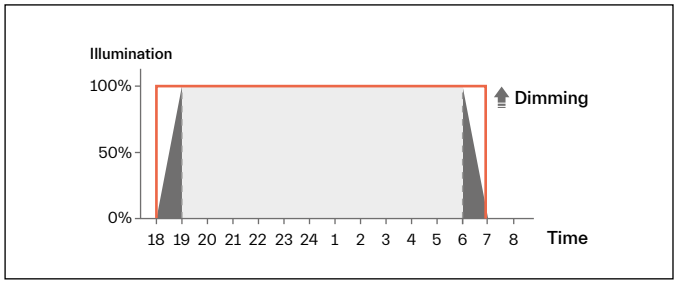
iPC Luminaire Controller

Functions

DOO (Dimmed ON/OFF)

The lighting system can be programmed to ensure the lighting level of luminaires slowly increases to the desired brightness upon being switched on and to dim down within a certain timeframe before switching off.

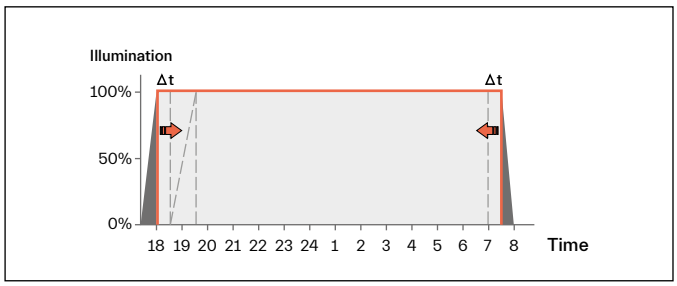
The brightness of luminaires based on LED technology can also be increased slowly up to a defined lighting level immediately after they have been switched on. This function enables a brightness-dimming sequence of max. 36 minutes to be set.



DPC (Delayed Switching for Pedestrian Crossing)

Delayed switching off or early switching on of the lighting in the closer area of pedestrian crossing zones.

For instance, street lighting is typically activated at 40 lux within pedestrian crossing zones, but at a lower lux level in areas outside of this zone. If the cabling infrastructure needed to set up such a system is missing, the iPC controller can emulate a similar effect thanks to its ability to “learn”. Pedestrian crossing zones can be switched for a longer period, whereas the remaining lighting can be switched independently and/or dimmed after a certain “learning” period.



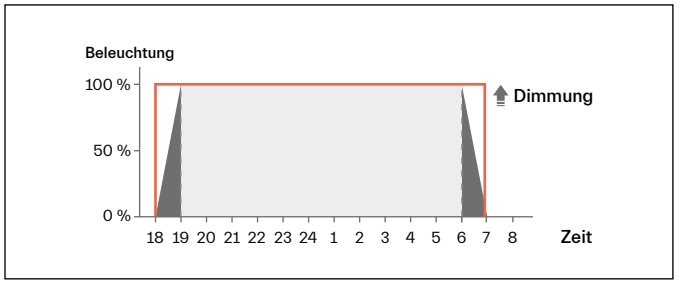
iPC Leuchtencontroller

Funktionen

DOO (Dimmung AN/AUS)

Die Beleuchtungsanlage kann so programmiert werden, dass das Beleuchtungsniveau von Leuchten beim Einschalten langsam auf die gewünschte Helligkeit ansteigt und vor dem Ausschalten innerhalb eines bestimmten Zeitfensters abdimmt.

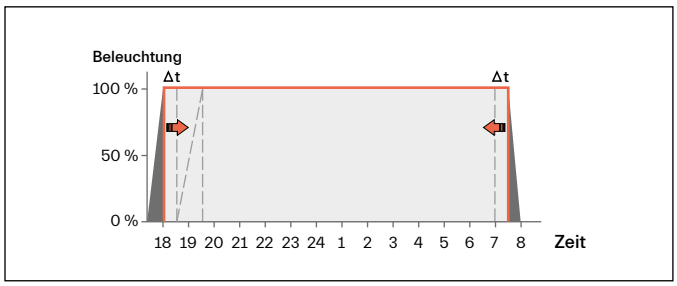
Bei Leuchten mit LED-Technik kann die Helligkeit auch direkt nach dem Einschalten langsam bis zu einem definierten Beleuchtungsniveau erhöht werden. Mit dieser Funktion kann eine Helligkeits-Dimmsequenz von max. 36 Minuten eingestellt werden.



DPC (Verzögertes Schalten für Fußgängerübergang)

Verzögertes Aus- bzw. vorgezogenes Einschalten der Beleuchtung in der näheren Umgebung von Fußgängerüberwegen.

Die Beleuchtung eines Fußgängerüberwegs soll bei typisch 40 Lux geschaltet werden. Außerhalb dieses Bereichs jedoch wird die Beleuchtung erst bei geringeren Lichtstärken geschaltet. Fehlt für eine derartige Steuerung die Verkabelungsinfrastruktur, kann der iPC-Controller ein ähnliches Verhalten aufgrund seiner Lernfähigkeit nachbilden. Der Bereich des Fußgängerüberwegs kann zeitlich verzögert geschaltet werden. Die Restbeleuchtung kann nach einer Lernfunktion unabhängig geschaltet und oder gedimmt werden.

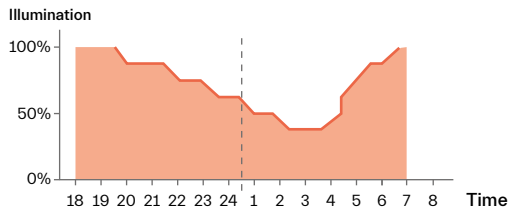


iPC Luminaire Controller

Functions

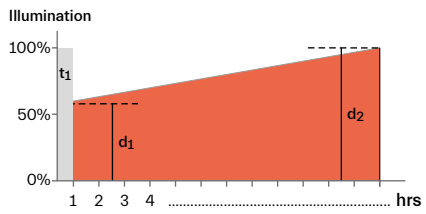
ISD (Intelligent Switching Time Dimming)

A season-specific reference value is derived from the period of time the lighting cable is switched on. In line with this reference value, the controller can manage the lighting system with up to 10 dimming levels and dimming sequences. Accidental (erroneous) configurations that can arise, for instance, during maintenance work, are suppressed by the controller as it ignores short lighting periods of less than 6 hours and long periods of more than 18 hours.



MFF (Maintenance Factor Function)

Lamps age, mirrors and luminaire cover glass become dirty. This unwanted effect is compensated over the service life of the lamp to ensure a constant luminous flux. The effect can be combated by quantifying the expected decrease in luminous flux over the lamp's service life, which helps to save energy costs. This function can also be used to precisely set the luminaire to suit the lighting task if the lighting level would otherwise be too high as a result of a substitute luminaire.



t_1 Period of time during which a high pressure discharge lamp is burned in, i.e. the time during which it must not be dimmed (typically 100 hours).

t_2 Service life of the lamp expressed in x 1000 hours.

d_1 Dimming value at the time of commissioning. The set value is shown in %.

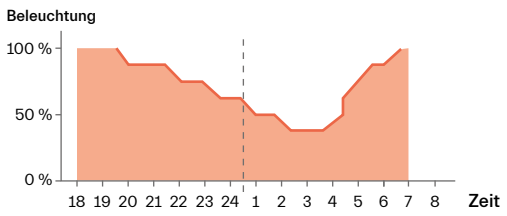
d_2 Dimming value at the end of the lamp's service life. The value is shown in %.

iPC Leuchtencontroller

Funktionen

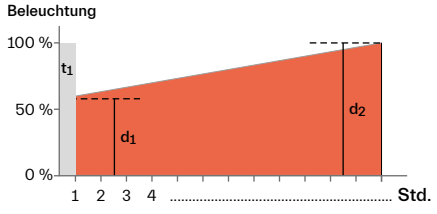
ISD (Intelligente schaltzeitenabhängige Dimmung)

Abgeleitet von der Einschaltdauer des Beleuchtungskabels erfolgt die Bestimmung einer jahreszeitspezifischen Referenzgröße. In Abhängigkeit von dieser Referenzgröße kann die Beleuchtung mit bis zu 10 Dimmleveln und Dimmverläufen über den Controller gesteuert werden. Fehlkonfigurationen, wie sie z. B. bei Wartungsarbeiten entstehen können, unterdrückt der Controller erfolgreich, indem kurze Einschaltzeiten von weniger als 6 Stunden und mehr als 18 Stunden ignoriert werden.



MFF (Wartungsfaktorfunktion)

Leuchtmittel altern, Spiegel sowie Gläser für die Abdeckung der Leuchte verschmutzen. Durch die Aussteuerung über die Leuchtmittellebensdauer wird diesem Prozess entgegengewirkt, so dass ein konstanter Lichtstrom generiert werden kann. Mit der Kenntnis des Lichtstromrückgangs über die Lebensdauer kann der Prozess ausgeglichen und Energiekosten eingespart werden. Gleichfalls ist mit dieser Funktion auch die genaue Einstellung der Leuchte auf die Beleuchtungsaufgabe möglich, wenn ansonsten eine Überdimensionierung aufgrund des Leuchtenersatzes der Fall wäre.



t1 Zeitdauer, innerhalb derer eine Hochdruck-Entladungslampe eingebrannt wird, d. h. nicht gedimmt werden darf (typischerweise 100 Stunden).

t2 Lebensdauer des Leuchtmittels in n x 1000 Stunden angegeben.

d1 Dimmwert zum Zeitpunkt der Inbetriebnahme. Der eingestellte Wert wird in % angegeben.

d2 Dimmwert zum Lebensdauerende des Leuchtmittels. Der Wert wird in % angegeben.

iPC Luminaire Controller

Functions

LST (Control input)

In addition, using a control input (e.g. with a push button or motions ensor) the system can be switched to a certain lighting level for a freely configurable period of time.

iPC Leuchtencontroller

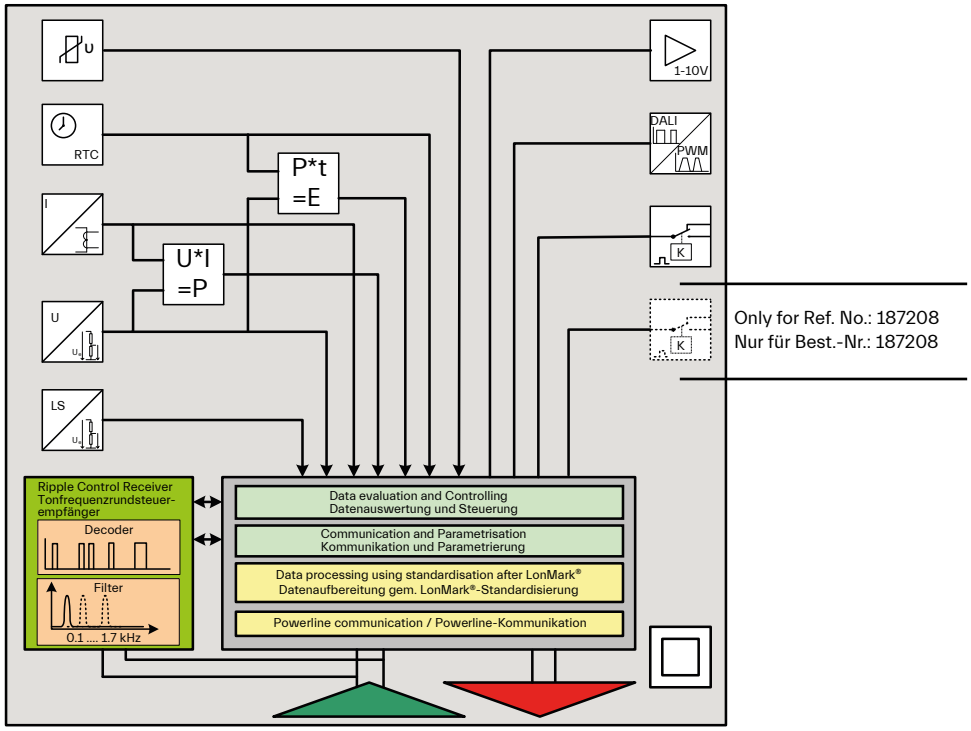
Funktionen

LST (Steuereingang)

Zusätzlich kann über einen Steuereingang (z. B. mit einem Taster oder Bewegungsmelder) für eine frei einstellbare Zeit auf ein bestimmtes Beleuchtungsniveau geschaltet werden.

Configuration and Graphic User Interface

Konfiguration und Bedienoberfläche



If the controller is initially operated without a light management system, the configuration process is undertaken using a programming tool. Despite being a highly complex piece of technology, the controller's intuitive software interface makes it both user-friendly and easy to configure. The GUI enables direct configuration via the powerline.

If the controller is integrated into a light management system, the same functions are available, but the parameters are configured from a central control point and lighting control is web-based online. In this case, time control using the "synthetic" midnight is only used as a redundant application.

Soll der Controller zu Beginn ohne ein Lichtmanagementsystem arbeiten, erfolgt die Konfiguration über ein Programmiertool. Trotz hoher Komplexität erhält der Anwender mit einer intuitiven Softwareoberfläche Zugang zur einfachen Bedienung und Parametrierung. Die grafische Bedienoberfläche erlaubt die direkte Konfiguration über Powerline.

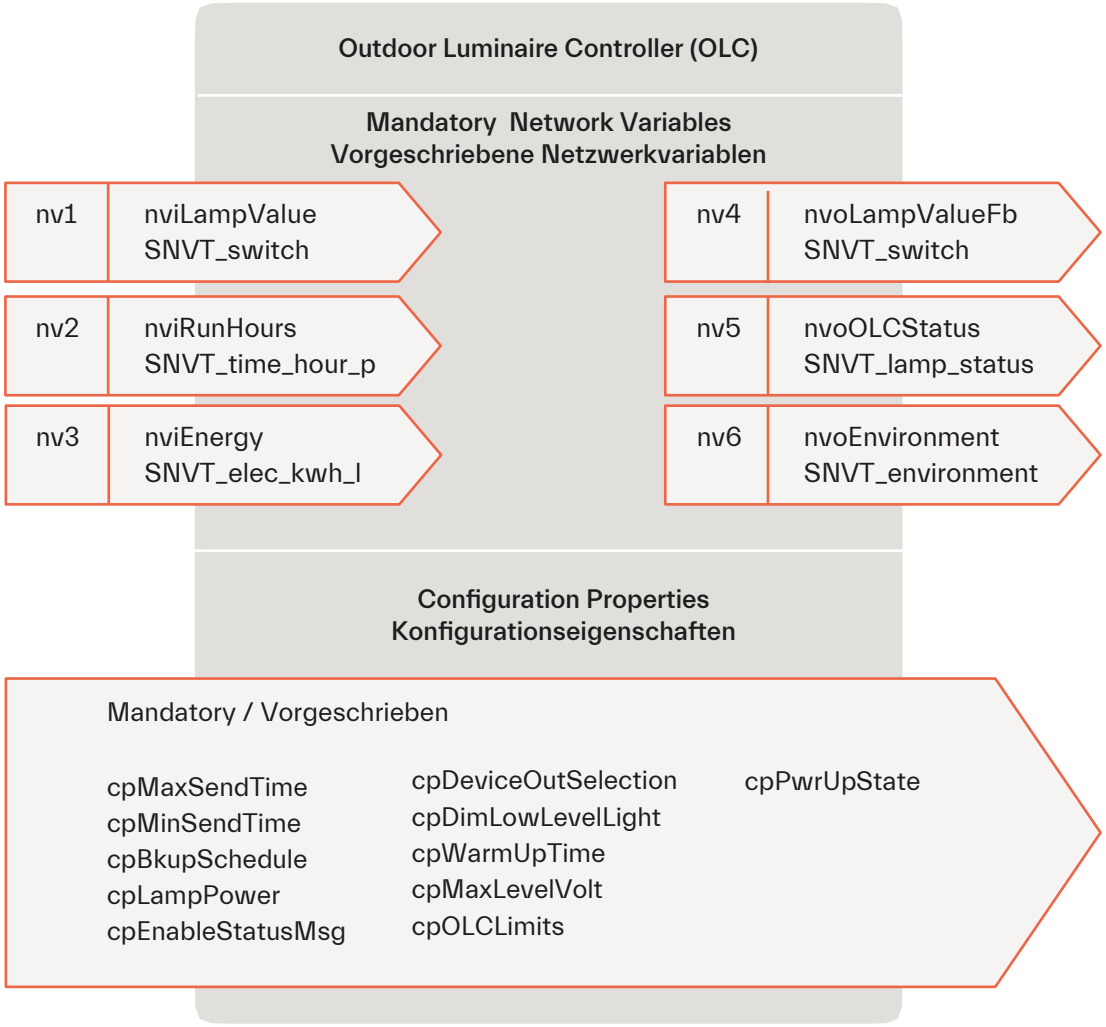
Ist der Controller in ein Lichtmanagementsystem integriert, stehen die gleichen Funktionen zur Verfügung, jedoch erfolgt die Parametrierung aus der Leitzentrale heraus und die Steuerung der Beleuchtung erfolgt webbasiert online. Die Zeitsteuerung über die synthetische Mitternacht wird in diesem Fall nur als redundante Applikation eingesetzt.

iPC Luminaire Controller

LonMark® OLC Profile

iPC Leuchtencontroller

LonMark® OLC-Profil



In accordance with the mentioned ANSI and EN specifications, the controller is fitted with an interoperable network interface, which is essential for setting up heterogeneous networks. The definition of the exact data structure for data transfer purposes is fixed in accordance with the LonMark® definition in line with the so-called OLC profile (Outdoor Luminaire Controller). Controllers that are manufactured in line with this standard, even if produced by different manufacturers, can be integrated into a common network. All communication data are completely routable to other medias like FT (Free Topology), wireless or narrow band powerline (PLC).

In Übereinstimmung mit den genannten ANSI- und EN-Spezifikationen ist der Controller mit einer interoperablen Netzwerkschnittstelle ausgestattet, die für den Aufbau heterogener Netzwerke unerlässlich ist. Die Definition der genauen Datenstruktur für den Datentransfer erfolgt gemäß der LonMark®-Definition in Übereinstimmung mit dem so genannten OLC-Profil (Outdoor Luminaire Controller). Nach diesem Standard hergestellte Controller können in ein gemeinsames Netzwerk integriert werden, auch wenn sie von unterschiedlichen Herstellern stammen. Alle Kommunikationsdaten sind vollständig auf andere Medien wie FT (Freie Topologie), drahtlos oder Narrow-Band-Powerline (PLC) routingfähig.

iPC Luminaire Controller

Circuit Diagrams

CONNECTION OF ELECTRONIC BALLASTS WITH 1–10 V / DALI CONTROL INPUT

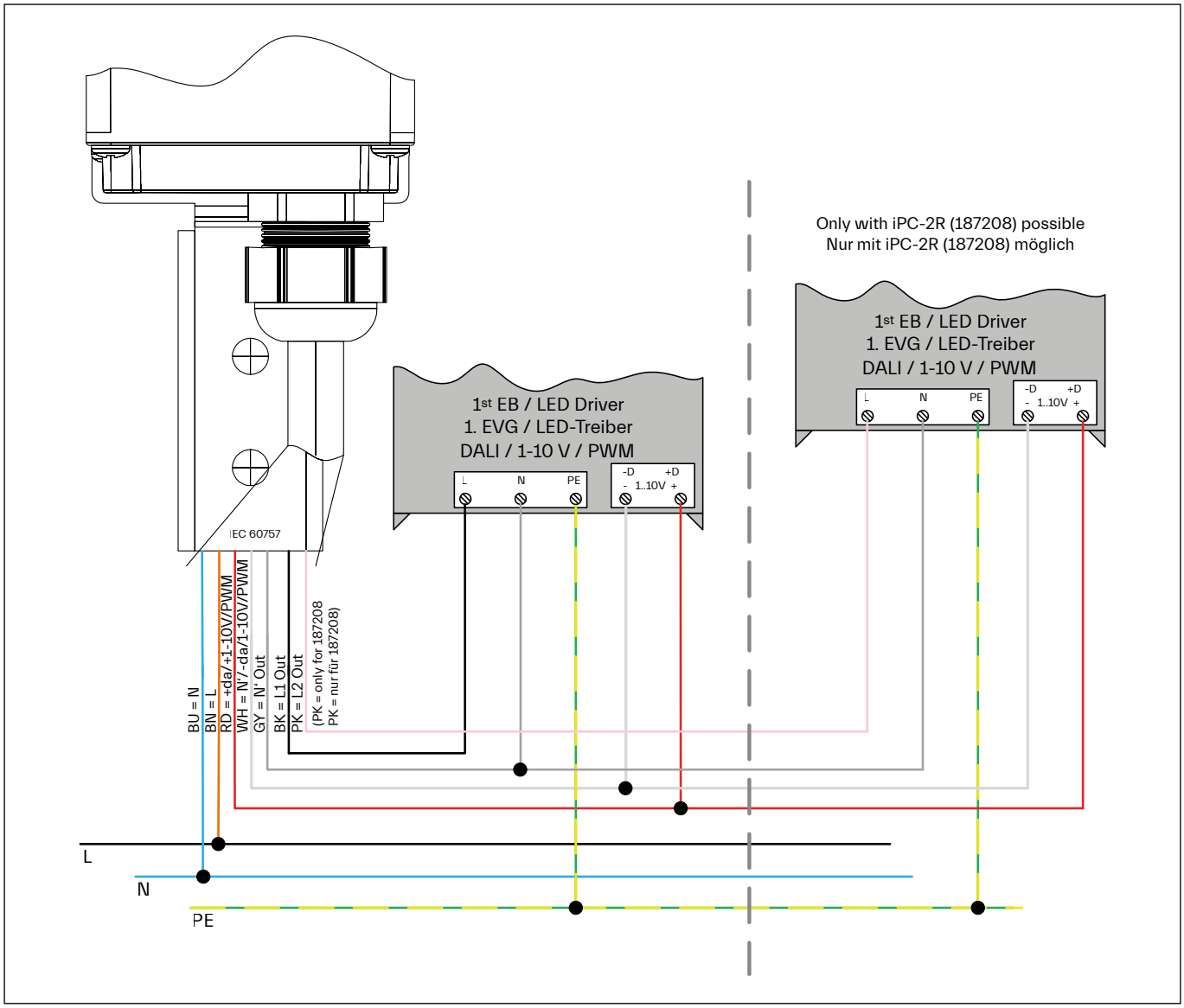
Apart from being able to address all commonly available ballasts, the controller also makes it possible to completely switch off electronic ballasts if connected to a switched lighting cable. This provides luminaires operated with 1-10 V electronic ballasts, in particular, with an important additional function. With DALI up to 4 individual ballasts are addressable per controller. With the iPC-2R, 2-lamp luminaires or 1-lamp luminaires with power reduction can be controlled via the second relay.

iPC Leuchtencontroller

Schaltbilder

ANSCHLUSS ELEKTRONISCHER VORSCHALT-GERÄTE MIT 1–10 V- / DALI-STEUEREINGANG

Neben der Ansteuerung von allen gebräuchlichen Vorschaltgeräten erlaubt der Controller auch das komplette Abschalten von elektronischen Vorschaltgeräten bei zugeschaltetem Beleuchtungskabel. Insbesondere Leuchten mit 1–10 V-EVGs erhalten hierdurch eine wichtige Zusatzfunktionalität. Mit DALI sind bis zu 4 einzelne Vorschaltgeräte pro Controller adressierbar. Mit dem iPC-2R können über das zweite Relais 2-lampige Leuchten oder 1-lampige Leuchten mit Leistungsreduzierung gesteuert werden.



iPC Luminaire Controller

Circuit Diagrams

CONTROL USING THE L_{ST} CONTROL INPUT VIA A MOTION SENSOR OR CONTROL LINE

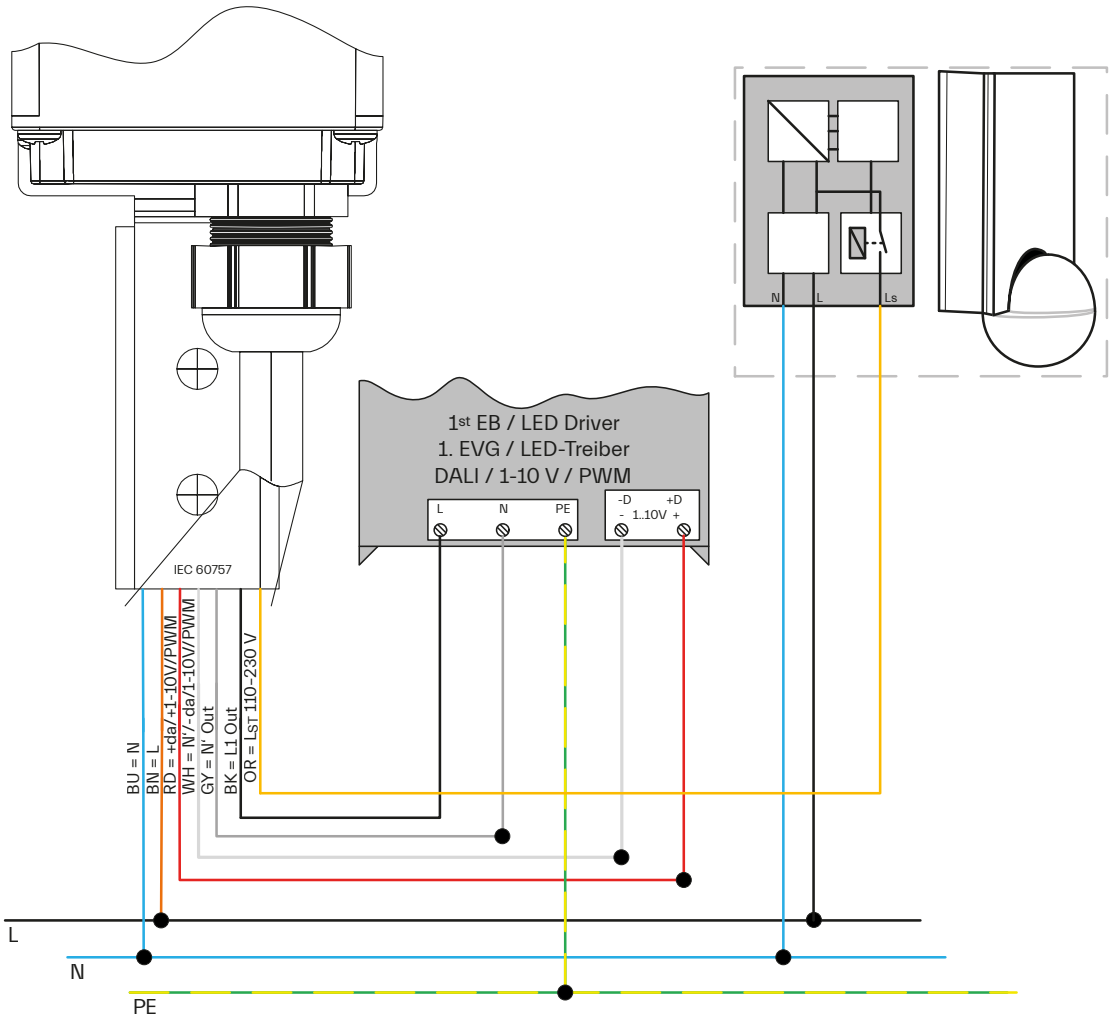
The L_{ST} input is designed for 230 V AC. Different functions can be used depending on the given configuration. When using a motion sensor, the lighting period can be defined in the controller. If motion is detected again during this period of time, the lighting period will restart for the specified time.

iPC Leuchtencontroller

Schaltbilder

STEUERUNG ÜBER STEUEREINGANG L_{ST} MITTELS BEWEGUNGSMELDER ODER STEUERKABEL

Der L_{ST}-Eingang ist für 230 V AC ausgelegt. Je nach gewählter Konfiguration lassen sich unterschiedliche Funktionen realisieren. Die Beleuchtungszeit bei Verwendung eines Bewegungsmelders kann im Controller definiert werden. Wenn während dieser Beleuchtungszeit eine neue Bewegung detektiert wird, verlängert sich die Beleuchtungszeit erneut um den eingestellten Wert.



iPC Luminaire Controller

Sales Text

Network-capable, multifunctional, intelligent built-in pole controller featuring powerline communication, stand-alone functionality and an optionally available audio frequency ripple control receiver that is suitable for street lighting, lighting in the vicinity of buildings and industrial (high-bay) lighting. The iPC enables control of luminaires operated with standard electromagnetic ballasts (CB, CB ECO) as well as electronic operating devices (EB, LED driver) with a 1-10 V, PWM or a DALI interface. The controller permits control of luminaires if connected to a switched lighting or mains cable. All kinds of sensor can be used with the universal control input. Ballasts with a DALI interface are addressed using a broadcast command, which removes the need for commissioning the electronic ballast. The controller is configurable and updateable. Key parameter values such as voltage, current, output, energy and lighting hours are captured for transfer to a central control point for evaluation. When the controller is operated in stand-alone mode, it is possible to set 10 switching times that are derived on the basis of the daily operating period; individual dimming sequences and dimming levels can be set for each of these 10 switching times. When used in areas outside of pedestrian crossings, this special configuration makes it possible to delay or bring forward the point in time when luminaires are switched on/off. Time offset, dimming sequences as well as dimming levels can be freely defined. The 230 V AC control input permits the superimposed use of up to 10 time-dependent dimming levels and dimming sequences. Furthermore, when used in sensor mode, the holding time for motion sensors can be freely and retriggerably defined.

Text for Invitation to Tender

Powerline-capable controller for integration into poles, available with an optional audio frequency ripple control receiver. The iPC enables control of luminaires in street lighting and lighting in the vicinity of buildings that are operated using a switched lighting cable or an unswitched mains cable in combination with a sensor or a control line. Data transfer is undertaken in accordance with the standards ANSI/CEA (709.1, 709.2) and EN (14908–1, 14908–3). The controller communicates using the OLC-LonMark® profile. In line with the LON philosophy and the OLC LonMark® definition, the controller is equipped with the requisite applications to enable control as well as calculation of data and limit values. Luminaires operated with a magnetic ballast, optionally with a power reduction relay, or with an electronic ballast with a 1-10 V, PWM or DALI control input can be connected and addressed. Used as a bus master during DALI operation, commands are transmitted to electronic ballasts in broadcast mode. The pole built-in luminaire controller 187207 features a switched output that makes it possible to turn a luminaire of up to 4 A on/off. The version 187208 comes with two switching outputs and a maximum capacity of 4 A in total. In accordance with CENELEC and EN 50065–1, bi-directional LON powerline communication is effected using the C band (115–135 kHz) for primary communications and the B band (95–115 kHz) for secondary communications. Optionally (configured) individual electronic ballasts can also be addressed via an allocated short address. The controller is suitable for ballasts fitted with a galvanically isolated input, but that lose their basic electrical isolation when connected to the controller.

Synchronisable real-time clock. Interoperable software interface, use of network variables and configuration parameters in acc. with LonMark®, control and monitoring parameters: switching on and off, power reduction/dimming, lighting hours, input voltage, current to the ballast/electronic ballast, phase shift cos(phi), calculated power uptake and energy consumption. Configuration and monitoring of limit values for voltage, current, capacitor effect (only with magnetic ballasts). Optionally extendable current measuring range via externally calibrated current converters in steps of 10 A to 100 A. The decline in luminous flux over the lamp's service life can be compensated. Start and end values as well lamp service life values can be freely configured. For new lamps, the entire superimposed dimming function can be switched off in a lamp- and lighting-hour-dependent manner.

During optional stand-alone operation, the dimming level is automatically calculated and tracked, which enables energy-optimised operation via the lamp's lighting hours as well as by adjusting over-dimensioned luminaires to suit specific lighting tasks. When in operating mode, the controller can be connected to a switched lighting cable or an unswitched network cable in combination with a sensor or a control line. Given typical use when connected to a switched lighting cable, the controller "learns" what time it is by itself based on the periods of time it was switched on during the first three days of operation; the detected time of day is then used to derive the real-life switching times. Up to 10 freely configurable times of day are available for setting the EB's dimming values. The switching status of the relay, the dimming value and the dimming sequence is individually configurable on the basis of the time set in the parameters section. The 230 V AC control input can be used to influence the internally calculated switching and dimming function. The control input initiates up to 10 timers that exert superimposed control over the sequence of the relay's switching status, the dimming value as well as the dimming sequence. Per timer, the switching status of the relay, dimming value and dimming sequence can be individually configured.

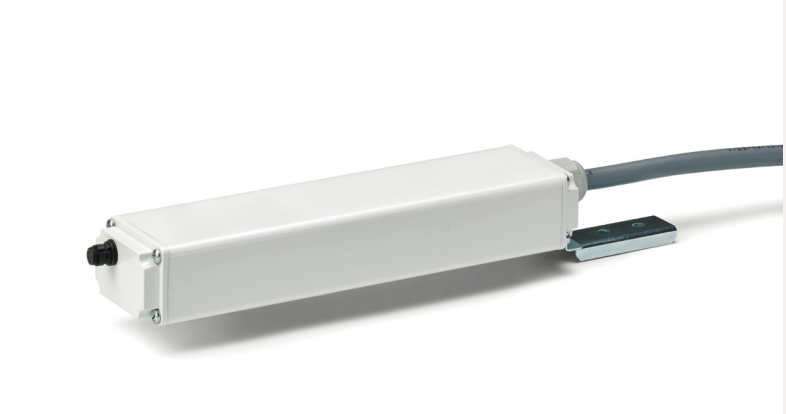
Electrical specifications: mains voltage 110–230 V AC (±10%), mains frequency 50/60 Hz, nominal current max. 4 A, power consumption 1 W (standby) / 3 W (transmission mode), surge voltage protection 4 kV / 1.2 / 50 in acc. with EN 61547. Measuring accuracy: voltage U_{eff}, current I_{eff}, output P_{eff}, upwards of 1% in acc. with upper range value, energy kWh better than 1%, temperature, phase shift cos(phi) ≤ 0.02°. Climatic conditions: operating temperature -25 °C to +80 °C, storage temperature -25 °C to +85 °C. Polycarbonate plastic casing, dimensions (W/H/D) 60 mm / 228 mm / 38 mm, weight 400 g, degree of protection IP65.

iPC-HD

iNTELLIGENT LUMINAIRE CONTROL WITH HIGH-SPEED COMMUNICATION

Developed for the use in street lighting and lighting in the vicinity of buildings, the iPC-HD operates with a standardised high-definition powerline for communication purposes and enables control of electronic operating devices fitted with a 1–10 V, PWM or DALI interface and the usage of devices with ethernet-connector via TCP/UDP/IP, like CCTVs, voice guidance systems, emergency products, advertising panels, support for WiFi access points etc.

Individually programmable and updateable, the controller provides all the functions of a modern light management system and thus ensures a high degree of investment protection. It offers the wide range of Smart City applications for the future.



FURTHER ADVANTAGES

- ✓ Interoperable luminaire controller in acc. with the OLC LonMark® profile
- ✓ High-definition powerline communication using the broadband between 2 and 28 MHz
- ✓ Power consumption: ~3 W
- ✓ High precision measurement of voltage, current, power factor, output, energy, temperature, lighting hours with very high accuracy
- ✓ Connection of various sensors such as motion sensors, key switches and light sensors
- ✓ High-speed communication up to 240 Mbit/s including 2.5 Mbit independent LON channel
- ✓ Up to 10 self-organised repeaters to overcome large distances for communication
- ✓ 5 years warranty

TYPICAL APPLICATIONS

- ✓ Street lighting and lighting in the vicinity of buildings
- ✓ Car parks, bus stops and railway stations
- ✓ Company premises, warehouses
- ✓ Sports facilities
- ✓ For Smart City applications the benefit of IP and LON communication can be used

Efficient tech
for intelligent cities

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Tannenwaldallee 2
61348 Bad Homburg, Germany
info@icititech.com

iPC-HD Luminaire Controller

Technical Details

Electronic Luminaire Controller 187211	
Type	iPC-HD
Input voltage	85–305 V AC
Mains frequency	50/60 Hz
Power consumption	~ 3 W
Communication	Via high-definition powerline in acc. with CENELEC 50561–1 / IEEE 1901
Band	2–28 MHz
Coding	OFDM
Data transfer (USA)	ANSI/CEA 709.1, ANSI/CEA 709.8
Data transfer (Europe)	EN 14908–1, EN 14908–8
Galvanic isolation	Isolation of control outputs for 1–10 V / PWM / DALI operating device
Switching current / cycles	10 A resistive load → 100,000 switching cycles 6 A PF = 0.7 inductive load → 15,000 switching cycles 2.5 A PF = 1 LED driver → 25,000 switching cycles For any further load please ask for support
Programmable	Yes
Configurable parameters	Yes
High-voltage control input	230 V AC
Switching output luminaire	2 x for connecting several luminaires
Control output electronic operating device	DALI / 1–10 V / PWM: short-circuit-proof, suitable for respective ballasts, DALI bus master interface for max. 4 ballasts
Connection cable	1 mm², length: 900 mm
Conductor type of the connection terminals	Stranded with ferrule bare end of core
Firmware update / parameter configuration	Via high-definition powerline
Control and monitoring parameters	Switch on and off / power reduction
Capture of measured data	Voltage, current, power factor, output, energy, temperature, lighting hours with an accuracy of better than 1%
Software interface	Interoperable in acc. with the LonMark® OLC profile, use of network variables and configuration parameters, repeatable
Operating temperature range tc	-25 to +70 °C
Storage temperature range	-25 to +85 °C
Humidity	90% non-condensing
Surge voltage protection	4 kV / 1.2 / 50; acc. to EN 61547
Degree of protection	IP65
Casing material	PC
Dimensions (WxHxD)	60 x 300 x 38 mm
Weight	400 g
Country of origin	Made in Serbia
Custom tariff number	8543 7090

iPC-HD Leuchtencontroller

Technische Daten

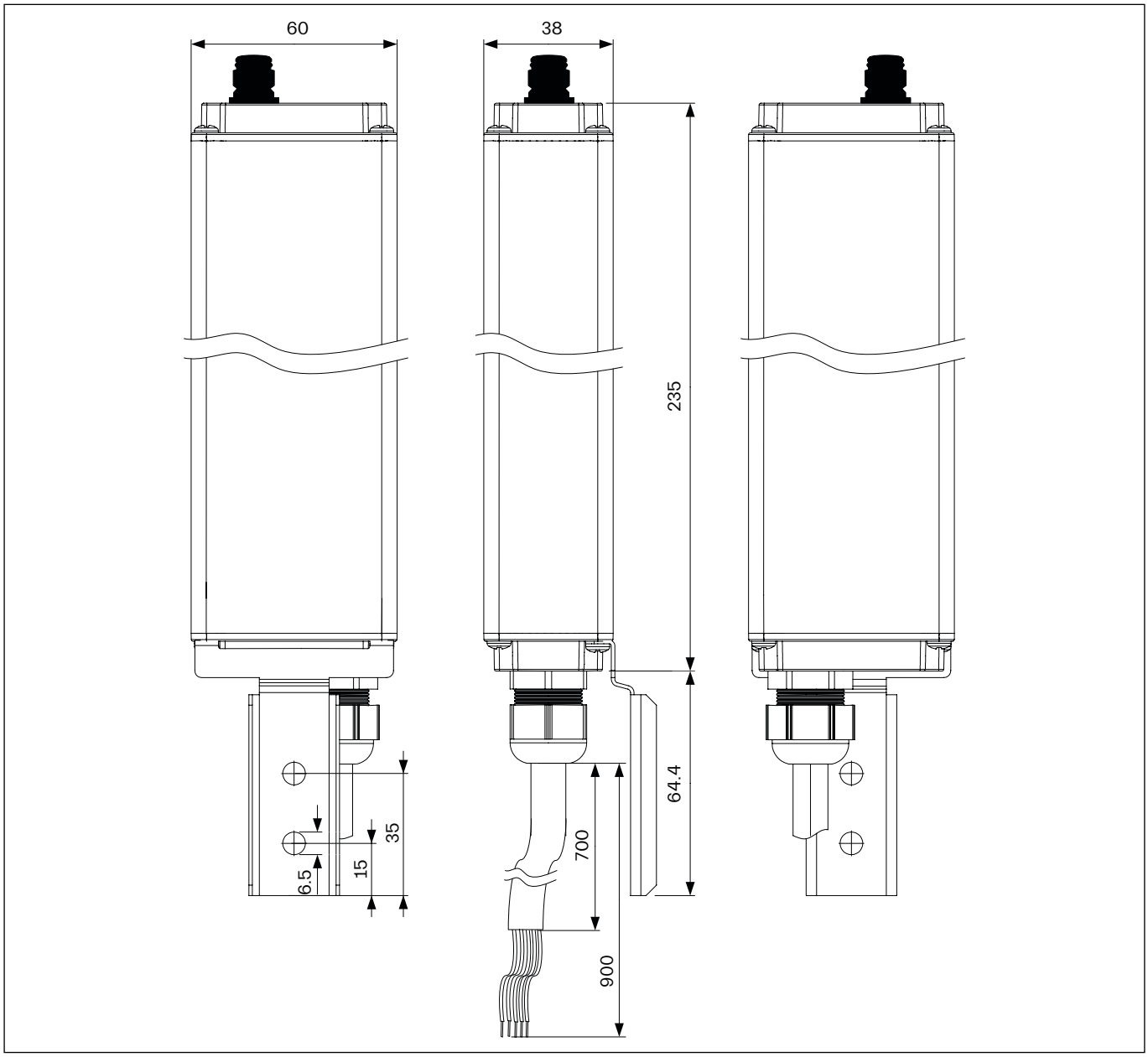
Elektronischer Leuchtencontroller 187211	
Typ	iPC-HD
Eingangsspannung	85–305 V AC
Netzfrequenz	50/60 Hz
Leistungsaufnahme	~ 3 W
Kommunikation	Über High-Definition-Powerline gemäß CENELEC 50561–1 / IEEE 1901
Band	2–28 MHz
Kodierung	OFDM
Datentransfer (USA)	ANSI/CEA 709.1, ANSI/CEA 709.8
Datentransfer (Europa)	EN 14908–1, EN 14908–8
Galvanische Trennung	Isolierung der Steuerausgänge für 1–10 V- / PWM- / DALI-Betriebsgerät
Schaltstrom / Schaltzyklen	10 A ohmsche Last → 100.000 Schaltzyklen 6 A PF = 0,7 induktive Last → 15.000 Schaltzyklen 2,5 A PF = 1 LED-Treiber → 25.000 Schaltzyklen Für andere Lasten bitten wir um Anfrage
Programmierbar	Ja
Konfigurierbare Parameter	Ja
Hochvoltsteuereingang	230 V AC
Leuchte mit Schaltausgang	2 x zum Anschluss mehrerer Leuchten
Steuerausgang elektronisches Betriebsgerät	DALI / 1–10 V / PWM: kurzschlussfest, geeignet für entsprechende Vorschaltgeräte, DALI-Bus-Master-Schnittstelle für max. 4 Vorschaltgeräte
Anschlusskabel	1 mm², Länge: 900 mm
Leitertyp der Anschlussklemmen	Mehrdrähtig mit Aderendhülsen
Firmware-Aktualisierung / Parameter-Konfiguration	Über High-Definition-Powerline
Steuer- und Überwachungsparameter	Ein- und Ausschalten / Leistungsreduzierung
Erfassung von Messdaten	Spannung, Strom, Leistungsfaktor, Leistung, Energie, Temperatur, Beleuchtungsstunden mit einer Genauigkeit von besser als 1 %
Software-Schnittstelle	Kompatibel mit dem LonMark®-OLC-Profil, Verwendung von Netzwerkvariablen und Konfigurationsparametern, wiederholbar
Betriebstemperaturbereich tc	-25 bis +70 °C
Lagertemperaturbereich	-25 bis +85 °C
Luftfeuchtigkeit	90 % nicht kondensierend
Überspannungsschutz	4 kV / 1,2 / 50; gemäß EN 61547
Schutzart	IP65
Gehäusematerial	PC
Abmessungen (BxHxT)	60 x 300 x 38 mm
Gewicht	400 g
Herkunftsland	Hergestellt in Serbien
Zolltarifnummer	8543 7090

iPC-HD Luminaire Controller

iPC-HD Leuchtencontroller

Dimensions (mm)

Abmessungen (mm)



The controller is designed for built-in into the pole. The 1-10 V / PWM / DALI output of the controller enables control of max. 4 electronic operating devices to permit effective control of luminaire groups or, for instance, RGBW LED modules. The digital control input ceases to be electrically isolated as soon as an electronic ballast is connected to the controller. The configurable parameters of the applications as well as optional firmware updates ensure a high degree of investment protection. Both, OEM and customer-specific versions can be protected against unauthorised distribution with a special software key. Please contact your iciti representative for more information on this function.

Der Controller ist für den Masteinbau konzipiert. Der 1-10 V- / PWM- / DALI-Ausgang ist für die Steuerung von maximal 4 elektronische Betriebsgeräte ausgelegt, um Leuchtengruppen oder z. B. RGBW-LED-Module effektiv zu steuern. Werden elektronische Betriebsgeräte an den Controller angeschlossen, wird die Potenzialfreiheit des digitalen Steuereingangs aufgehoben. Parametrierbarkeit der Applikationen und die optionalen Firmware-Updates bieten einen hohen Investitionsschutz. Sowohl OEM als auch kundenspezifische Versionen können über einen speziellen Softwareschlüssel gegen Weitergabe geschützt werden. Für weitere Informationen zu dieser Funktion wenden Sie sich bitte an Ihren iciti-Ansprechpartner.

iPC-HD Luminaire Controller

Main Cable for Supply and Control of Driver and Sensor

CABLE ASSIGNMENT SUPPLY SIDE

According to IEC 60757

Colour	Abbreviations		IEC 60757	Configuration	Special features for 187211
Black	SW	sw	BK	L1 Out	
Brown	BR	br	BN	L IN	
Red	RT	rt	RD	+CTRL Out	+ (1-10 V/DALI/ PWM)
Orange	OR	or	OR	LST 110...230 V	Shrinking
Blue	BL	bl	BU	N IN	
Grey	GR	gr	GY	N' Out	
White	WS	ws	WH	-CTRL Out	- (1-10 V/DALI/ PWM)
Pink	RS	rs	PK	L2 Out	Shrinking

IEC = International Electrotechnical Commission

Preassambled cable 10 x 1 mm², oilflex-sheathed cable classic 100, ferrule on bare end of core on connection side.

iPC-HD Leuchtencontroller

Hauptkabel für die Versorgung und Steuerung von Treiber und Sensor

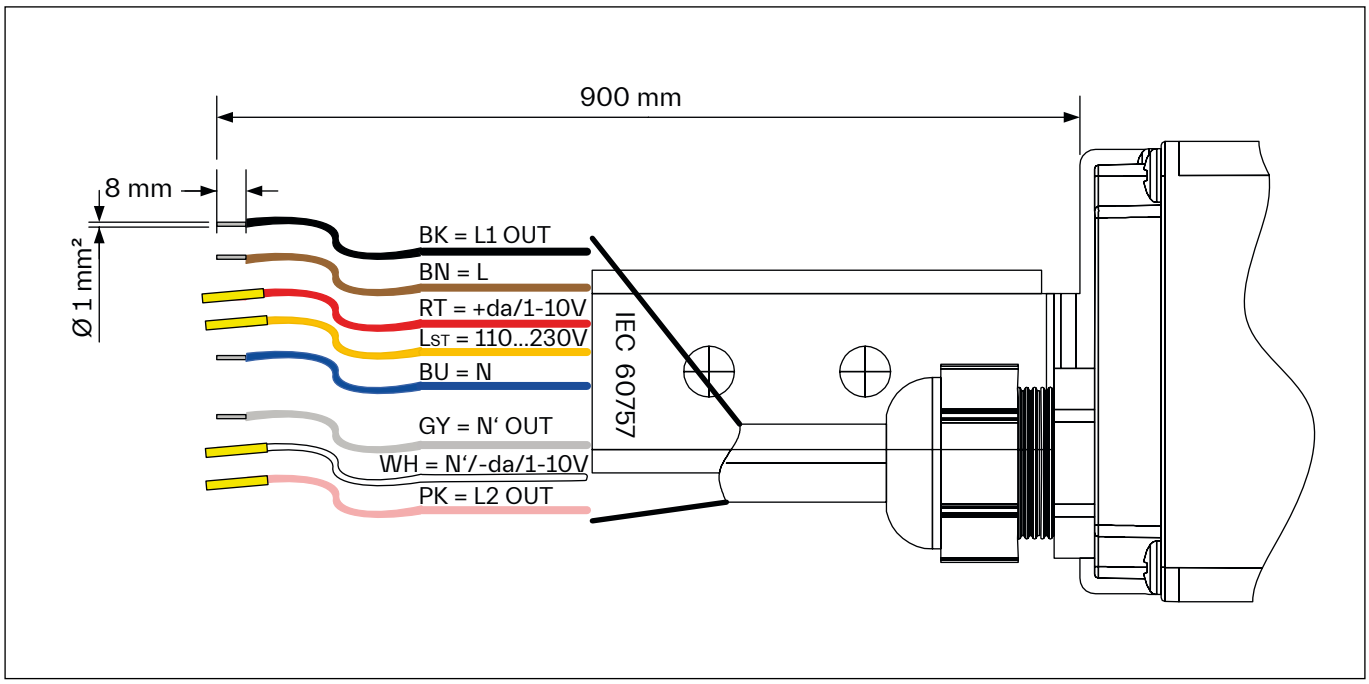
KABELZUORDNUNG ANSCHLUSS VERSORGUNGSSEITE

Gemäß IEC 60757

Farbe	Abkürzungen		IEC 60757	Belegung	Besonderheiten für 187211
Schwarz	SW	sw	BK	L1 Out	
Braun	BR	br	BN	L IN	
Rot	RT	rt	RD	+CTRL Out	+ (1-10 V/DALI/ PWM)
Orange	OR	or	OR	LST 110...230 V	abgeschrumpft
Blau	BL	bl	BU	N IN	
Grau	GR	gr	GY	N' Out	
Weiß	WS	ws	WH	-CTRL Out	- (1-10 V/DALI/ PWM)
Rosa	RS	rs	PK	L2 Out	abgeschrumpft

IEC = International Electrotechnical Commission

Vorkonfektioniertes Kabel 10 x 1 mm², Ölflex-Mantelleitung Classic 100, anschlussseitig mit Aderendhülsen

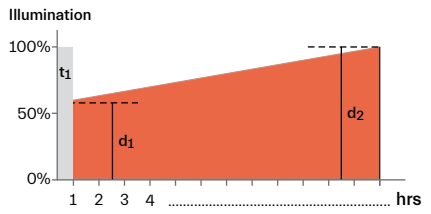


iPC-HD Luminaire Controller

Functions

MFF (Maintenance Factor Function)

Lamps age, mirrors and luminaire cover glass become dirty. This unwanted effect is compensated over the service life of the lamp to ensure a constant luminous flux. The effect can be combated by quantifying the expected decrease in luminous flux over the lamp's service life, which helps to save energy costs. This function can also be used to precisely set the luminaire to suit the lighting task if the lighting level would otherwise be too high as a result of a substitute luminaire.



t_1 Period of time during which a high pressure discharge lamp is burned in, i.e. the time during which it must not be dimmed (typically 100 hours).

t_2 Service life of the lamp expressed in x 1000 hours.

d_1 Dimming value at the time of commissioning. The set value is shown in %.

d_2 Dimming value at the end of the lamp's service life. The value is shown in %.

L_{ST} (Control input)

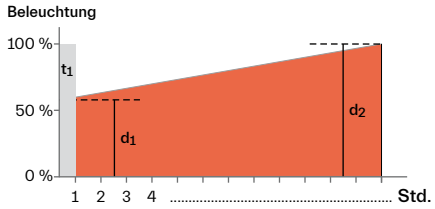
In addition, using a control input (e.g. with a push button or motions ensor) the system can be switched to a certain lighting level for a freely configurable period of time.

iPC-HD Leuchtencontroller

Funktionen

MFF (Wartungsfaktorfunktion)

Leuchtmittel altern, Spiegel sowie Gläser für die Abdeckung der Leuchte verschmutzen. Durch die Aussteuerung über die Leuchtmittellebensdauer wird diesem Prozess entgegengewirkt, so dass ein konstanter Lichtstrom generiert werden kann. Mit der Kenntnis des Lichtstromrückgangs über die Lebensdauer kann der Prozess ausgeglichen und Energiekosten eingespart werden. Gleichfalls ist mit dieser Funktion auch die genaue Einstellung der Leuchte auf die Beleuchtungsaufgabe möglich, wenn ansonsten eine Überdimensionierung aufgrund des Leuchtenersatzes der Fall wäre.



t1 Zeitdauer, innerhalb derer eine Hochdruck-Entladungslampe eingebrannt wird, d. h. nicht gedimmt werden darf (typischerweise 100 Stunden).

t2 Lebensdauer des Leuchtmittels in n x 1000 Stunden angegeben.

d1 Dimmwert zum Zeitpunkt der Inbetriebnahme. Der eingestellte Wert wird in % angegeben.

d2 Dimmwert zum Lebensdauerende des Leuchtmittels. Der Wert wird in % angegeben.

L_{ST} (Steuereingang)

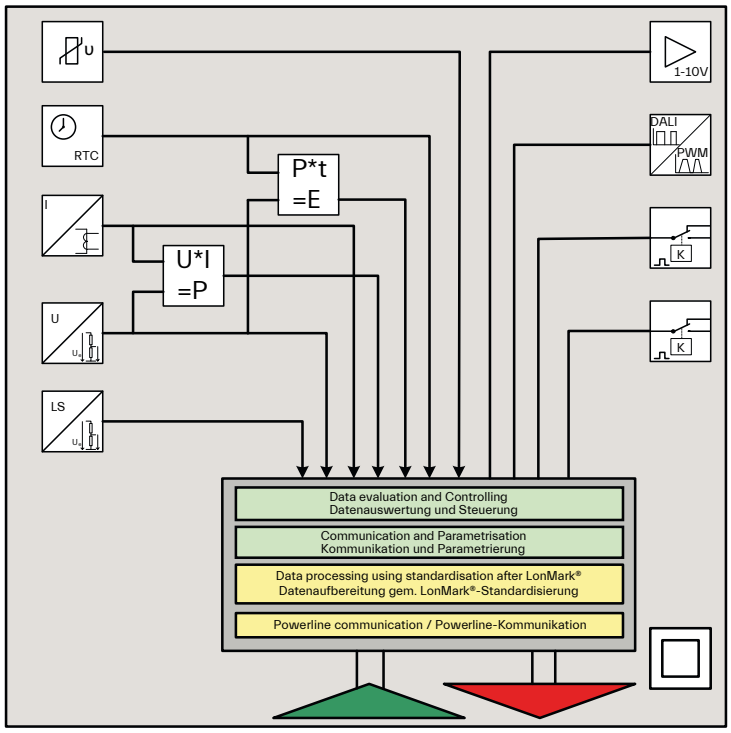
Zusätzlich kann über einen Steuereingang (z. B. mit einem Taster oder Bewegungsmelder) für eine frei einstellbare Zeit auf ein bestimmtes Beleuchtungsniveau geschaltet werden.

iPC-HD Luminaire Controller

Configuration and Graphic User Interface

iPC-HD Leuchtencontroller

Konfiguration und Bedienoberfläche



Despite being a highly complex piece of technology, the controller's intuitive software interface makes it both user-friendly and easy to configure. The GUI enables direct configuration via the powerline.

If the controller is integrated into a light management system the parameters are configured from a central control point and lighting control is web-based online.

Trotz hoher Komplexität erhält der Anwender mit einer intuitiven Softwareoberfläche Zugang zur einfachen Bedienung und Parametrierung. Die grafische Bedienoberfläche erlaubt die direkte Konfiguration über Powerline.

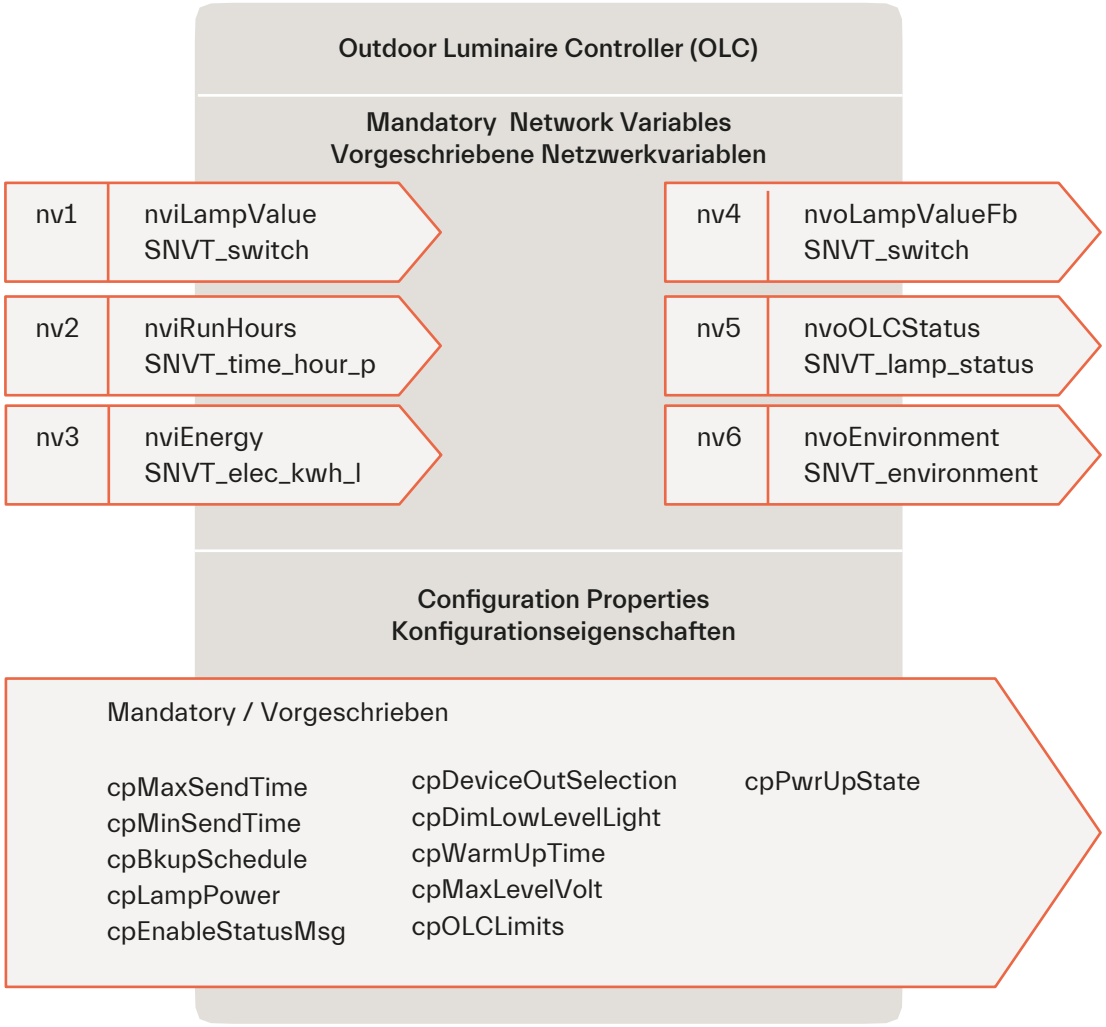
Ist der Controller in ein Lichtmanagementsystem integriert erfolgt die Parametrierung aus der Leitzentrale heraus und die Steuerung der Beleuchtung erfolgt webbasiert online.

iPC-HD Luminaire Controller

LonMark® OLC Profile

iPC-HD Leuchtencontroller

LonMark®-OLC-Profil



In accordance with the mentioned ANSI and EN specifications, the controller is fitted with an interoperable network interface, which is essential for setting up heterogeneous networks. The definition of the exact data structure for data transfer purposes is fixed in accordance with the LonMark® definition in line with the so-called OLC profile (Outdoor Luminaire Controller). Controllers that are manufactured in line with this standard, even if produced by different manufacturers, can be integrated into a common network. All communication data are completely routable to other medias like FT (Free Topology) or wireless.

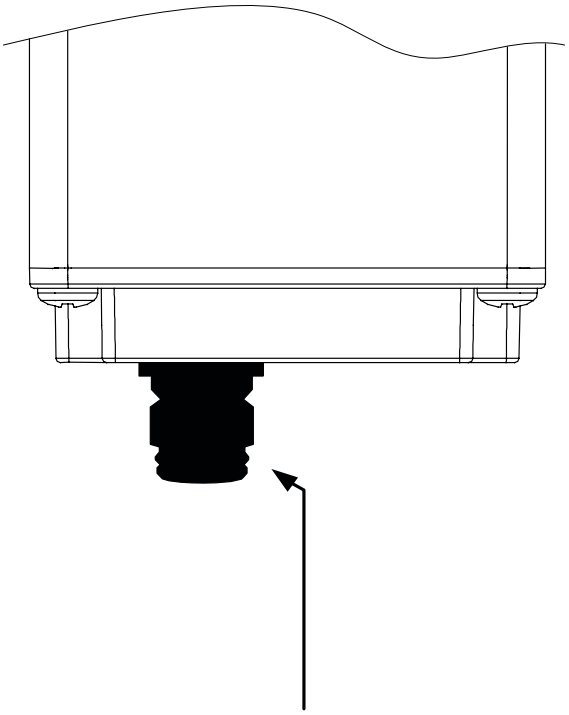
In Übereinstimmung mit den genannten ANSI- und EN-Spezifikationen ist der Controller mit einer interoperablen Netzwerkschnittstelle ausgestattet, die für den Aufbau heterogener Netzwerke unerlässlich ist. Die Definition der genauen Datenstruktur für den Datentransfer erfolgt gemäß der LonMark®-Definition in Übereinstimmung mit dem so genannten OLC-Profil (Outdoor Luminaire Controller). Nach diesem Standard hergestellte Controller, auch wenn sie von unterschiedlichen Herstellern stammen, können in ein gemeinsames Netzwerk integriert werden. Alle Kommunikationsdaten sind vollständig auf andere Medien wie FT (Freie Topologie) oder drahtlos routingfähig.

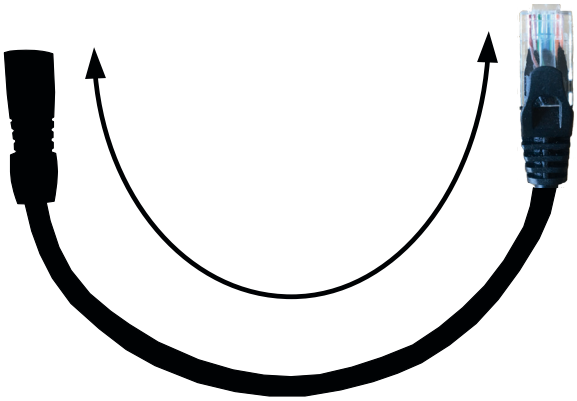
iPC-HD Luminaire Controller

IP/CAT5 Cable 100BASE-T with IP65 Protection Class as Optional Accessory

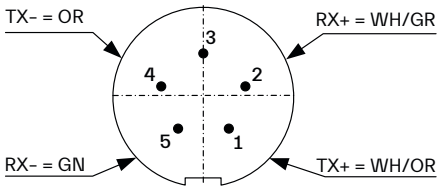
iPC-HD Leuchtencontroller

IP/CAT5-Kable 100BASE-T mit IP65-Schutzklasse als optionales Zubehör





Cable length / Kabellänge: 2 m
Ref. No. / Best.-Nr.: 186889



BINDER 620 **FEMALE**
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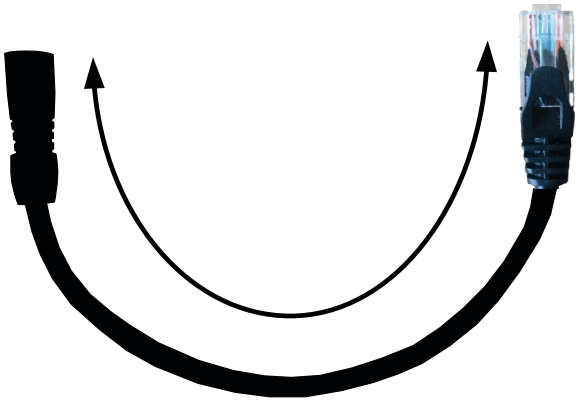
VIEW SOLDER SIDE



Cable length / Kabellänge: 7.5 m
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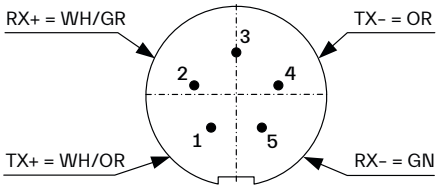

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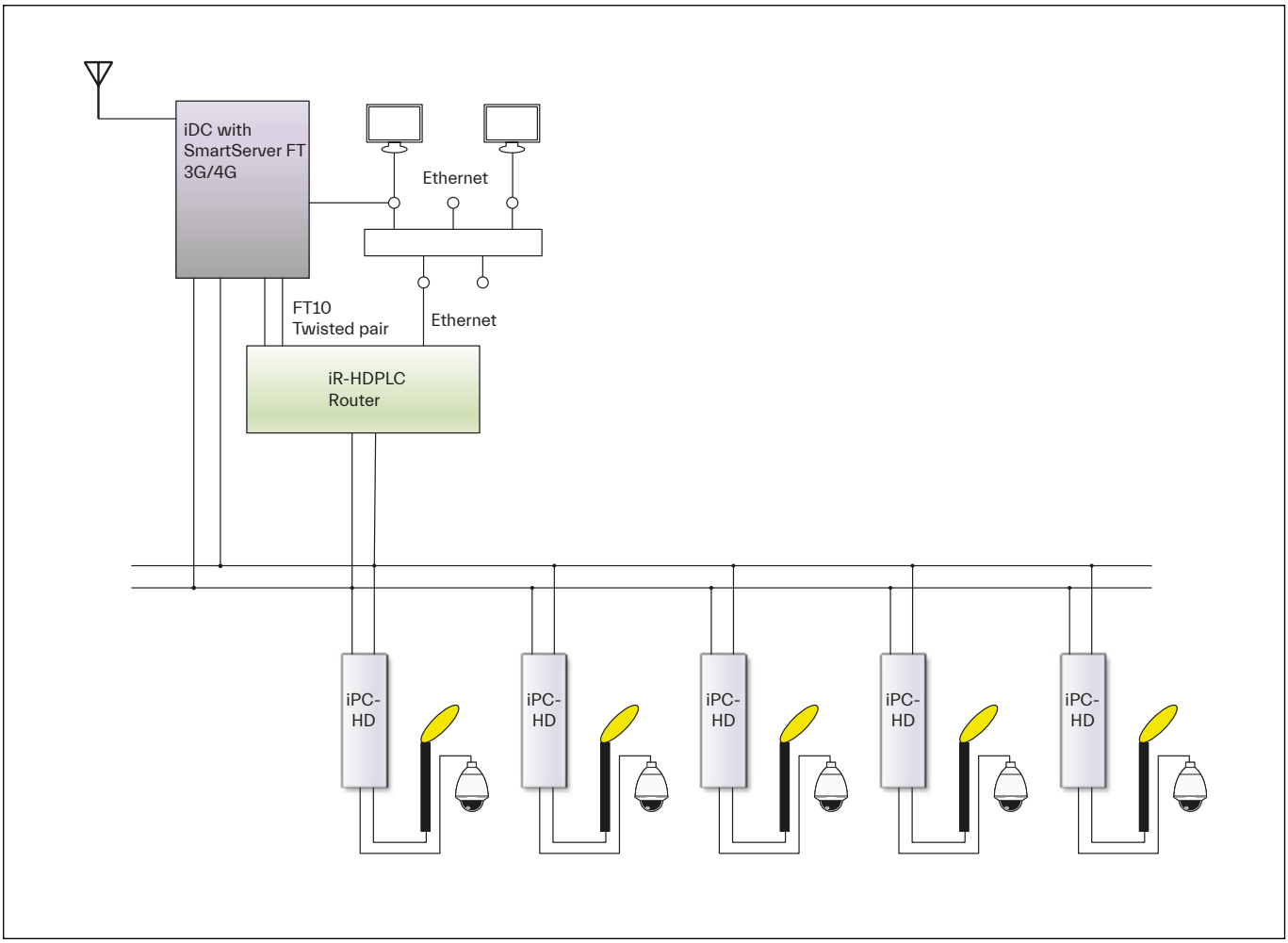
iPC-HD Luminaire Controller

Typical Application

iPC-HD Leuchtencontroller

Typische Applikation



Configuration example for a typical application using an FT router. This configuration can be realized in street lighting as well as in buildings.

In addition to the transmission of standard control signals, multimedia/IP data with large data volume can also be transmitted by using the iPC-HD controller.

Konfigurationsbeispiel für eine typische Anwendung unter Verwendung eines FT-Routers. Diese Konfiguration kann sowohl in der Straßenbeleuchtung als auch in Gebäuden realisiert werden.

Neben der Übertragung von Standard-Steuersignalen können durch die Verwendung des iPC-HD-Controllers auch Multimedia-/IP-Daten mit großen Datenmengen übertragen werden.

iPC-HD Luminaire Controller

Sales Text

Network-capable, multifunctional, intelligent built-in pole controller with high-definition powerline communication, suitable for use in street lighting, lighting in the vicinity of buildings and industrial lighting. The iPC-HD enables the control of luminaires with electronic control gears (EBs, LED drivers) with 1–10 V, PWM or DALI interface. The controller permits control of luminaires if connected to a switched lighting or mains cable. All kinds of sensor can be used with the universal control input. Ballasts with a DALI interface are addressed using a broadcast command, which removes the need for commissioning the electronic ballast. The controller is configurable and updateable. Key parameter values such as voltage, current, output, energy and lighting hours are captured for transfer to a central control point for evaluation. The 230 V AC control input permits the superimposed use of time-dependent dimming levels and dimming sequences. In sensor mode, the holding time for motion detectors can also be freely and retriggerably defined. In addition to pure lighting management, the iPC-HD offers transparent IP communication for IP/multimedia applications. A 100Base-T interface is available for connecting IP-capable components.

Text for Invitation to Tender

Powerline-capable built-in pole controller for controlling luminaires in street lighting and in the vicinity of buildings that are operated using a switched lighting cable or an unswitched mains cable in combination with a sensor or a control line as well as for transparent IP communication for IP/multimedia applications via 100Base-T interface. Data transfer is undertaken in accordance with the standards ANSI/CEA (709.1, 709.8) and EN (14908–1, 14908–8). The controller communicates using the OLC-LonMark® profile. In line with the LON philosophy and the OLC LonMark® definition, the controller is equipped with the necessary applications to enable control as well as calculation of data and limit values.

The lighting control interface supports up to 4 EBs that have a 1–10 V / PWM or DALI control input. The pole controller features two switched outputs for switching a luminaire on and off up to 4 A in total. As a bus master in DALI operation, commands are transmitted to the electronic ballasts via in broadcast mode. The bidirectional LON powerline communication is carried out according to CENELEC 50561-1 / IEEE 1901 with a bandwidth of 2–28 MHz. The strength of HD-PLC communication technology supports automatic configuration of up to 10 repeaters organised by primary and secondary master. Thus, communication distances can be bridged between controllers that would never be able to communicate with each other in a direct way.

Optionally (configured) individual electronic ballasts can also be addressed via an allocated short address.

Synchronisable real-time clock, interoperable software interface, use of network variables and configuration parameters in acc. with LonMark®.
control and monitoring parameters: switching on and off, power reduction/dimming, lighting hours, input voltage, current to the electronic ballast, phase shift cos(phi), calculated power uptake and energy consumption. Configuration and monitoring of limit values for voltage, current, power. Optionally extendable current measuring range via externally calibrated current converters in steps of 10 A to 100 A. The decline in luminous flux over the lamp's service life can be compensated. Start and end values as well lamp service life values can be freely configured. For new lamps, the entire superimposed dimming function can be switched off in a lamp- and lighting-hour-dependent manner. When in operating mode, the controller can be connected to a switched lighting cable or an unswitched network cable in combination with a sensor or a control line. The 230 V AC control input can be used to influence the internally calculated switching and dimming function. Automatic calculation and tracking of the dimming level enables energy-optimised operation over the burning time of the light source as well as adaptation of oversized luminaires to the specific lighting task.

Electrical specifications: mains voltage 85–305 V AC, mains frequency 50/60 Hz, nominal current max. 4 A, power consumption ~ 3 W, surge voltage protection 4 kV / 1.2 / 50 in acc. with EN 61547.

Measuring accuracy: voltage U_{eff}, current I_{eff}, output P_{eff}, upwards of 1% in acc. with upper range value, energy kWh better than 1%, temperature, phase shift cos(phi) ≤ 0.02°.

Climatic conditions: operating temperature -25 °C to +70 °C, storage temperature -25 °C to +85 °C.

Polycarbonate plastic casing, dimensions (W/H/D) 60 mm / 300 mm / 38 mm, weight 400 g, degree of protection IP65.