Intelligent Control Solutions for Outdoor Lighting

Product catalogue 2013
C2 SmartLight Ltd is a Finnish technology company which specialises in Intelligent Control Solutions for outdoor lighting. Head Office is based in Jyväskylä, Finland, where the company was founded in 2004. In 2011, a subsidiary company was established in Uppsala, Sweden. C2 SmartLight Ltd is a global company and is focused on the development of international networks. C2 has established strategic partnerships in Russia, Asia and in the Middle East. The aim is to build an extensive collaboration network with a range of partners, around the world. The company’s mission is to deliver innovative solutions for the management of outdoor lighting which are cost effective and ensure a positive user experience.

Table of Contents

C2 Global................................................................. 5
General Architecture of C2 SmartLight® Control Solution..... 6
Customer Benefits................................................................. 7
How it works in practice............................................................. 7
Case: ISS Service Ltd and C2............................................... 8
C2 SmartLight® Hardware Product Family.......................... 10
C2 SmartLight® Street............................................................ 10
C2 SmartLight® City............................................................... 11
C2 SmartLight® Relay Unit......................................................... 12
C2 SmartLight® Measurement Unit........................................ 12
C2 SmartLight® LUCONC Base Station.................................... 13
C2 SmartLight® General Interface Unit.................................... 13
Case: Pori Harbour............................................................... 14
C2 SmartLight® Luminaire Specific Controller....................... 16
C2 SmartLight® LUCONT IP67.................................................. 16
C2 LUCONT PCB................................................................. 17
C2 SmartLight® Complete Solution with AutoTransformer .......... 18
C2 SmartLight® Pocket-Size Control Centre............................ 19
Case: E18 Highway.............................................................. 20
C2 SmartLight® Sensors.......................................................... 22
C2 SmartLight® Light Sensor.................................................... 22
Products C2 SmartLight® Temperature Sensor....................... 23
C2 SmartLight® Software Product Family............................... 24
C2 SmartLight® Centralized Control Solution......................... 24
C2 SmartLight® Products........................................................ 26
FAQ’s..................................................................................... 26
Certificates.............................................................................. 33
Glossary.................................................................................. 34

Mauri Haapasaari
CEO
The municipality of Reykjavik is currently considering different solutions for the monitoring and maintenance of their outdoor lighting systems in order to ensure that the city takes full advantage of its lighting assets, i.e., 28,000 luminaires and 400 street light cabinets.

Consequently, C2 SmartLight, together with the consultant Verkis, introduced the C2 SmartLight City Solution to the city of Reykjavik. The Reykjavik municipality then commissioned a pilot system in order to verify the benefits of the C2 Intelligent Control System. In cooperation with Orkuveita Reykjavíkur, the local power company, the pilot system was installed at the end of October. The installation proceeded quickly and smoothly and the system was fully operational by the 29th of October. In the first two months Verkis was able to verify the actual consumption of energy per phase of the street light cabinets. In addition, Orkuveita Reykjavíkur is discovering how to take full advantage of the system in the course of their maintenance work.

C2 SmartLight® Control System is a small investment with a big effect on lifetime costs of outdoor lighting. The implementation of C2 solution provides significant benefits. Average return on investment is only 3-4 years.

For further information on how to become our partner, visit www.c2smartlight.com

Example of Lifecycle costs of outdoor lighting

| 60% Energy | Energy (~0.1€/kWh) |
| 20% Maintenance | Luminaires |
| 20% Investment | C2 Control Solution (~0.5%) | Luminaires | Poles | Cables & cabinets | Work |

Legend:
- Energy
- Luminaires
- Poles
- Cables & cabinets
- Work

Example: Lifecycle costs of outdoor lighting

- Energy: 60%
- Luminaires: 20%
- Poles: 20%
- Cables & cabinets: 5%
- Work: 5%

C2 Global

Uruguay:
- Intelligent monitoring of individual luminaires.

Moscow:
- Innovative approach to street lighting management.

Reykjavik:
- Control Solution to ensure the city takes full advantage of its lighting assets.

Helsinki:
- Effective solution for the whole metropolitan area.

Dubai:
- High-performance management of lighting infrastructure.

Shanghai:
- Precise optimization of illumination and management.

Singapore:
- Reduction of energy consumption at required illumination.

Uppsala:
- Europe’s best practice for street light control.

London:
- Intelligent monitoring of individual luminaires.

Moscow:
- Innovative approach to street lighting management.

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General Architecture of C2 SmartLight® Control Solution

C2 SmartLight® control solution is a centralized system with secured data communication channels. The user defines the parameters and the schedule of operation of the luminaires via user interface. The commands are transferred via a secured GSM network to C2 control units installed in electrical cabinets on site. C2 control units measure energy consumption and the level of ambient illumination. The measured values are stored in a system database and can be accessed at any time.

The control units communicate with luminaire specific controllers and light sensors via RF and PLC creating an independent local network. In case of GSM connection failure, lights are automatically turned on/off based on the level of ambient illumination. The main feature of the C2 SmartLight® control solution is that the system management and the equipment located on site can work independently. The luminaires operate according to a predetermined schedule and/or according to the real-time ambient illumination level measured by C2 Light sensors, despite any connection failures to the server.

Customer Benefits

- Energy savings
- Reduced carbon emissions and less bulb waste
- Measurement of consumption
- Measuring energy consumption per lamp
- Fast Return on investment
- Scalable and modular control units, so customer can buy just the modules needed ➔ competitive pricing
- Savings in maintenance costs
- Full service model with SLA
- Easy to use, control and follow-up by office PC or mobile phone
- Turnkey projects and easy to take in use
- Energy savings
- Reduced carbon emissions and less bulb waste
- Measurement of consumption
- Measuring energy consumption per lamp
- Improved street light quality
- Quality and security
- Reliable, 3rd generation product
- Tested concept
- Variety of references

How it works in practice:

Reliability of measurements:
- Several places of brightness measurement to minimize measurement error
- Each user group has the capability to set parameters to meet their requirements

Control of the lights according to brightness:
- Optimization of schedule, when lights should be turned on and off for each control area separately, due to time, brightness levels, weather conditions, and traffic volume (optional).

Energy Savings at optimal brightness level:
- Turn off specific phase ➔ 1/3 or 2/3 of the fixtures are turned off during the quiet hours of the night
- Total blackout of quiet uninhabited areas during the night

Dimming saves money:
- According to traffic volume and weather conditions
- According to the season: possible to use longer dimming periods during snowy winters i.e. snow reflects light
- Dimming of luminaires at areas, where excessive amount of light is not needed e.g. pedestrian crossing and bus stops should be well lit, but other parts of the road can be dimmed

Maintenance savings:
- Manual control via mobile phone
- Luminaire installation: control solution calculates burning hours and the group of luminaires is changed according to real burning hours
- Easy implementation of special effects for events like Earth Hour or specific schedules for national celebrations
- Because of several light sensors, lights operate normally even if one sensor fails
ISS Service Ltd and C2
Renewing the Street Lighting of
Helsinki metropolitan area

City of Vantaa signed a 12-year-contract with ISS Service Ltd in 2011. In Vantaa, there are approx. 38,500 street lamps and 550 street light cabins out of which 80 control different kinds of parks and sports grounds. “Vantaa has practically outsourced their street light controlling to us,” says Kari Rantanen, district manager of ISS Service Ltd.

ISS selected C2 SmartLight to be their partner after a long evaluation process. ISS sold the street light control solution for Vantaa and C2 delivered the control units for ISS. C2 licensed the control software for ISS and installed it into ISS server hotel. Now ISS can provide street light Control Solution for their customers worldwide and monitor the street lights from their service centers. C2 has trained the ISS operators, as well as their local maintenance organizations to take care of all operations from installation to upgrading the Control Solution.

The companies are co-operating very closely, and C2 is ready to provide any support required by ISS. “ISS provides the first level support for their street light customers, and our technicians provide the second level support helping our partner to solve more complicated problems. Both organizations operate 24/7, so we can provide quick response for ISS customers,” says Mauri Haapasaari, CEO of C2.

In 2012 Helsinki council has been looking for a service provider of intelligent control solutions for street lighting from leading European manufacturers. As a result of careful evaluation of different systems, C2 SmartLight control solution was chosen. By 2014 about 1750 control units and 100,000 luminaire specific controllers will be implemented in the Helsinki city area. Helsinki council has signed a contract for 15 years with ISS Service Ltd. for service support of the C2 system. Therefore, 130,000 luminaires will be controlled by C2 SmartLight Control Solution in the capital area.

C2 SmartLight is searching for partners among luminaire manufacturers and maintenance service providers all around the world.
The C2 SmartLight® Hardware Product Family consists of control units for specific features and utilization purposes. The primary function of control units is to permit centralized remote control over an entire electrical line. A luminaire specific controller can be utilized to control a single luminaire separately on an electrical line.

C2 SmartLight® Street package provides versatile tools for the control, monitoring, and maintenance surveillance of outdoor lighting in industrial areas, on individual properties, and in cities. The solution can be operated remotely. The lighting infrastructure can be managed via a web-based user interface. In case of trouble, the Street Solution sends out an alarm which signifies a failure. In normal circumstances, information is sent on when and where lights are switched on, and for how long.

The modular Street product package includes basic functions but can easily be expanded with additional modules, such as supplementary relays. Consisting of three light sensors, the measuring station for the Street Solution ensures that the lights are switched on and off at the right time in all control areas.

Order Number: C2 2614101

Main Features of C2 SmartLight® Street

<table>
<thead>
<tr>
<th>Communication Signal</th>
<th>GPRS, 3G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network</td>
<td>IP network</td>
</tr>
<tr>
<td>Luminaires Types</td>
<td>All</td>
</tr>
<tr>
<td>Performance</td>
<td>1 relay, failure alarms</td>
</tr>
<tr>
<td>Load max.</td>
<td>The load is regulated by contactors in electrical cabinet</td>
</tr>
<tr>
<td>Ambient light measurement</td>
<td>1-9 light sensors</td>
</tr>
<tr>
<td>Management</td>
<td>Remote access via web-based user interface</td>
</tr>
<tr>
<td>Reporting</td>
<td>Reports history, online monitoring</td>
</tr>
<tr>
<td>Capacity</td>
<td>Relay Unit can be added to increase capacity, 3 relays per unit</td>
</tr>
</tbody>
</table>

C2 SmartLight® City package provides full light specific control, measurement, and surveillance of outdoor lighting in cities, industrial areas and ports, as well as on individual properties. Scaled to each customer's needs, modular City Solution includes modules for measurement of output and voltage. It can be equipped with required relay units or with a module for controlling individual luminaires (about luminaire specific controller see p. 16).

In addition to luminaire specific control, City Solution provides energy consumption measurement and enables anticipation of faults on the basis of measurement results. It also notifies of burnt out luminaires in safety critical locations. The user interface is clear and easy-to-use and includes map-based view of the lighting infrastructure.

Order Number: C2 2614102

Main Features of C2 SmartLight® City

<table>
<thead>
<tr>
<th>Signal Protocol</th>
<th>DALI, 1-10V DC for luminaire specific controller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Signal</td>
<td>GPRS, 3G, RF, PLC</td>
</tr>
<tr>
<td>Network</td>
<td>Zigbee, IP network</td>
</tr>
<tr>
<td>Luminaires Types</td>
<td>All</td>
</tr>
<tr>
<td>Performance</td>
<td>4-7 relays, energy measurement, failure alarms</td>
</tr>
<tr>
<td>Load max.</td>
<td>The load is regulated by contactors in electrical cabinet; 800W per controller</td>
</tr>
<tr>
<td>Control</td>
<td>Remote control via web-based user interface</td>
</tr>
<tr>
<td>Reporting</td>
<td>Online monitoring, reports history</td>
</tr>
<tr>
<td>Optional features</td>
<td>- Relay unit can be added to increase capacity, 3 relays per unit</td>
</tr>
<tr>
<td></td>
<td>Measurement unit (C2MU) can be added to increase capacity, 3 channels per unit</td>
</tr>
</tbody>
</table>
C2 Relay Unit has been designed to extend the capacity of C2 SmartLight® packages. Once the basic set of C2 Street is implemented, it is possible to upgrade the set package with additional relay units to improve the capacity. In addition, the scalable solution is suitable for dynamic customer requirements. Customer does not need to purchase a lot of equipment at one time, but to order necessary devices according to emerging needs.

C2 SmartLight® Measurement Unit has been designed for precise measurement of energy consumption. Energy consumption is a critical aspect which affects the feasibility of any network. In public lighting, it is important to know the actual amount of energy consumed. On the other hand, energy measurement allows the user to assess the feasibility of implementation of energy saving equipment. In addition, online energy measurement helps to optimize dimming schedule of HPS luminaires (for more information see p. 18). There are many facets to the C2 Measurement Unit and each customer will be able to find the best way of utilizing C2MU.

C2LUCONC Base Station has been designed for the separate management of C2LUCONT Luminaire Specific Controllers. Base station communicates with controllers via PLC and/or RF connection to set new parameters and obtain feedback data. In case of disconnection to the main server, the network operates independently according to predetermined schedule/current brightness level/astronomical clock. In case of failure of one/several Luminaire Specific Controllers, the RF signal is rerouted to deliver failure signal to C2LUCONC, which transfers messages to C2 centralized solution. The failure signal is sent concurrently via PLC.

The C2 General Interface Unit has been designed to obtain data from measurement equipment such as traffic volume measurement, movement detectors, units that determine weather conditions, light measurement, luminance measurement etc. The measurements are transferred over encrypted Extranet network to the C2 centralized solution, which can be monitored via user interface. The additional parameters can be used to optimize the amount of light required at any particular time and in any conditions. Therefore, we are able to create a comfortable environment for the public.

The C2GI Unit has been designed for use in the project for the upgrade of the E18 highway.

Main features of C2 Relay Unit
- **Capacity**: 3 relays
- **Load max.**: Load is regulated by contactors in an electrical cabinet
- **Control**: C2 Centralized Solution
- **Compatibility**: C2RU can be added to any C2 product package

Main features of C2 Measurement Unit
- **Capacity**: 3 channels measurement of energy consumption
- **Load max.**: 50 A and 100 A Measuring Transformers
- **Control**: C2 Centralized Solution
- **Compatibility**: C2MU can be added to any C2 product package

Main features of C2LUCONC Base Station
- **Capacity**: any number of C2LUCONT controllers can be connected
- **Network**: RF (Zigbee), PLC
- **Control**: C2 Centralized Solution
- **Compatibility**: C2LUCONC can be added to any C2 product package

Main features of C2 General Interface Unit
- **Interaces**: 3 x 4-20 mA DC, 1 x on/off input, 1 x I²C-Bus
- **Network**: GPRS, GSM
- **Protection Class**: IP 65
- **Devices Types**: Devices that support analogue signal interface
- **Control**: Stand-alone or connected to C2 Centralized Solution
- **Reporting**: Online reports when connected to C2 Centralized Solution
Pori Harbour
Switched to Smart Lighting

In 2009, C2's lighting control system was implemented for the port of Pori. Taking a little over a year, the project enabled environmentally friendly and intelligent lighting for the Mäntyluoto harbour area.

The most important objectives in the lighting improvement were efficient focusing of the lights, a user-friendly system, and saving of energy. The project was a challenging one, as irregular production hours in the harbour area call for flexible lighting control. "Primarily, production takes place during morning and evening shifts, but often ships are loaded and unloaded even at night," explains Kai Heinonen, the port’s operations manager.

The project began with an assessment and functionality check of the old control systems in the harbour. During installation, the old and new systems were integrated. Since the implementation, the port of Pori and C2 have been developing the lighting control application to better suit the working environment. "It is great that C2 has listened to our wishes and tailored the product to our needs. We are still continuing the development work together," Heinonen says.

Bespoke solutions

The new system enables energy savings of 10–30%, depending on how the lights are used. "These are significant savings on our scale. In the end, the amount of savings depends on us. The next goal is to get the staff committed to using the new system efficiently," Heinonen sums up.

Kai Heinonen, Operations manager of Pori Harbour

C2 control solution provides 10-30% of energy savings depending on the lighting schedule.
C2 SmartLight® Luminaire Specific Controller

C2 SmartLight has designed two versions of controllers. One controller has IP67 protection class and can be installed anywhere, whereas a PCB controller is always installed inside the cover of a luminaire.

C2 SmartLight® LUCONT IP67

C2LUCONT has been designed for installation in challenging environments and has IP67 certification. The controller is compatible with a variety of lighting technologies and supports DALI and 1-10V DC control signals. It can be utilized to control LED luminaires, electronic interface of HPS lamps and dual ballasts. The device contains two relays and is able to feed a maximum load of 800W, making it possible to control several luminaires mounted on a single pole. Due to the small size, the controller can be easily installed inside a light pole and is out of sight.

C2 LUCont PCB

C2 LUCont PCB has been designed for installation inside luminaire’s cover. The controller is compatible with any manufacturer’s luminaires, and supports DALI and 1-10V DC control signals. It can be utilized to control LED luminaires, electronic interface of HPS lamps and dual ballasts. The device contains two relays, which makes it possible to control separately two lamps inside one luminaire.

The web-based user interface enables the user to monitor the condition of the lighting network in real-time, to define the parameters of the luminaire operation, and to access the energy measurement reports. The performance reports are saved in the database throughout the lifetime of an individual controller. The performance reports can be exported in Excel format.
The key feature of the Solution of AutoTransformer integrated with C2 control units is that it allows efficient dimming of an entire line of luminaires. The online monitoring enables the user to adjust the dimming to the optimum level. Therefore, our customers are able to save energy prior to implementation of LED luminaires.

AutoTransformer is connected with C2 modules providing remote and centralized control over the lighting network. It is able to dim luminaires on a single line by reducing line voltage, which decreases energy consumption. The main concern is that because of the lower voltage at the end of the line, some luminaires may turn themselves off. In order to avoid this problem, C2 Solution provides a feedback signal of constant load measurement obtained from the end of the line. The online monitoring of load changes helps to achieve correct dimming level and avoid lights unexpectedly switching off. C2 Control Solution stabilizes the power grid.

In addition to specific features, all traditional functions of C2 Solution are supported. Main Features of C2SmartLight® Complete Solution with AutoTransformer

<table>
<thead>
<tr>
<th>Communication Signal</th>
<th>PLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network</td>
<td>Zigbee, IP-network, GPRS, 3G</td>
</tr>
<tr>
<td>Luminaires Types</td>
<td>HPS, LPS, PLC, MV, MH and mixed</td>
</tr>
<tr>
<td>Performance</td>
<td>Power grid stabilization, dimming of luminaires</td>
</tr>
<tr>
<td>Load max.</td>
<td>5 kVAR – 50 kVAR per phase</td>
</tr>
<tr>
<td>Control</td>
<td>Remote control via user interface</td>
</tr>
<tr>
<td>Reporting</td>
<td>Online monitoring, reports history, exportable in Excel format</td>
</tr>
</tbody>
</table>

Pocket-Size Control Centre has been designed as a turn-key solution for special customer needs, such as to control lighting of parks, a single street separately from the rest of the streets, and group of luminaires exceeding 800W. The Lucont controller is able to feed luminaires with the total load of more than 800W, because the load regulation is done via contactors. The implementation of Pocket-Size Control Centre requires PLC or RF connection to the base station (C2LUCONC), so that the data is exchanged at no cost.

Main Features of C2SmartLight® Pocket-Size Control Centre

<table>
<thead>
<tr>
<th>Communication Signal</th>
<th>RF, PLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network</td>
<td>Zigbee, IP-network</td>
</tr>
<tr>
<td>Protection Class</td>
<td>IP 65</td>
</tr>
<tr>
<td>Luminaires Types</td>
<td>All</td>
</tr>
<tr>
<td>Performance</td>
<td>2 relays, energy measurement of single phase</td>
</tr>
<tr>
<td>Load max.</td>
<td>The load is regulated by contactors in electrical cabinet</td>
</tr>
<tr>
<td>Control</td>
<td>Remote control via user interface OR automatic operation according to pre-defined schedule</td>
</tr>
<tr>
<td>Reporting</td>
<td>Online monitoring, history reports</td>
</tr>
</tbody>
</table>
C2 SmartLight Ltd. has signed a contract to provide luminaire specific control on E18 highway from the eastern border of Finland to the city of Kotka. E18 highway is over 50 km long and it includes about 1300 HPS luminaires with electronic ballasts, which are all controlled by using Lucont IP67 luminaire specific controllers.

C2 SmartLight control solution measures the amount of light (lx), as well as luminance (L) in six different places at highway E18. These measurements are combined with the information about traffic volume in each area, making it possible to adjust the lighting to correct level. Lights will be dimmed automatically on each area, providing that there is not a lot of traffic and the weather conditions allow it. “The control of lighting according to the traffic volume saves a lot of energy,” says sales director Petri Laitinen from C2 SmartLight Ltd.

Project requirements:
1. «Green Solution»
2. At least 35% reduction of energy consumption and maintenance costs
3. Smart wireless control over RF, GSM, 3G as well as PLC
4. Appropriate level of luminance at any time by using the dimming feature of luminaires
5. Lighting with suitable output according to the amount of traffic and the weather conditions

Control Solution provided by C2 SmartLight
1. Control modules enable line connection with up to 1 300 luminaires
2. Road can be illuminated at desired times, in the desired places, and with suitable output
3. Luminance on the road changes according to the conditions of environment and the amount of traffic
4. C2 SmartLight control units are installed into the electric cabins to turn lights on/off, measure energy and communicate with the Central Solution
5. Luminaire specific controllers Lucont IP67s are installed inside the poles

Usage and Maintenance
1. Reduces the maintenance costs
2. Alarms of broken luminaires, fuses, power failures etc.
3. Each luminaire obtains own GPS address => Easy to identify broken luminaires
4. User-friendly interface => Web-based user interface, maps, reports etc.
5. Remote control via laptop and mobile phone

The Control Solution is a small part of the total investment that significantly reduces lifecycle costs of outdoor lighting.

Highway E18 is one of C2 SmartLight’s most successful projects. The company now controls over half a million street lights in Finland.
C2 SmartLight® Sensors

C2 SmartLight® Sensors has been designed to support reliability of C2 equipment and justify operation parameters set by user via C2 Centralized Solution. C2 Sensors enable C2 units to operate independently from Centralized Solution. Sensors can be included in any C2 product package.

C2 SmartLight® Light Sensor

The implementation principles of C2 Light Sensors (C2LM) are simple and ensure reliable operation of equipment. One to nine (1 – 9) sensors are installed where equipment is operated. Each of these sensors is installed in separate control units (C2CU) at particular points where light pollution is at its minimum. Therefore, the most representative measurements can be achieved. The measured values are combined and the average value is taken as a control parameter.

Main Features of C2 Light Sensor

<table>
<thead>
<tr>
<th>Communication Signal</th>
<th>Encrypted data via cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>Pilkington Activ™ self-cleaning</td>
</tr>
<tr>
<td>Thickness of glass</td>
<td>4 mm</td>
</tr>
<tr>
<td>Measurements</td>
<td>Illumination range 0-6500 Lux</td>
</tr>
<tr>
<td>Bus</td>
<td>+5 V DC PC-Bus / cable 4 m / RJ45</td>
</tr>
<tr>
<td>Measurement range</td>
<td>0-6553 lx</td>
</tr>
<tr>
<td>Most precise lux measurement</td>
<td>0-50 lx</td>
</tr>
</tbody>
</table>

C2 SmartLight® Temperature Sensor

Temperature Sensor (C2TM) can be combined with all C2 product packages. C2 SmartLight® Temperature Sensor measures the ambient temperature.

Main Features of C2 Temperature Sensor

<table>
<thead>
<tr>
<th>Communication Signal</th>
<th>Encrypted data via cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurements</td>
<td>Temperature range -40 - +70 Celsius</td>
</tr>
<tr>
<td>Bus</td>
<td>+5 V DC PC-Bus / cable 4 m / RJ45</td>
</tr>
</tbody>
</table>
C2 SmartLight® Software
Product Family

C2 SmartLight® Centralized Control Solution provides online monitoring and adjustment of lighting parameters at all lighting points. Failure notifications are received and monitored immediately. The local network software enables the user to control lighting points locally via RF signal from a laptop or smart/mobile phone. The software features are constantly revised and updated by C2 specialists.

C2 SmartLight®
Centralized Control Solution

The C2 SmartLight® Centralized Control Solution has been designed for professional utilization in combination with a user-friendly interface and the functions of C2 software. The C2 Solution is accessed online by login via a browser interface. The main page of the Solution interface has a simple structure and easy access to the functions. The most important information can be obtained at first glance on the main page: map view of units and their status, list of units and their detailed information, groups of units, search function etc.

The summary page presents a more detailed view of the operational status of the units’ operation.

Every user receives an individual login and password for the system as well as individually defined access rights. Top-level users are able to define operation schedules and energy saving modes, solve alarms and generate system reports. The parameters of lighting points can be defined in advance and be automatically followed by the program without constant monitoring.

The failure notifications are graphically represented on the map and marked by red. A list of failure units is also generated, which contains details of the alerts. C2 Control Solution automatically sends failure notifications to the mobile phones of the maintenance personnel.

The user is able to monitor online reports about the units operation. Different parameters are available e.g. Current state, Relay state, Burning hours and Load state. The history of measurements and alarms is also available.

Illuminance measurements

1. Load state 2. Relay state 3. Energy consumption and current state

Load state    Relay state    Energy consumption and current state
### C2 SmartLight® Products

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Order number</th>
<th>Content</th>
<th>Quantity [pcs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2 SmartLight Street</td>
<td>C2 2614101</td>
<td>C2PU Power Supply Unit</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C2CU Central Unit</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C2ANT Antenna, 3m connection cable</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C2PCON Power Connector</td>
<td>1</td>
</tr>
<tr>
<td>C2 SmartLight City</td>
<td>C2 2614102</td>
<td>C2PU Power Supply Unit</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C2CU Central Unit</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C2RU Relay Unit</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C2MU Measurement Unit</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C2CuT Current Measuring Transformer</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C2ANT Antenna, 3m connection cable</td>
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<td>C2PCON Power Connector</td>
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<td>C2MCABLE Module Cable, RJ45 30cm</td>
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<td>C2 SmartLight Pocket-Size Control Centre</td>
<td>C2 2614123</td>
<td>C2 LUCONT Contacts</td>
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<td>Fuses</td>
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<td>Autotransformer</td>
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<td>C2CU Central Unit</td>
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<td>C2RU Relay Unit</td>
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<td>C2CuT Current Measuring Transformer</td>
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<td>C2MCABLE Module Cable, RJ45 30cm</td>
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<td>C2LUCONT Luminaire Specific Controller (Base Station)</td>
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<td>2.4GHz Antenna</td>
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<td>C2LUCONT Luminaire Specific Controller IP67</td>
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C2 SmartLight Street

C2 SmartLight City

C2 SmartLight Pocket-Size Control Centre

C2SmartLight® Complete Solution with Auto Transformer

Autotransformer

C2PU Power Supply Unit

C2CU Central Unit

C2RU Relay Unit

C2MU Measurement Unit

C2CuT Current Measuring Transformer

C2ANT Antenna, 3m connection cable

C2PCON Power Connector

C2MCABLE Module Cable, RJ45 30cm

C2LUCONT Luminaire Specific Controller (Base Station)

2.4GHz Antenna

C2LUCONT Luminaire Specific Controller IP67

C2LUCONT Luminaire Specific Controller (Base Station)

2.4GHz Antenna

C2LUCONT Luminaire Specific Controller IP67
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<td>C2LUCONC Luminaire Specific Controller (Base Station)</td>
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<td>2.4GHz Antenna (different versions available)</td>
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<td>C2LUCONT Luminaire Specific Controller PCB For installation inside luminaire</td>
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For extensive list of system features, please send an inquiry to sales@c2smartlight.com.
1. **Is the C2 management system a centralized control solution for outdoor lighting?**
The C2 control solution is a combination of intelligent control units and user friendly management software, which permits control of an entire lighting infrastructure from one user account.

2. **What kind of interfaces for lighting control does the luminaire specific controller have?**
The luminaire specific controllers C2Lucont IP67 and C2Lucont PCB support 1-10V DC signal and DALI for dimming of luminaires.

3. **Do I need to set the operational schedule manually and directly to the equipment at the electrical cabinet?**
The user is able to set parameters and schedule for lighting operation remotely via C2 management system and create automatic schedule operation.

4. **Is it possible to control an group of luminaires or individual luminaires separately from the network?**
The C2 control solution offers devices and packages for individual control of luminaire or group of luminaires.

5. **How will I know about failures of lighting infrastructure?**
The C2 SmartLight® solution detects faults that occur such as broken luminaires, fuse, line etc. and creates an alarm message which is sent to the management program, which automatically sends alarm information directly to the maintenance personnel or other IT solutions.

6. **Does the equipment have enough to large quantity of relays?**
The modular construction of control solution allows of adding as many relay units as needed.

7. **Is it possible to obtain information about energy consumption from each electrical cabinet or specific luminaire?**
It is possible to receive reports about energy consumption from each electrical cabinet and specific luminaire if C2Lucont IP67 or C2Lucont PCB has been connected to the luminaire.

8. **Are the data connection channels secured?**
All data transfer between units is encrypted and data exchange with the server occurs via secured VPN.

9. **Is it necessary to use luminaires from a specific manufacturer?**
The C2 control solution is compatible with luminaires of all manufacturers.

10. **What kind of communication backups do you have?**
C2 control solution supports three types of communication backup: 1) if total solution lacks communication data, it sends SMS to units which requested the data. 2) if no feedback is available, circle message is sent via GSM network (both GSM signal and direct data signal) 3) an astronomical clock operates if data is not available or parameters are not defined.
**Glossary**

1-10V DC Lighting Control Signal - 0-10V is one of the earliest and simplest electronic lighting control signaling systems. The controlled lighting should scale its output so that at 10 V, the controlled light should be at 100% of its potential output, and at 0 V it should at 0% output (i.e. "Off"). pp. 11, 16, 17, 28.

Astronomical Clock – all control units are equipped with internal astronomical clock, which is a software used to calculate real sunset and sunrise time of different seasons. Astronomical clock is used as a backup, if measured value of brightness is not available. It can also be the main control mode, for example for luminaire specific controllers, which can operate alone using astronomical clock to turn lights on and off. User can adjust +/- offset time, so lights can be turned on for example, 20 minutes after the actual real sunset. pp. 13, 17, 28.

AutoTransformer - is an electrical transformer with only one winding. AutoTransformer is able to dim whole group of luminaires by reducing voltage, while feedback solution makes sure that even last luminaire stays ON. AutoTransformers have the advantages of often being smaller, lighter, and cheaper than typical dual-winding transformers. p. 18

C2LUCONT IP67 – a luminaire specific controller in IP67 protected cover. The device includes two relays, energy measurement function, dimming function (1-10V DC, DALI), communication via RF in mesh network and/or PLC. The device is controlled via centralized management system or via mobile management in Zigbee network. It has been designed for utilization in challenging (harsh) environment. pp. 16, 19, 21, 28.

C2LUCONT PCB – a luminaire specific controller represents a printed circuit board which can be integrated with the luminaire of any manufacturer. The integration turns luminaire into intelligent device, which is able to dim, record energy consumption, and control remotely via centralized management system or via mobile management software. pp. 17, 28.

DALI (Digital Addressable Lighting Interface) – in any dimming system, the ballasts and controllers must be able to “speak” and “hear/understand” the same language. In the case of digital dimming systems, this language is either proprietary – that is unique to a particular manufacturer and, if allowed, other adopters – or an open standard: the digital addressable lighting interface protocol. DALI, originally part of Europe’s Standard 60929, has been a NEMA Standard (243-2004) in the United States since 2004. pp. 11, 16, 17, 28.

Extranet – an Extranet is a private network that uses internet protocols and the public telecommunication system, to securely share part of business information or operations with partners or customers. It uses TCP/IP, HTTP and other Internet protocols. It requires greater security: Firewalls, Digital Certificates (user authentication), Virtual Private Network and encryption serve the purpose to a larger extent. pp. 6, 13, 16, 17, 18, 19, 28.

Luminance - is a photometric measure of the luminous intensity per unit area of light travelling in a given direction. It describes the amount of light that passes through or is emitted from a particular area, and falls within a given solid angle. pp. 13, 21.

Lux [Lx] – is a unit of illuminance and luminous emittance, measuring luminous flux per unit area. It is equal to lumen per square metre. pp. 21, 22.

Mesh network – is a wireless LAN network, where each node is connected to others. A mesh network is a LAN (usually wireless), where each node is connected to many others, configured to allow connections to be re-routed around broken or blocked paths, with the signal hopping from node to node until it reaches its destination. Mesh networks are self-healing and very reliable. pp. 16, 17.

Power line communication (PLC) – power line which carries data on a conductor and is also used simultaneously for AC electric power transmission. pp. 6, 11, 13, 16, 17, 18, 19.

Zigbee - A wireless network conforms to the IEEE 802.15.4 wireless standard for low data rate networks with a maximum speed of 250 Kbps at 2.4 GHz. pp. 11, 13, 16, 17, 18, 19.