CELtek Central Management System

Technical Specification

Ingenuity at work

Charles Endirect

Charles Endirect Control+Connectivity Products

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Introduction

Charles Endirect Ltd is a leading manufacturer of electrical components and equipment principally supplied into the street lighting industry. The Company has been supplying these products to the UK and International markets since 1985.

Our experience and expertise in this field gives us the edge to manufacture and supply some of the most intelligent, high specification and robust products to the market.

Charles Endirect Ltd is an ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 Quality Accredited company with all departments in our organisation operating stringent, quality control systems resulting in products that are designed and manufactured to comply with, or exceed, the requirements of current legislation, regulations and standards. Charles Endirect is a founder member of the Highway Electrical Association (HEA), and a Premier member and supporter of the Institution of Lighting Professionals (ILP).

The CELtek, Central Management System, introduced in 2007 by Charles Endirect Ltd, allows the end user to control and monitor their street lighting and traffic sign assets, along with the facility to maximise energy efficiency.

Charles Endirect Ltd and CELtek continue to keep at the forefront of customer demands and developments of "Smart City" thinking and technologies. Through CELtek, we offer "Internet of things" (IoT) capabilities, including multi-level platform integration to other manufacturer's equipment. This has broadened the scope of application possibilities to give increased system flexibility and give the end customer greater control of their assets.

The system can achieve high cost savings, resulting in a quick return on the initial investment and through-life cost savings, while helping to deliver the highest degree of public safety and security. The whole system can be set and adjusted to meet ever-changing requirements in standards and customer lighting policies.

In order to achieve the maximum energy savings on all forms of exterior and interior lighting, it has been clear for some time that a Central Management System (CMS) is a needed. This has been promoted by the UK Lighting Board and ADEPT (formerly the CSS) as well as being deployed in many installations throughout the UK and Europe.

TALQ – The Smart Protocol. We are members of the TALQ Consortium which aims to define a globally acceptable smart city protocol for central management software to configure, control and monitor smart city device networks.

Elexon - The CELtek system has an approved Elexon metering system which enables the cost savings to be recognised and then passed back to the customer. CELtek's Elexon approval is vital and plays a key role in ensuring that real cost savings are made. Without it, output and resulting energy charges are based on UMSUG codes alone. Elexon approval ensures that energy savings result in cost savings.

Contents

Charles Endirect Ltd reserves the right to change the information in this document without prior notice.

Glossary of Terms

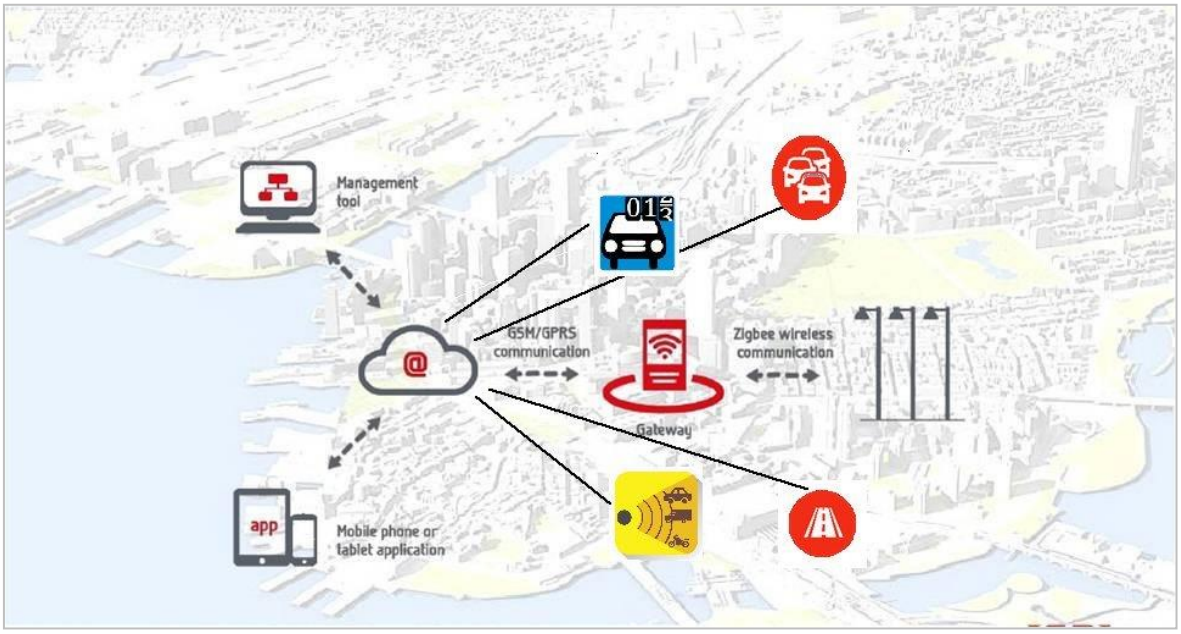
AMS	Asset Management System
API	Application Program Interface (for Software Protocols)
BSCP520	Balance and Settlement Codes for Unmetered Supplies registered in SMRS
CDM	Discharge Lamp Type - Ceramic Metal Halide
CDO	Discharge Lamp Type – Philips," Master City" Ceramic Metal Halide
CMS	Central Management System
CPO	Discharge Lamp Type - Philips" Cosmopolis" Ceramic Metal Halide
CSV	Comma Separated Values (data table imported to spreadsheet)
DALI	Digital Addressable Lighting Interface (Software Protocol)
DNO	Distribution Network Operator(s)
ENEC	European Harmonised Lamp Standard for Electronic HID Ballast
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
GPS	Global Positioning Satellite
HPS	Discharge Lamp Type - High Pressure Sodium
HTTPS	Hypertext Transfer Protocol Secure (used to transfer and request data)
IoT	Internet of Things
Java	Program language and computing platform
LCU	Lighting Control Unit
LED	Lamp Type - Light Emitting Diode
MFH	Maintenance Factor Harvesting
MoRLiCS	Motorway Road Lighting Control System (Highways England)
NSG	National Street Gazetteer
EMA	Industry standardised socket commonly used in street lighting luminaires
OPD	One Percent Dimming
OTA	Over the Air (remote access and upgrade protocol)
PDF	Portable Document Format (Secure document file)
PECU	Photo-electric Control Unit
LCU	Light Control Unit
SLA	Service & Software License Agreement
SOAP	Simple Object Access Protocol (used in web services)
SQL	A standardised form of computer language "Structured Query Language"
UMSUG	Unmetered Supply User Group (ELEXON Governing Body)
UHF	Ultra High Frequency

1. CELtek CMS Summary

- Only two components are required to run the CELtek system: a Gateway (3G/4G enabled) and Light Control Unit (LCU) either internal or external. LCUs are mounted externally or enclosed within the luminaire.
- The internal LCU can be located within the base of a column when base compartment control gear is used.
- The Gateway can be mounted on a lighting column or fitted into a feeder pillar; both options are located within IP65 rated enclosures.
- Zigbee/GSM antennas are required for the transmission and reception of data from and to Gateways.
- Additional control can be added via Digital PECU or an Analog LUX meter.
- Additional monitoring components can be added via the EX9063D Watchdog.
- No additional software is required as the system is controlled by the server using a web interface, accessed on the internet via most web browsers.
- A Zigbee based RF Mesh Network System is ideal for places where there are obstructions such as buildings and trees and where direct line of sight is not easily definable.
- Not all LCUs need to be in direct range of the Gateway as all units can communicate with each other. The range of communication between LCUs can be up to 500 meters.
- Power to the LCU can be turned off during the day to save energy and make circuits electrically safe.
- LCUs have a long-life span which equates to approximately 50,000 hours continuous operation.
- The system uses an Open Protocol (DALI) which can control either HPS, HID or LED luminaries with different ballast and drivers installed providing they are DALI marked or have been tested.
- Compatible with all type-tested electronic control gear.
- Front end user screen is easy to navigate using simple drop-down menus on a Windows based platform.
- The system can be controlled with an internet connection, by external devices such as mobile phones, notebooks and tablets.
- The system can be expanded to meet customers' requirements and have a planned rollout.
- CELtek is TALQ compliant

CELtek is fully supported by a UK based support team located at our Wincanton head office and field engineers who are available for site work when required

2. Smart Cities IoT



A "Smart City" can be defined as an urban area that uses different types of embedded electronic sensors to supply data back to centralised hubs. These communicate through back office systems, which are then used to efficiently manage assets and resources.

The system works and interfaces with other systems so that data can be passed and processed using one network.

CELtek is IoT ready and currently works with a Gully management system where all the data is gathered from the Gully node and then transferred using the CELtek Zigbee network. The data is then delivered to the correct management system where the data is analysed and worked on.

CELtek interfaces into many systems and other manufacturers equipment such as traffic counters, water meters and pumps. Currently CELtek interfaces with MoRLiCS, a Highways England system which uses a Web service to interface to monitor traffic flow. This enables the system to vary the light output in response to traffic flow, to give the correct lighting levels.

CELtek also interfaces with Pharos DMX equipment. This means that commands from Pharos can control the lights to dim to the correct light requirements for an artistic event.

A set of Web Services is available called OLAN which interface with other systems such as asset management systems, traffic management or CCTV systems.

Charles Endirect are constantly developing the system with the intent to lead from the front with Smart City Technology. The system has a number of analogue and digital inputs and outputs which makes the system versatile.

From the Gateway you can connect up to 4 analogue inputs, 4 digital inputs and 4 digital outputs. The following list shows what can currently be connected.

Analog Inputs

- Lux Meter
- Water Level Meter
- Generic Analogue in Equipment

Digital Inputs

- Inc Control Signal
- Photocell
- Power Meter
- Traffic Counter
- Stadium Switch Panel
- Contactor Feedback
- Traffic Controlled Tunnel Lights
- Door Switch
- Circuit Breaker
- Residual Current Circuit Breaker
- Ground Fault Indicator
- Surge Protection
- Auto/Manual Switch
- Other Equipment

Digital Outputs

- Lights
- Outgoing Control Signal

3. How CELtek Works

3.1 The Correct Level of Light

The principle behind the introduction of a Central Management System is to deliver the right amount of light at the appropriate time, whilst retaining the ability to increase or decrease lighting levels according to future needs. This will automatically contribute to the end user's ability to reduce their carbon footprint.

Defined lighting levels are regulated from a program on the server. This sets typical parameters such as percentage of dimming power, along with start and finish times.

The most common control parameters for control of light levels are:

- Initiation by a photocell, light meter, timer, astronomical clock (built into the server), a switch and triggers.
- Regulation of the light level determined by event timings, traffic density, motion detectors etc.
- Different levels of control and screen access are allocated to each operator and defined within the system (controlled via password access). This enables complete security and flexibility of control, with restrictions between a system manager and a maintenance contractor.
- All configurations for switching and dimming occur on the server's web-based interface and are accessed via the internet on a simple browser.

3.2 Data Acquisition

All LCUs transmit data every 10 minutes to the Gateway. Some of the data transferred will be routine with fixed data transmitted at configured intervals, while the transfer of event based data is by the change in value. In addition to the regular transmission of certain data to the server, data can also be requested as needed from the server by a user-initiated request.

3.3 Remote Monitoring

Although automatic switching and dimming of lights (all, groups or individual luminaires) is performed from the server as a pre-programmed operation, it is also possible to switch on, turn off and dim the lights from a mobile phone via SMS or application.

3.4 Data Communications

Communication between server and Gateway takes place over the GSM network using GPRS data communications. Should a failure of the GPRS network occur then the LCU will continue to operate on the last set of switching commands received.

Communication between the Gateway and an LCU is achieved by the use of radio communications. The radio technology used is Zigbee, self-healing mesh system. A standard system widely used for communication over short distances in area-based radio networks.

The system is able to communicate and integrate with a third-party system. Asset Management Systems (AMS), such as Mayrise may be a requirement in the future. The system can also be integrated with other hardware applications, such as Traffic Counters and the Highways England motorway road lighting control system "MoRLiCS".

3.5 Local Control of Lamps

The system provides several in built mechanisms to ensure that errors in communications via the server or Gateway will not cause the light to fail.

Normal Situation

In a situation where all the devices are functioning normally, new instructions are delivered from either the server or Gateway. If the control sequence is already programmed to happen at specific times, then the action is performed from the Gateway.

Error in Communication between the Server and Gateway or Server Failure

The server transmits to Gateways a daily timetable of expected and calculated lighting and switching command times for the next 7 days. If a Gateway fails to communicate with the server at the time of switching, the Gateway still performs the action of switching the lighting on and off locally.

If a Gateway is in full communication with the server, but at the time has not received the necessary command for switching the lighting, and within the configured time period, then the Gateway will perform the action of switching the lighting locally.

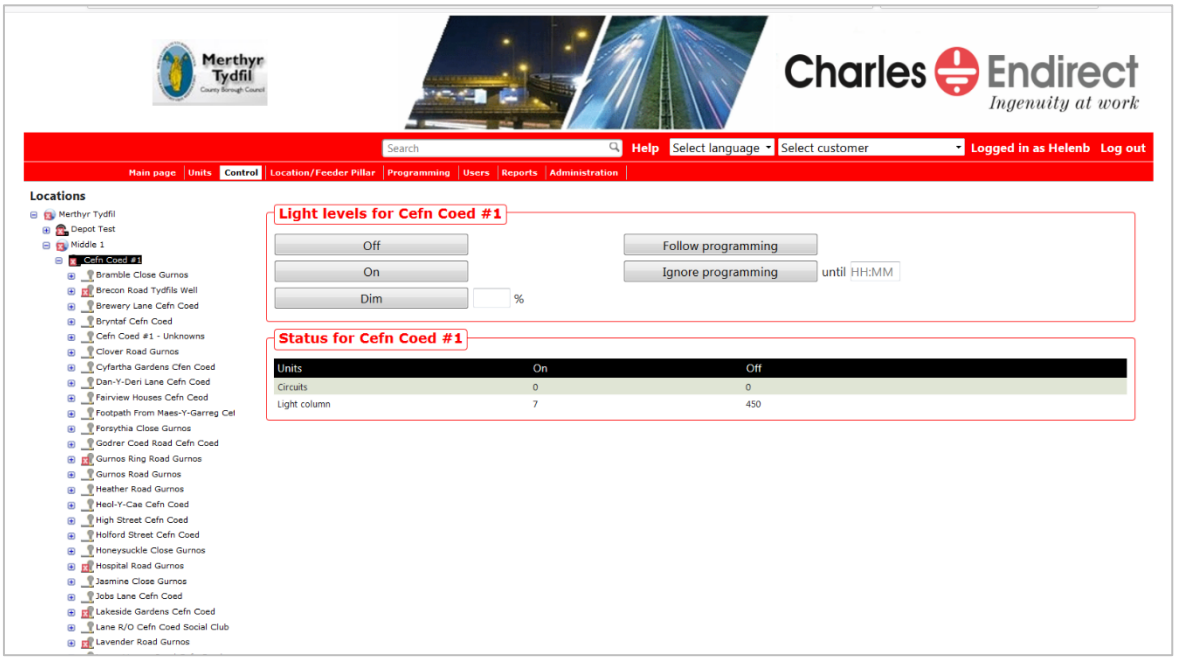
Error in Communication between the Gateway and LCU or Failure of the Gateway

The server transmits daily information about the next expected or estimated time of switching of all LCUs. However, if there is no communication between a Gateway and an LCU at the time of switching, then the LCU will perform the action locally from its previous instruction.

3.6 Functionality

Switching Lamps On

Luminaires can be switched on and off, in groups or individually. This is normally scheduled over each day of the week to allow differing levels to be set at weekends, school holidays and bank holidays if required. Switching can also be carried out from the mapping interface, (see the mapping section for more detail). The system allows for a manual override of the set switching regime at any time but this is subject to the level of authorisation given to a User. Setting of column groups of luminaires allows dynamic switching and dimming of the system, for example where a zone conflict exists or where alternative lighting levels are required.

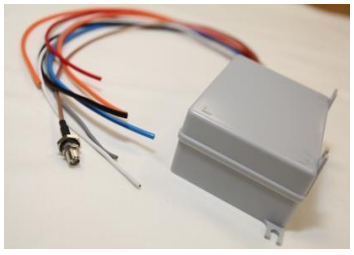


Electronic Control Gear

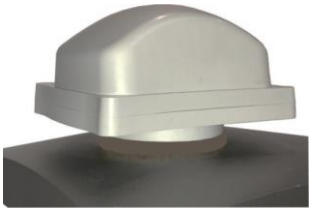
The LCU controls the electronic ballast with an interface of DALI this is and open protocol, essential to allow the control of different manufacturers' products.

GEN3 External LCU, GPS version also available

GEN3 Internal LCU



GEN3 NEMA LCU with 7 Pin NEMA Socket, GPS version also available



Zhaga External LCU

Variable Dimming Levels

Dimming is available in steps of one percent increments within the lamp's control parameters.

Burn Time

Lamp burning hours are recorded and the information about the periods of burn time can be extracted from the reports section with the drop-down menu.

Dimming Value and Other Information

Any changes in the value of dimmed light fittings are stored on the server. These can be extracted from the reports section for a specified time period.

Current dimming values are displayed at all times on the server. In addition to the dimming values, the following information is also available:

- Voltage
- Current
- Phase angle (power factor)
- Temperature
- Lamp power (wattage)
- Communication (level of quality available at the unit)

Lamp Error – Alarms

The performance of the lamp's status will be reported and compared with the expected values. For example, if a lamp draws less power than expected from the defined nominal lamp wattage and dimming level, then an alarm will be generated regarding the low power of the system. Should a lamp burn out due to power failure this will also trigger an alarm.

These active alarms will be displayed on the main page of the web application. Alarm notifications can be generated by e-mail and/or SMS to the users who subscribe to them.

Communication Failures

If communication between the Gateway and LCU or the Gateway and the server drops out it will generate an active alarm. The LCU errors will be displayed with a red icon on the map.

Power Consumption

The offset power consumption of each fixture is approved as Class B according to the standard EN 50470-3. The system is measured on each unit and includes input power to the lamp, electronic ballast and LCU.

System Voltage

System voltage (primary voltage) of all and any road lighting luminaire is available as a report and an alarm.

Software Upgrade, OTA

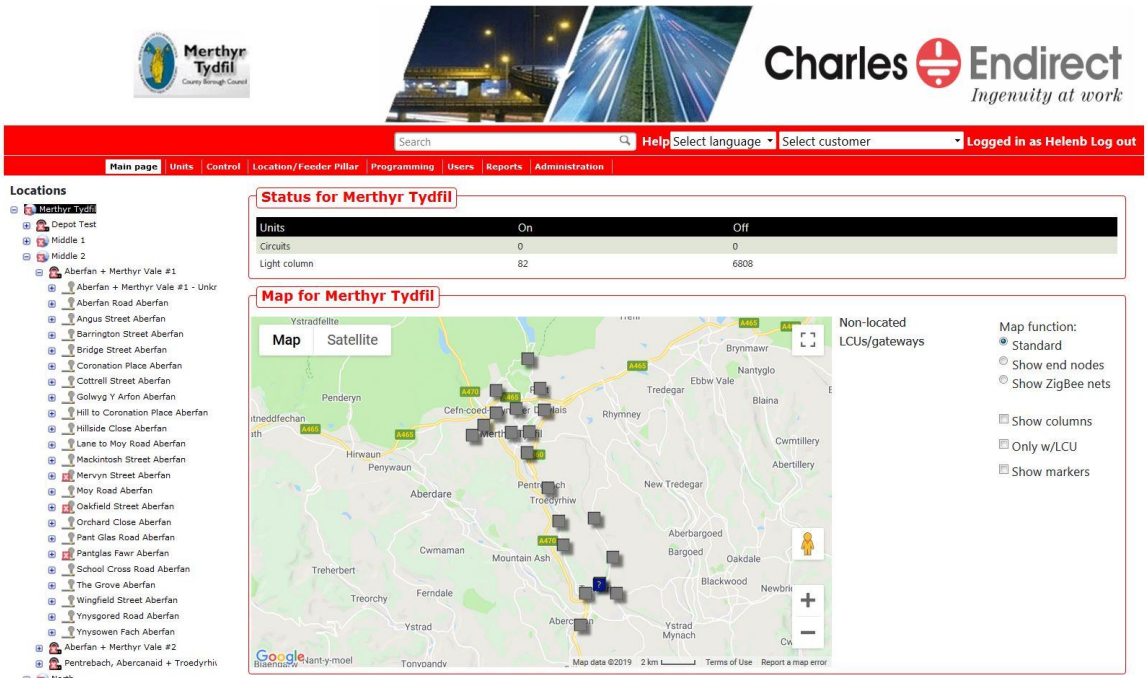
Software in the LCU can be upgraded via the radio link, (over-the-air (OTA)), this is done directly from the server. The system's Gateway(s) can be upgraded directly from the server; this allows forward and backward compatibility, making sure that systems are future proofed.

3.7 Functions and Information Available to the Operator

Monitoring and Management of Road Lighting Luminaries

The luminaires are organised in a tree structure that can be based on area, road or function and setup to meet the National Street Gazetteer (NSG) structure or entirely at the choice of the user. The operator can choose to see the fittings in the tree structure, parts of the tree structure or individual luminaries.

The operator can thus simply choose to control any part of the system based on any section from an individual luminaire up to an entire area.



Status and Dynamic Measurements

Status of the fittings and the system is also available at several locations in the system and displayed by clear graphical presentation and a list view. The standard graphical display is via Google Maps, either in satellite or map view.

Luminaires are displayed as simple coloured icons depending on the status of each luminaire on the map.

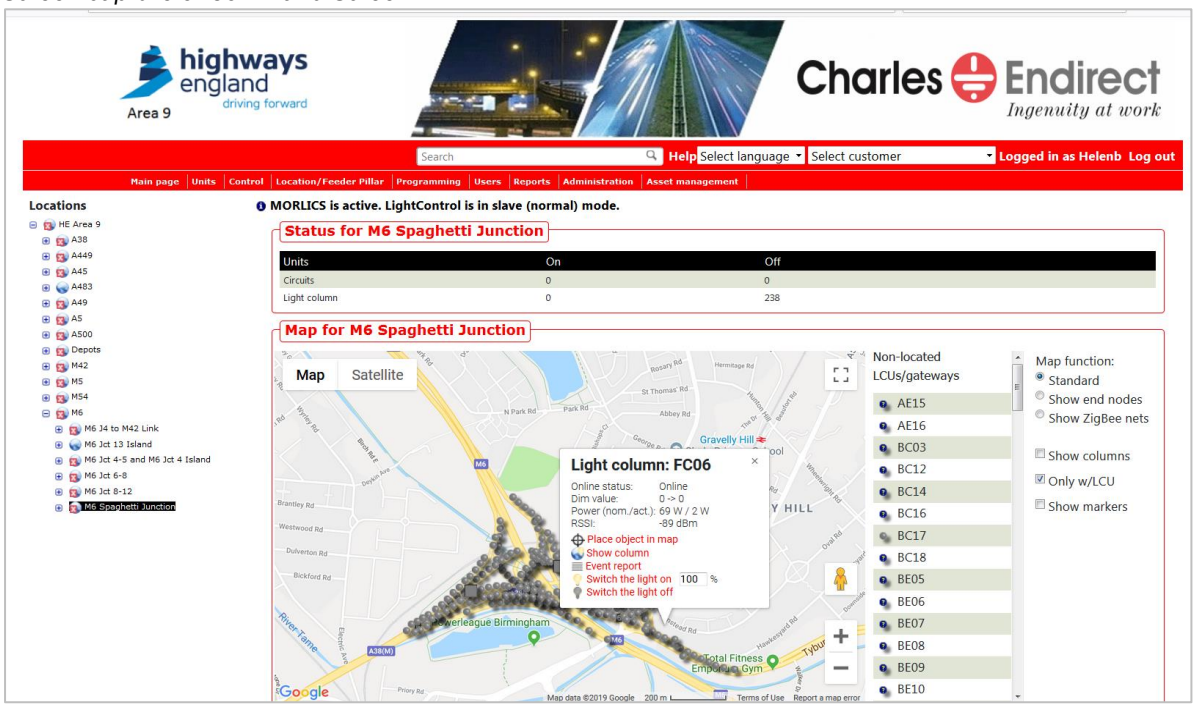
From the map, the values of the luminaire are accessed by pointing to the lamp and left clicking the mouse.

Commands and Values

From the interface panel, the operator can send any command to all the units individually, in groups or by areas.

All critical values are available from the operator interface and can be adjusted from there.

Screen capture of Command Screen

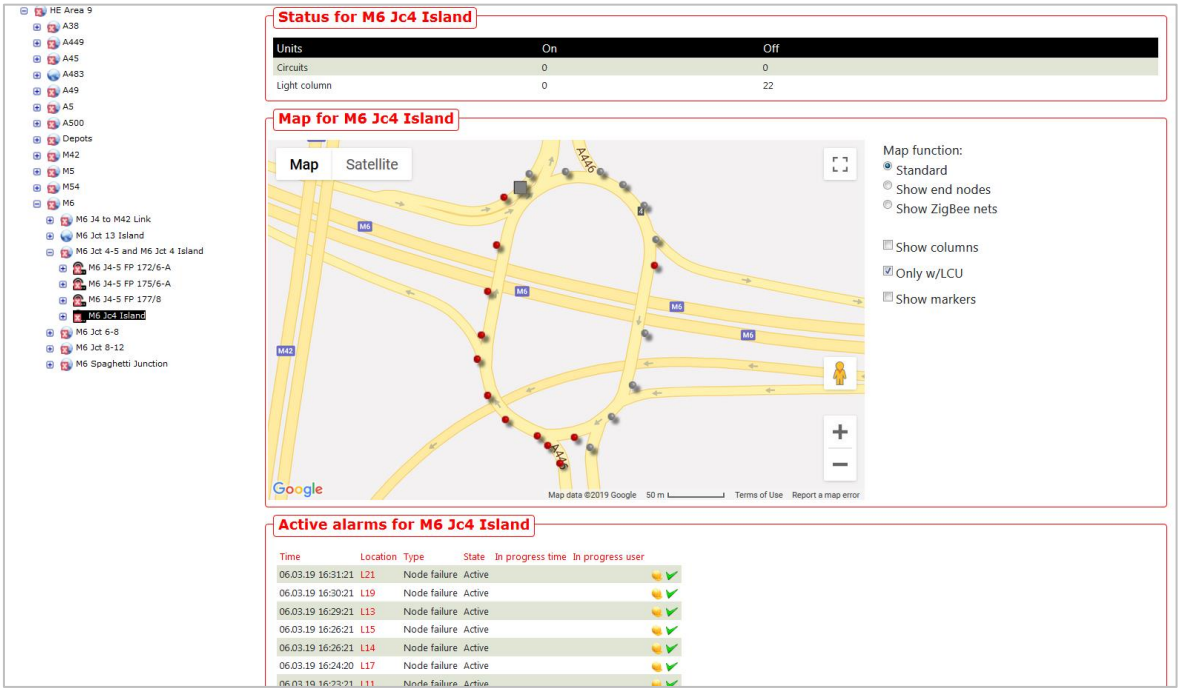


Alarm Handling

Alarms can be marked and designated so that they are assigned to a particular operator. The system can determine what alarms should be removed automatically when the error is no longer present. In most cases it will be normal that an LCU failure that indicates lost communication with the unit will automatically remove the alarm when the fault is fixed, and communication is re-established.

All alarms once cleared will be stored in the report section under Alert History. These can be accessed at any time and will show who cleared the alert.

Screen capture of Active Alarms



3.8 Access to Data

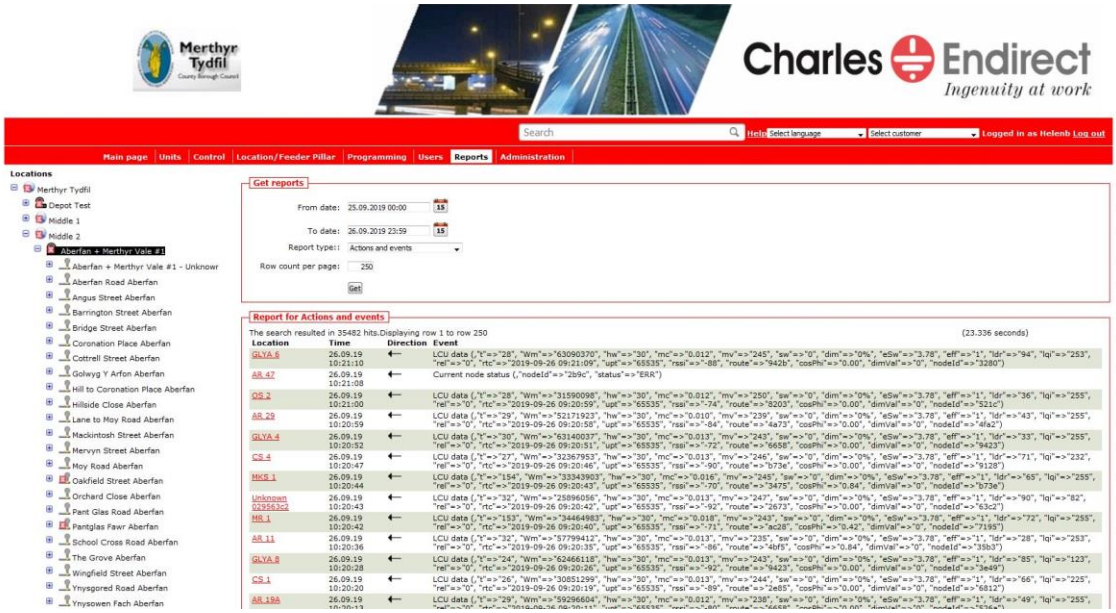
The system does not store data locally within the Gateway or LCU. If there is a need to retrieve information when maintenance crews are on-site, this can be done simply by connecting to the server with any device that has an internet connection. Access will then be available to all data and functions for control and parameter setting etc. This is carried out at the same level as the operator interface.

3.9 Organisation of Data

The system stores all data received from the LCUs in a database for later use. All alarms are time stamped and stored within the database. Receipt of specific alarms will always be treated in accordance with the rules as registered on the server for notifications or other measures.

Each LCU will transmit data every ten to fifteen minutes to the server with information on all key parameters.

Screen capture of data organisation



3.10 Inadvertent Loss of Power

All system devices will "remember" the last state or value received and will turn on and revert to their correct status once the power is re-established. If the luminaires were in light before the power was lost, the lights will be lit when the power is restored. If the day/night setting has changed during the time of the power outage and the time when the power is restored, the server will send notice of change at the first receipt of a status report from the luminaires.

There are no self-test routines or other mechanisms in the system that can lead to inadvertent switching of the light.

3.11 Electronic Energy Metering

CELtek receives information about the energy measurement from all luminaires and records it on the server. All storage, processing and reporting of energy consumption and meter readings are handled by the system.

The system is ELEXON compliant, UMSUG coded and approved for use within BSCP520, as required.

3.12 Language

All information supplied to the operator is in English.

4. CELtek CMS Hardware

4.1. Hardware Overview

CELtek has two main components to the operational system:

- Gateways (3G/4G enabled) with Zigbee/GSM antenna
- LCUs which communicate with ballasts or drivers to control the lighting.

The system can be used to turn on and off individual luminaires. Lighting units can be dimmed to the required lighting levels and be monitored for faults, present voltage, current and energy usage.

Control capability will depend on the equipment installed:

1 Magnetic ballast and non-DALI electronic ballasts and drivers can be switched and monitored but not dimmed.

2 Electronic ballasts installed on the CELtek system must be DALI compatible and approved. Ballasts can be switched and monitored, and lamps can be dimmed subject to the restrictions of the lamp type and the lamp manufacturer's limits. For example, High Pressure Sodium lamps the lowest dimming level will be 50% of light output.

3 LED drivers must be DALI. Again, the driver must be approved to DALI standards. Drivers can be switched and monitored and dimmed down to 1% light output.

All the above use the same LCU and Gateway which makes upgrading very easy from magnetic to electronic and keeps costs down on equipment.

Gateways can be used in two different types of installations:

1 A Group Switch Gateway is used on private networks, mainly on Motorway or Highways England installations. This type of installation allows for monitoring and switching of individual cable circuits and can be controlled by a LUX meter, photocell or by the use of the astronomic clock. The Gateway can also control a Zigbee network which will allow direct communication to individual columns or luminaires.

2 A Gateway fitted with a Zigbee antenna will carry out all the necessary functions to monitor and control individual luminaries using an LCU fitted to the luminaries. The Gateway can control up 800 LCUs using a Zigbee self-healing mesh network; the installation distance between each LCU can be up to 500m. The primary use of this type of system is on Direct Network Operators (DNO) supplied networks to individual columns.

4.2 Gateway Plus 3G/4G enabled

CELtek Gateway Plus 3G/4G enabled

The Gateway is a main control unit which operates within the CELtek Central Management System. The device is particularly adapted with functionality that offers specific levels in controlled lighting systems.

The Gateway can be connected to circuits that are to be controlled, and signals from specific components to be monitored such as integrity of fuses, RCD and contactor functions along with cabinet door open and water level alarms etc.

The Gateway can control road lighting and traffic signs, sports stadiums and leisure facilities, all of these facilities can be managed at the user level.

Key Features:

- ✓ Gateway controls up to 800 LCUs
- ✓ Notification of errors to the operating staff
- ✓ Can control up to 42 circuits with an expansion module
- ✓ Communicates with the server over GSM-GPRS network
- ✓ Ethernet can be used instead of GSM where the customer's own network is used
- ✓ Switching can be made by SMS from a mobile phone
- ✓ All outputs can be controlled separately and turned on and off simultaneously or at different times
- ✓ Battery back-up in case of a power failure
- ✓ IP67 Rating
- ✓ Built-in security that prevents unauthorised use
- ✓ Reading of meter and transfer of consumption every 30 minutes

Inputs and Outputs

If more inputs and outputs on a Gateway are required, then a device can be fitted with expansion modules. For special applications the number of inputs and outputs can be expanded further by using the expansion port. The Gateway can also communicate and gather data from other systems over RS-232, Ethernet or IoT.

Function:	Gateway	
	Built in	Expanded Max
Relay Outputs	4	42
Digital Input	4	12
Analog Input	4	4
Analog Output	4	4
Expansion Port	Yes	
RS232	2	

TECHNICAL DATA

Power Supply:	Min	Typical		Max		
		DC	AC			
On Board Li-ion Battery Pack		1900			mAh	
Operating Voltage AC	85	-	-	265	VAC	Fused
Operating Voltage DC	8	-	-	36	VAC	Protected against wrong polarity

Other:	
Gateway external Dimensions:	W130mm x H180mm x D60mm (excludes glands)
UMSUG Code	81 7001 0001 100
International Protection code (IP):	IP67
Standards	EN61000-6-2 EN61000-6-3
Directives	2014/53/EU (RED) CE

4.3 LCU External NEMA

CELtek Generation 3 NEMA External LCU

The CELtek LCU is a primary component used in the CELtek Central Management System. A complete CMS lighting installation consists of one or more LCUs remotely controlled through a Gateway using RF technology (*see separate data sheet).*

Key Features:

- ✓ The LCU controls streetlight ballasts and drivers using DALI or DC (1 to 10V)
- ✓ The LCU is designed to measure temperature, mains voltage, current, power factor and real power
- ✓ An LCU with a built in GPS receiver can be installed to provide accurate mapping and positioning
- ✓ All LCUs are ZigBee routers. Messages to and from the unit are relayed according to MESH network topology
- ✓ With inexpensive dipole antennas and good 'line of sight', a range of up to 500m can be obtained
- ✓ Both the LCU application and the radio software can be upgraded over-the-air (OTA)
- ✓ Time stamped samples of the accumulated energy consumption is stored and logged every thirty minutes in a non-volatile memory
- ✓ Total control over reduced energy consumption
- ✓ Reduced overhead maintenance expense
- ✓ No need for infrastructure changes on the customer's distribution network
- ✓ Monitoring and control of each individual luminaire

Technical Data

Power Supply:	
Rated Voltage AC	210-260 (Nominal 230)
Rated Current	4A
Main Functions:	
Zigbee Transceiver	EM351
Real Time Clock	For autonomous local operation
1 - 10V line interface	1 – 11V DC IC current sink or source: >2mA
DALI line interface	Can drive up to 4 DALI loads @ 2mA
GPS (Optional)	NMEA protocol
Auxiliary interface	Logical output: The output transistor shall drive to ground when active. Vout ≤40V, IOUT max 30mA Input: Analogue input 0 - 1.2V Logical 0 input 0 - 0.4V Logical 1 input 2 - 3.3V
Power/energy meter	ADE7763 chip
Other:	
Storage Temperature	-40 - +80°C
Operating Temperature	-30 - +80°C
Weight	130g
External Dimensions	W105mm x H50mm x D75mm
International Protection code (IP)	IP67
UMSUG Code	98 0002 0012 100
Standards and Directives	EN61000-6-2 EN61000-6-3 2014/53/EU (RED) CE

4.4 LCU External 20mm

CELtek Generation 3, 20mm External LCU

The CELtek LCU is a primary component used in the CELtek Central Management System. A complete CMS lighting installation consists of one or more LCUs remotely controlled through a Gateway using RF technology (*see separate Data Sheet).*

Key Features:

- ✓ The LCU controls streetlight ballasts or drivers whether they are DALI or DC (1 to 10V)
- ✓ The LCU is designed to measure temperature, mains voltage, current, power factor and real power
- ✓ An LCU with a built in GPS receiver can be installed to provide accurate mapping and positioning
- ✓ All LCUs are ZigBee routers which will relay messages to and from the unit, according to a MESH network topology
- ✓ With inexpensive dipole antennas and good 'line of sight' a range of up to 500m can be obtained
- ✓ Both the LCU application and the radio software can be upgraded over-the-air (OTA)
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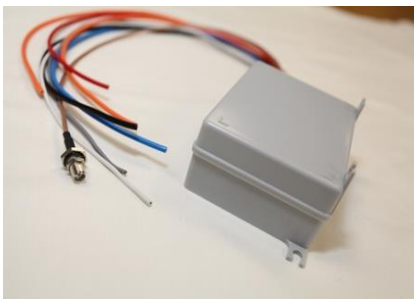
Main Functions:	
Zigbee Transceiver	EM351
Real Time Clock	For autonomous local operation
1 - 10V line interface	1 – 11V DC IC current sink or source: >2mA
DALI line interface	Can drive up to 4 DALI loads @ 2mA
GPS (Optional)	NMEA protocol
Auxiliary interface	Logical output: The output transistor shall drive to ground when active. Vout ≤40V, IOUT max 30mA Input: Analogue input 0 - 1.2V Logical 0 input 0 - 0.4V Logical 1 input 2 - 3.3V
Power/energy meter	ADE7763 chip
Other:	
Storage Temperature	-40 - +80°C
Operating Temperature	-30 - +80°C
Weight	130g
External Dimensions	W105mm x H50mm x D75mm
International Protection code (IP)	IP67
UMSUG Code	98 0002 0012 100
Standards and Directives	EN61000-6-2 EN61000-6-3 2014/53/EU (RED) CE

4.5 LCU Internal



CELtek Generation 3 Internal LCU

The CELtek internal LCU is a component in the CELtek Central Management System. A complete CMS system consists of one or more LCUs remotely controlled through a Gateway using RF technology *(see separate Data Sheet).*

Key Features:

- ✓ The LCU controls streetlight ballasts whether they are DALI or DC (1 to 10V)
- ✓ The LCU is designed to measure temperature, mains voltage, current, power factor and real power
- ✓ An LCU with a built in GPS receiver can be installed to provide accurate mapping and positioning
- ✓ All LCUs act as ZigBee routers, and they will relay messages to and from the unit, according to a MESH network topology
- ✓ Supplied with an external antenna connection.
- ✓ With inexpensive dipole antennas and 'line of sight', a range of up to 500m can be obtained
- ✓ Both the LCU application and the radio software can be upgraded over-the-air (OTA)
- ✓ Time stamped samples of the accumulated energy consumption is stored and logged every thirty minutes in a non-volatile memory
- ✓ Reduced energy consumption
- ✓ Installed to reduce maintenance costs
- ✓ Total control over energy consumption
- ✓ No need for infrastructure changes on the distribution network
- ✓ Monitoring and control of each individual luminaire

Technical Data

Power Supply:	
Operating Voltage AC	210-260 (Nominal 230)
Current	4A
Main Functions:	
Zigbee Transceiver	EM351
Real Time Clock	For autonomous local operation
1 - 10V line interface	1 – 11V DC IC current sink or source: >2mA
DALI line interface	Can drive up to 4 DALI loads @ 2mA
GPS (Optional)	NMEA protocol
Auxiliary interface	Logical output: The output transistor shall drive to ground when active. Vout ≤40V, IOUT max 30mA Input: Analogue input 0 - 1.2V Logical 0 input 0 - 0.4V Logical 1 input 2 - 3.3V
Power/energy meter	ADE7763
Other:	
Storage Temperature	-40 - +80°C
Operating Temperature	-30 - +80°C
Weight	130g
External Dimensions	W92mm x H38mm x D70mm
International Protection code (IP)	IP44
UMSUG Code	98 0002 0012 100
Standards and Directives	EN61000-6-2 EN61000-6-3 2014/53/EU (RED) CE

4.6 LCU External Zhaga

CELtek Zhaga External LCU

CELtek LCU Zhaga is a component of CELtek Light Control's versatile management system for outdoor lighting. Together with a CELtek Gateway Plus, and a cloud-based server, the lighting control system has been developed to optimize energy use, streamline operations and maintenance as well as minimizing unwanted light pollution.

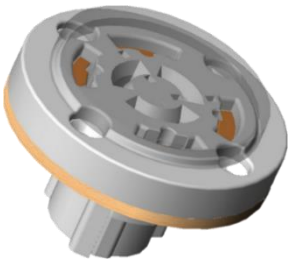
Key Features:

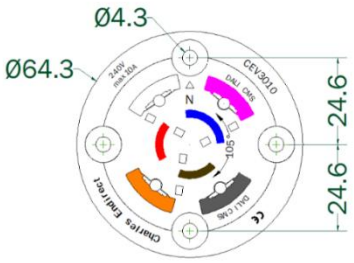
- ✓ CELtek LCU Zhaga is designed for integration with LED light sources that have integrated the Zhaga Book 18 standard connector, and that support Dali 2.0.
- ✓ These standards facilitate integration between control system and luminaire so that the customer can freely choose the luminaire manufacturer without any concerns about compatibility with the CELtek Light Control solution.
- ✓ The control node uses the ZigBee 2.4 GHz Mesh radio for communication.
- ✓ With local intelligence and built-in light meter, the unit will provide the ignition and switch off itself should interruptions occur in one or more parts of the communication chain.
- ✓ The unit has an internal antenna and is powered direct from a compatible LED driver in the luminaire.
- ✓ In the event of a power outage in the post, a small amount of stored energy will be used to send a message to the server about this (Last Gasp).
- ✓ Optionally, CELtek LCU Zhaga can be equipped with a GPS module for automatic location in the field.
- ✓ CELtek closely follows developments with international standardization in the lighting industry.
- ✓ Upgrades and new functionality are constantly being developed and CELtek is implementing continuous changes driven by: -
    - o https://www.digitalilluminationinterface.org and
    - o https://www.zhagastandard.org With OTA (Over-the Air) software update,
- ✓ The customer will always be assured that the device has been upgraded with the latest version of the software that includes new and updated features when available.

Technical Data

General information:	
Operating Temperature	-40 - + 70° C
Humidity	(RH, non-condensing): 4-90%
International Protection code (IP)	IP66
Weight	30g
External Dimensions	W48mm x H30mm x D48 mm
Outdoor Suitability	(UV) UL 746C f1
UMSUG Code	*Awaited*
Standards and Directives	EN 301 489-1 and -17 EN 60529 EN 62262: 2002 impact IK9 EN 501581: 2012 IEC 61347-1 IEC 61347-2-11 IEC/EN 61347-2-11:2001 IEC/EN 61347-:2015

4.7 7 Pin NEMA Socket





Key Features:

- ✓ Designed for connectivity of NEMA type plug in devices: photocell/CELtek LCU/smart city
- ✓ Simple luminaire or wall box fitment
- ✓ Pre-wired for ease of installation
- ✓ Compatible with 3 Pin NEMA devices
- ✓ CE marked
- ✓ “Smart City” future proof

Technical Data

Electrical:				
Rated operational voltage *Ue*	240V ac			
Rated frequency *fn*	50/60 Hz			
Rated current *In*A	10A			
Rated Insulation voltage *Ui*	500V ac			
Mechanical:				
Housing	Nylon PA66 UV Protected			
Power contacts	Phosphor Copper, Nickel/Tin Plating			
Dimming contacts	Beryllium Copper, Gold Plating			
IP codes	IP2X / IP65 (with compatible IP rated device fitted)			
Normal Service Conditions:				
Ambient air temperature for operation	-25 °C to 55 °C			
Altitude	< 2000m			
Humidity	95 % @ 55 °C			
Pollution degree	3			
Connections:				
Wires (BS6231)	CSA mm²	Length mm	Terminations	Function
Brown	0.75	500	Live 230V ac	Power
Blue	0.75	500	Neutral	Power
Red	0.75	500	Load 230V ac	Switching
Violet	0.5	500	Pin 4	Control signal connections for manufactures devices
Grey	0.5	500	Pin 5	
Orange	0.5	500	Pin 6	
White	0.5	500	Pin 7	
Directives:				
LVD 2014/35/EU, EMC 2014/30/EU, RoHS 2011/65/EU				
Related documents:				
EU Declaration of conformity				

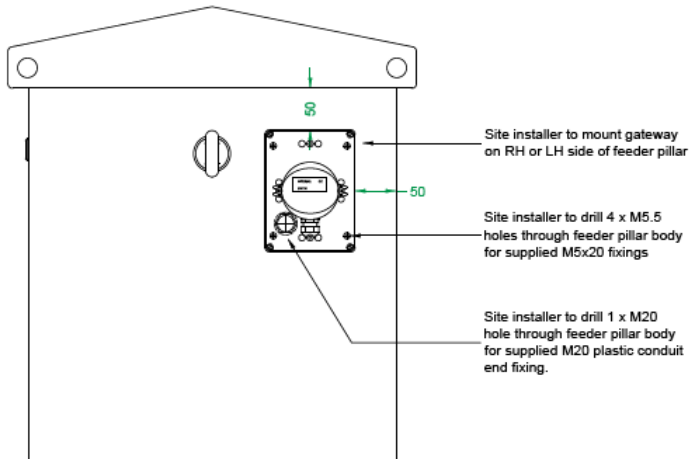
4.8 CELtek LUX Meter IP65 (pillar mounted)

In some circumstances it may be deemed necessary to install an alternative method of controlling the lighting system, and under certain conditions, the provision of an additional monitoring device would be the solution.

The installation of a LUX meter provides that additional control. The sensor is wired in via the Gateway offering additional flexibility of customer options.

The sensor is connected and controlled via the analogue ports of the Gateway. The LUX meter measures the current light intensity and outputs these readings as an analogue 0-10V DC value (the higher the value, the higher the light intensity).

The CELtek LUX Meter has two measuring LUX ranges, 1,000 x 10,000. These settings can be directly set via a jumper located under the cover of the device. For the purpose of controlling the street lighting the jumper within the meter MUST be set to 1,000 LUX.



The LUX meter is supplied by Charles Endirect Ltd, wired and fitted into an IP65 rated polycarbonate enclosure with a transparent removable lid. The unit should be located in a suitable position on the feeder pillar body, below the pillar roof line.

When connecting the LUX meter, the following connections to the Gateway are observed: -

Terminal 1 – to DC OUT12
Terminal 2 – AGND
Terminal 3 – A/1

A strap must be installed between terminals AGND and GND on the Gateway

Attention: Make sure the wiring and the setting on the analogue input are correct.

4.9 CELtek LUX Meter/IP65 Box/Tespa Bracket (post mounted)

The post mounted unit is designed as an alternative for when fitting a pillar version is not possible. It can be fitted remotely on a 5m or 6m post, providing it is located within 10m of the Gateway position.

5. CELtek CMS Hosting

5.1 Servers

CELtek is a fully hosted system with access via a Web browser. This gives full access using any device with internet connectivity.

- ✓ PC and Mac computers
- ✓ Tablets including Apple
- ✓ Most Android devices
- ✓ Mobile phones

Platform

- ✓ Linux
- ✓ Windows
- ✓ Java (JME/JSE/JEE)
- ✓ Ruby / JRuby
- ✓ Android

Database Systems

- ✓ PostgreSQL
- ✓ JavaD /Derby
- ✓ Oracle
- ✓ MS SQLServer
- ✓ MySQL

The data is stored in a SQL database on a SQL server.

The database used within our own installation is Postgre SQL.

The data is backed up every day ensuring that the risk of data loss is kept to a minimum.

The Charles Endirect Ltd support team constantly carries out full and thorough system checks on all their customers' databases to ensure there is no loss of data. The support team also works regularly with the systems software engineers to maintain a high level of support.

The CELtek system is constantly reviewed and upgraded throughout the year with changes to the system only put in place after full analysis and testing has taken place.

This regular monitoring and upgrading is covered under the Customer Licensing or a Service Level Agreement.

5.2 Server Location

CELtek servers are based in a Data House with full and comprehensive security in Ireland. All data is backed up and stored at another location, this provides a full back up service of all of the CELtek data. This is carried out to ensure no data is ever lost and systems are fully functional at all times.

Amazon is the Data House that CELtek uses, giving full secure data and security for each customer.

6. CELtek CMS Reports

6.1 Selection

The reporting facility within the software is connected via the systems tree structure. The data chosen will be for the selected level or section of the tree, including all sub-areas.

To run the majority of the available reports, a time span must be selected. If a defined time span has not been selected, then the system will automatically default to the previous 7 days.

The reports are divided into seven categories:

Events	These are system-generated actions that are performed automatically. A specific parameter can be selected from the available list.
Alert History	These are all alerts that have been cleared stored in the database.
Photocell	This report shows the times that any selected photocell connected to the Gateways switch any circuits, or LCUs associated with that Gateway, on and off.
Lux Meter	This report shows the times that any selected lux meter connected to the Gateways switch any circuits, or LCUs associated with that Gateway, on and off.
Energy Consumption	This report allows the User to accurately calculate the energy used by the units connected to the system.
Other reports	These are standard reports. See the following for more details.

6.2 Events

The following reports can be generated:

Name	Group switching	Pole based switching	Description
Add node		✓	Lists adding of new nodes to the system
Configuration status	✓		Lists configuration updates
Current gateway status		✓	Lists the gateway status updates
Current node status		✓	Lists the node status updates
Daytime	✓	✓	Lists the photocell switching to daytime
Dim		✓	Lists all dimming commands
Get all short addresses		✓	Lists collection of node addresses
Get current and phase angle		✓	Lists collections of current and phase angle measurements
Get effect		✓	Lists collections of effect measurements
Get energy		✓	Lists collections of energy measurements
Incoming steering signal	✓	✓	Lists changes on an incoming steering signal if defined on a group switch unit or ZigBee gateway
LCU data		✓	Lists data to/from LCUs (see below for detailed explanation)

Light switched off locally	✓	✓	Lists LCU(s) and time when the LCU(s) have switched off independently. Happens when the LCU is offline with the gateway at the same time as it switched off the day before.
Lights off	✓	✓	Lists all «off» commands
Lights on	✓	✓	Lists all «on» commands
Night time	✓	✓	Lists the photocell switching to night time
Outgoing steering signal	✓	✓	Lists changes on an outgoing steering signal if defined on a group switch unit or ZigBee gateway
Ping		✓	Lists handshaking between an LCU and ZigBee gateway
Remove node		✓	Lists all commands to remove nodes (LCU)
Set all dim values		✓	Lists all outgoing dim commands
Signal strength	✓	✓	Lists signal strength measurements
Unit update	✓	✓	Log of when units were last updated

6.3 Lighting Control Unit

Example:

LCU-data (3248, EFF=1, DIM=0(0%), RSSI=-59, T=26,
Lqi=255mc=0.014(0.14), mv=239(239), cosPhi=0.42,
Wm=21577967, rel=5, rtc=2001-12-19 02:41:40, sw=9
eSw=v1.6, hw=7, route=27034)

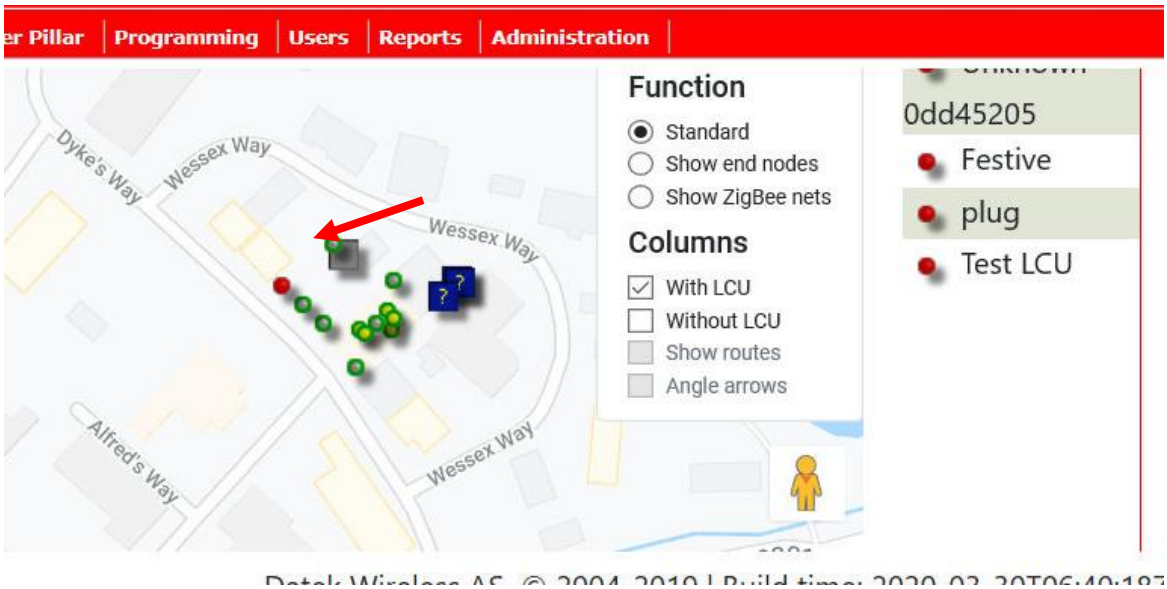
eff	Reported power consumption at the time of measurement
dim	Reported dimming level from LCU in levels from 0-255.
rssi	Signal strength in dBi
t	Temperature eon the LCU print board in degrees (centigrade)
Lqi	Link quality
Mv	Voltage
CosPhi	Phase angle
Wm	Watt minutes
Rel	Position of the relay(s) in the LCU.
RTC	Date and time of the LCU internal Real Time Clock
Sw	Software version of the measurement and control processor in the LCU
eSv	Software version of the communication software
hw	Version of the PCB
route	Routing information for the communication. For debugging purposes

6.4 Other Reports

Name	Group switching	Pole based switching	Description
Actions	✓	✓	Lists all actions
Actions and events	✓	✓	Combines all actions and events
Active alerts	✓	✓	Lists all active alarms
Meter reading total	✓		Shows meter value for external power meter if connected
Meter reading	✓		Lists meter readings within the defined period
Raw meter reading data	✓		Shows all meter reading data within a defined period
Burn time	✓		Lists burn hours within a defined period
Burn time total	✓		Shows the total number of burn hour from the installation date
Lux meter	✓	✓	Lists the reported lux meter values within a defined period
Messages from mobile phone	✓	✓	Shows all messages sent from mobile phones to the system
Messages to mobile phone	✓	✓	Shows all messages sent from the system to mobile phones, including confirmation messages to the users
Lantern burn time total		✓	Shows the total number of burn hour from the installation date
Lantern current		✓	Lists the current readings within a defined period
Lantern power consumption		✓	Lists the power consumption readings within a defined period
Lantern power consumption total		✓	Lists the total power consumption since installation
Lantern temperature		✓	Lists the temperature readings on the LCU print board within a defined period
Lantern voltage		✓	Lists the voltage readings within a defined period

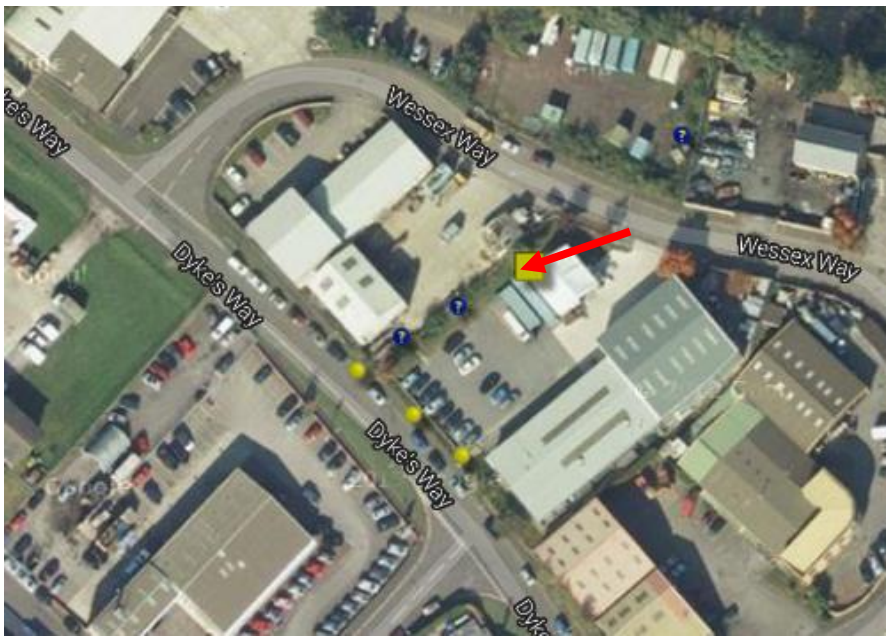
7. Mapping

CELtek has a built-in system for unit mapping and allows navigation of the system through Google maps. Many functions can be controlled using the built-in mapping tools; these include switching on or off of the luminaire via the LCU or dimming the lantern. Additional asset information is also available via the mapping tool. This mapping function provides an invaluable way of determining geographic information when viewing installations and areas within a customer's system.



The use of Google Maps ensures that the CELtek system always has the most up to date mapping engine to suit all of the customer's requirements. It also provides the additional advantage of showing satellite imagery as well as hybrid and terrain mapping.

When Google update their mapping system, CELtek automatically updates. This ensures the system keeps up with the latest available mapping and images.



8.System Interfaces

CELtek provides interfaces with external programs to allow data to be synchronised. Currently there are several interfaces available with asset management systems and traffic counter systems.

Where a customer has an AMS program, links will be put in place to ensure only one data set is used. This will ensure that each customer's asset data system will be used to populate CELtek. This will guarantee that the data is in the "Well-Lit Highways Appendix "A" format".

With AMS integration in place, all the faults recorded in CELtek can be transferred and raised as jobs or works orders. These can then be issued to repair crews, and the outstanding faults and subsequent repairs logged electronically. Job sheets can be checked before they are issued to repair crews ensuring duplicate jobs are not raised.

Attributes can be updated with rules put in place so only accurate data is populated into CMS and AMS systems. This can save time and money for asset updates and checks can be put in place to ensure the system is only updated with correct data.

CELtek has analogue and digital interfaces for use with Traffic Counter Systems allowing dimming to be implemented when the required level or count is reached.

MAYRISE

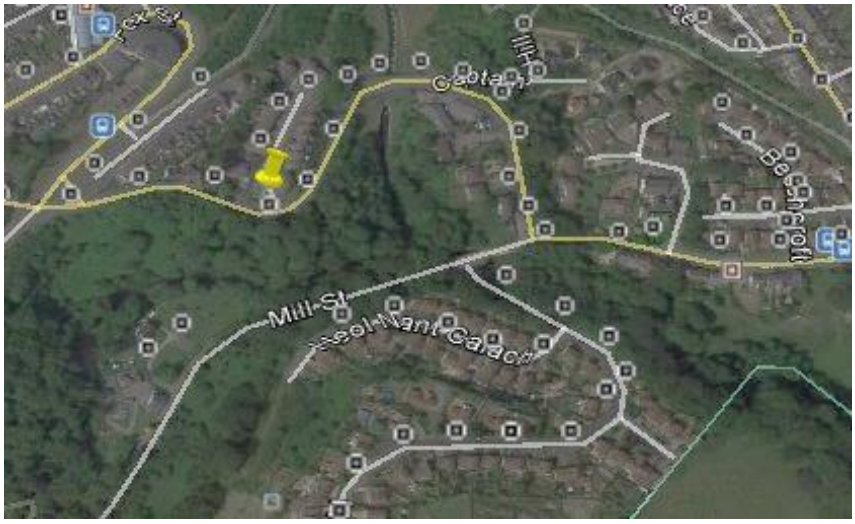
CONFIRM

MORLICS

9. Commissioning & Training

9.1 Commissioning

Charles Endirect Ltd will investigate and then plan large installations using Google Earth to select the best locations for the installation of the Gateways. By using the customer's asset data system and plotting locations by Easting and Northing, or by Latitude and Longitude, the number of Gateways used on any project will be optimised.



As the infrastructure is being rolled out and installed, the support team will constantly monitor progress of the works to ensure the system is up and running as the installation proceeds.

KML files are produced and exported enabling the roll out program and installation to be kept up to date. The KML files can also be used to update a corporate mapping system where required.

Charles Endirect Ltd can supply onsite engineers to help and assist with commissioning of the installation when requested by the customer.

All LCUs can be pre-populated into the CELtek system prior to installation. If the GPS version of the LCU is used; then once it is installed and connected to a working Gateway, the correct location and position of the LCU will be immediately identified as soon as it is registered into CELtek system, with no administrative input needed, saving time and money.

9.2 Training

Training is structured to meet the customer requirements and can be split into two areas: office-based staff and onsite engineers. In addition, all training can be tailored to meet specific requirements of the customer.

Training is carried out by the CELtek support staff and covers all aspects and functions of the CELtek system right up to Administrator level.

Half day training modules

- Basic Training covers a complete overview and reporting within the CELtek system
- Onsite Engineers training covers how to install Gateways and LCUs, and fault diagnosis of components
- Half day training is also given when updates to the system are released and changes to CELtek are made
- Training can be given at Charles Endirect Ltd offices or onsite at a customer's location. All training is agreed with customers so that all CELtek users are trained to the required standard

One and a half day training module

CELtek User training extensively covers how the system works. It explains how to enter data on to the system and how to program dimming profiles. The training also covers a comprehensive session on onsite installation.

Two day training module

This training is comprehensive and geared for CELtek Administrators. It covers how the software and the associated system works, explains and demonstrates in depth how to set up areas through the tree system and deals with individual units and control. The session also covers users, administration duties and profiles. It explains all reporting along with programming and dimming profiles, setting up Gateways and installation of LCUs and associated importing of data.

10.CELtek Support

10.1 Support

The CELtek support team is based in Wincanton, Somerset at Charles Endirect Ltd. Support is available Monday to Friday during normal office hours from 8.30am to 5.00pm. If system support is required outside normal office hours, then this can be arranged with prior agreement.

Onsite assistance from a Charles Endirect Technical Support Engineer during the hours stated above can also be provided, planned and agreed to suit the need of the customer.

Out of office support is available and specific times can also be arranged and negotiated at that time to meet the customer's requirements.

The standard assistance and support costs are covered in the annual software and service Level agreements, these costs also cover all software upgrades.

The support team logs all calls or emails with a log number which is then relayed to the customer as a reference. Any outstanding issue is updated to the current status to the customer every week.

Support team will notify of any upgrades and send out release notes before updates take place.

All technical documentation, user guides and documents relating to customers are maintained and updated by the support team.

10.2 Managed Service

This is a service provided by Charles Endirect Ltd where a customer requires a project to be managed for an arranged period of time. This service is without the standard support terms and chargeable at our standard current rates and subject to our terms and conditions. If required, Charles Endirect Ltd can supply a managed service for any project involving CELtek where the customer requires additional resource.

10.3 Contacts for CELtek CMS Technical Support Team

Name	Job Title	Contact details
Barry Bennett	Business & Product Development Manager	M: 07715 091 146 E: barry.bennet@charlesendirect.com
Helen Cooper	CELtek CMS Manager	T: 01963 828 412 E: helen.cooper@charlesendirect.com
Chris Knight	Technical Support Engineer	M: 07917 091 957 E: chris.knight@charlesendirect.com
Ivan Hawtin	Technical Manager	T: 01963 828 423 E: ivan.hawtin@charlesendirect.com

Appendix 1

Elexon Information

146/02

Approval of CELtek Central Management System

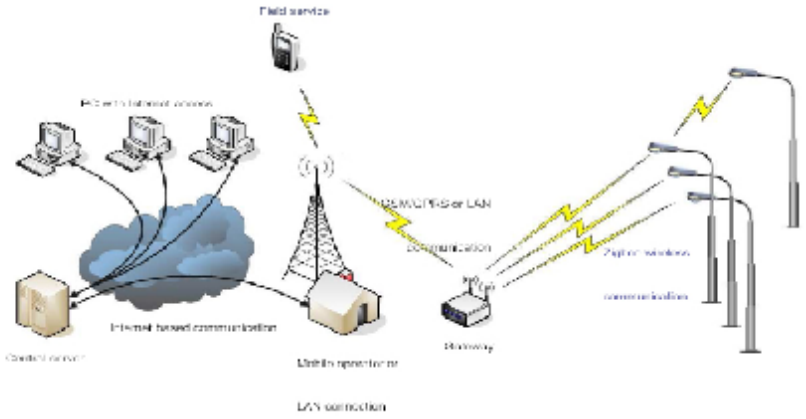
Meeting Name	Supplier Volume Allocation Group
Meeting Date	2 April 2013
Purpose of paper	For Decision
Summary	Charles Endirect, in partnership with Datek, have produced the CELtek server-based Central Management System (CMS) for remote Street Lighting control. They submitted a formal application for approval of the system in January. We have received the self-test report and completed our witness testing. This paper reports that the system has passed the testing process, and invites the SVG to approve the CELtek CMS for use in Settlement. The Unmetered Supplies User Group (UMSUG) is currently considering the application ex-committee; we do not anticipate any UMSUG objections but will update the SVG verbally at its meeting.

1. What is the CELtek CMS?

1.1 The CELtek CMS is an advanced service for the remote control of street lights.

1.2 The system uses a Gateway that controls a number of Lighting Control Units (LCUs) and the server is via Global System for Mobile (GSM) / General Packet Radio Service (GPRS) or Local Area Network (LAN).

1.3 Zigbee wireless communication is used between the LCUs, with a mesh functionality which offers full redundancy for Street Lighting columns. Each column fitted with LCU can act as a 'repeater' for other columns, securing communication over great distances. Failure of a single column will not disturb the overall functionality since columns can communicate via several other column routes, as shown in the diagram below:



1.4 The system servers will be hosted by Datek on behalf of any customer that purchases the CMS. Additionally, the system will be implemented with a two-way electronic interface with the customer's inventory database (e.g. Mayrise, Confirm or other system).

1.5 The LCU and Gateway have already been provided with the following Charge Codes:

Nominal Watts	Unit Description 1	Unit Description 2	Company	Manufacturer's Designation	New Charge Code
2	CMS Equipment	Light Control Unit	Charles Endirect Ltd	Datek Wireless Light Control Unit (Light Control Unit)	817 0002 004 100
10	CMS Equipment	Gateway	Charles Endirect Ltd	Datek Wireless Light Control Unit (Gateway)	81 7001 0001 100*

*New Charge Code - 98 0002 0012 100 see Elexon website for details

2. Test Report and Witness Testing

2.1 Charles Endirect have provided a test report (see Attachment A), detailing the self-testing that they have undertaken against the ELEXON Equivalent Meter (EM) Testing Specification.

2.2 We undertook witness testing of the CELtek CMS (v2.35.23) on 21 February 2013 at ELEXON's offices. The test scripts used were based on the Test Specification and the requirements set out in BSCP520 'Unmetered Supplies Registered in SMRS'. The system passed the witness testing process and a few follow-up data requests have been completed. These included provision of the systems user manual (available on request).

2.3 You can find the completed test report in Attachment B. The Event Log produced from the systems has also been successfully downloaded from the Datek File Transfer Protocol (FTP) server, and was processed by Power Data Associates who confirmed that it was in the correct format.

3. Testing and Approval Scope

3.1 The testing scope included the ability to switch and dim individual lamps using the CMS, and to accurately report the events to the Meter Administrator (MA) in the Event Log. The CELtek system can potentially, like other approved CMS systems, group-switch lamps on or off using a single controller (e.g. in a feeder pillar). In such a scenario, the customer would have to declare a separate inventory for group switch lamps on a separate sub-meter Id and declare the appropriate Switch Regime (200 Series).

3.2 The scope of the approval for the CELtek system is therefore to the extent that the system can be used to control individual lamps via a LCU. The approval does not preclude use of the system to undertake group switching, but where such switching occurs the customer must use the normal approach to inventory declaration for timeswitches.

4. ELEXON's and UMSUG's Views

4.1 The CMS passed testing and the approach to server hosting and management appears to be robust. The CMS customer interface is clear and easily understood. The system could potentially be used as stand-alone, but integration with customer inventory databases will most likely be used in practice.

4.2 ELEXON recommends that, since the system is robust and has passed the testing requirements, the SVG should approve the CELtek CMS for use in Settlement. The UMSUG is currently considering the application ex-committee; we do not anticipate any UMSUG objections but will update the SVG verbally at its meeting.

5. Recommendations

5.1 ELEXON invites the SVG to:

a) **NOTE** the findings in the CELTEK test report;

b) **NOTE** the successful witness testing undertaken by ELEXON; and

c) **APPROVE** the CELtek CMS (v2.35.23) for use in Settlement.

Appendices
None

Attachments
Attachment A – CELtek report
Attachment B – ELEXON test report

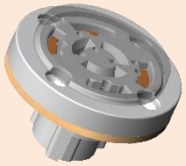
For more information, please contact:
Kevin Spencer, Market Analyst, BSC Operations
Kevin.Spencer@elexon.co.uk / 020 7380 4115

Appendix 2

Component List

CELtek CMS Component Options

Part no	Name	Description	Picture
CEV8999	CELtek Gateway Plus with 4G radio and onboard LAN (SIM card to be included with every Gateway despatched)	Gateway for CELtek CMS system for control of LCUs. Communicates with server over GSM GPRS and LCUs over radio. Antenna connectors: GSM and radio SMA F. IP67	
CEV8100	CELtek Column Mounted Gateway	Gateway and antenna in an IP65 box with bracket and stainless steel straps for column mounting	
CEV8101	CELtek Feeder Pillar Mounted Gateway	BDP80/HS Pillar fitted with Gateway	
CEV8104	CELtek CMS Interface Relay Unit	Isolator Unit (L4) with relay for connecting 230V remote photocell to a Gateway	
CEV8982	CELtek LCU/G3/External	LCU Gen3 for external installation. Internal (chip)-antenna. Dali and 1-10V control interface for ballast/LED Driver.	
CEV8989	CELtek LCU/G3/External /GPS	LCU Gen3 for external installation. Internal (chip)-antenna. Dali and 1-10V control interface for ballast/LED Driver. With internal GPS receiver.	

Part no	Name	Description	Picture
CEV8976	CELtek LCU/G3/NEMA/CHIP DALI ED04 (without Tyco relay DALI only)	NEMA Gen3 external LCU for use with DALI gear.	
CEV8977	CELtek LCU/G3/NEMA/CHIPGPS DALI ED08	NEMA Gen 3 external LCU for use with DALI gear with internal GPS receiver.	
CEV3010	Seven Pin NEMA socket	Seven Pin NEMA socket IP2X for use with the CEV8976 or CEV8978	
CEV8975	Zhaga Node	Zhaga DALI node	
CEV8983	CELtek LCU/G3/Internal (Requires Antenna Zigbee: CEV7052, CEV7051 or CEV7049)	LCU Gen3 for internal installation in luminaire. 50cm antenna cable for external antenna. Dali and 1-10V control interface for ballast/LED Driver. Antenna connector: SMA F.	
CEV8987	CELtek LCU/G3/Internal/GPS (Requires Antenna Zigbee: CEV7052, CEV7051 or CEV7049)	LCU Gen3 for internal installation in luminaire. 50cm antenna cable for external antenna. Dali and 1-10V control interface for ballast/LED Driver. GPS receiver. Antenna connector: SMA F.	
CEV7070	NEMA to 20mm Adaptor	Converts Nema Socket to 20mm hole.	
CEV7052	Antenna ZigBee straight 30mm,	Antenna for luminaire, external installation. Ground plane required.	

Part no	Name	Description	Picture
CEV7051	Antenna ZigBee Right Angle 30mm, SMA	Antenna for luminaire, external installation. Ground plane required.	
CEV7049	Antenna ZigBee Straight, 105mm SMA-M	Antenna for luminaire, external installation. Ground plane not required.	
CEV7062	CELtek GSM/Zigbee Puck Antenna (for Feeder Pillar)	Antenna for outdoor installation. Low profile, 2 x 1M cables with SMA M connectors.	
CEV5051	CELtek Ant Ext Zigbee 9 metre SMA-M/SMA-M	9m extension cable	
CEV5053	CELtek Ant Ext Zigbee 15mt SMA-M/SMA-M	15m extension cable	
CEV5055	CELtek Ant Ext Zigbee 18mt SMA-M/SMA-M	18m extension cable	
CEV6008	CELtek Antenna cable for GEN2 LCU	Cable for external antenna in luminaire with LCU Gen 2 inside the luminaire. Chassis mount connector.	
CEV6019	CELtek Antenna blade GSM/ZigBee	Antenna for internal installation – used in Column Mounted Gateway Ground plane not required.	
CEV6001	CELtek Antenna Cable HF50 FME F Connector Both Ends 1M	HF50 coax antenna cable (Super Low Loss).	

Part no	Name	Description	Picture
CEV6007	Adapter SMA M - FME M	Adapter option for aerial installation.	
CEV6015	CELtek Antenna Cable HF50 FME F Connector Both Ends 2M	HF50 coax antenna cable (Super Low Loss).	
CEV6002	CELtek Antenna Cable HF50 FME F Connector Both Ends 3M	HF50 coax antenna cable (Super Low Loss).	
CEV6003	CELtek Antenna Cable HF50 FME F Connector Both Ends 5M	HF50 coax antenna cable (Super Low Loss).	
CEV6004	CELtek Antenna Cable HF50 FME F Connector Both Ends 10M	HF50 coax antenna cable (Super Low Loss).	
CEV6005	CELtek Antenna Cable HF50 FME F Connector Both Ends 15M	HF50 coax antenna cable (Super Low Loss).	
CEV6006	CELtek Antenna Cable HF50 FME F Connector Both Ends 20M	HF50 coax antenna cable (Super Low Loss).	
CEV7066	CELtek Adapter, RPSMA M to SMA F	Adapter, RPSMA M to SMA F, straight	
CEV7083	CELtek. Small Zigbee Puck Antenna.	Antenna for internal or external installation – used in Column Mounted Gateway or remote gear housing. Ground plane not required.	

Part no	Name	Description	Picture
CEV6020	CELtek Adapter SMA F to FME M	Adapter SMA F to FME M	
CEV7047	LUX Meter, 1-10V DC	Lux-meter 0-1000 Lux. Connects to the analogue input on Gateway	
CEV7046	CELtek Feeder Pillar mounted LUX Meter.	0-1000 Lux meter installed within IP66 enclosure for attachment to feeder pillar or column mounted gateway. Connects to the analogue input on Gateway (3G Enabled).	
CEV7043	CELtek Column or Post mounted LUX Meter.	0-300 Lux meter installed within IP66 enclosure and fitted with banding bracket for attachment to lighting column or post. Connects to the analogue input on Gateway (3G Enabled).	

Directory of changes - CELtek CMS Technical Specification

Document: CELtek Central Management System
Document ref: 1008

Current version available to download from our website www.charlesendirect.com

Change to:	Description:	Page/s	New issue
LCU UMSUG codes	From 81 7000 2004 100 to 98 0002 0012 100	21, 23, 25	V2 Oct 2020
Product code	Change product code from CEV8979 to CEV8976	46	V2 rev1
HEA Logo	Updated to show 2021 Award	2	V2 rev1

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