

PHOTOVOLTAICS STREET LAMPS FOR DECORATIVE AND PUBLIC LIGHTING

GENERAL FEATURES

To plan a well working street lighting system with photovoltaic power supply means to consider some basic elements such as:

BUDGET. The whole system must be both economical and able to compete with traditional solutions connected to the electricity network (not always at hand).

AESTHETIC APPEARANCE. The different components of the street lamp will not be too heavy from an aesthetic point of view. Photovoltaic modules must not be too bulky; fixing structures or poles must not be poorly built and assembled and should not result unsightly; accumulators must not be too bulky and difficult to combine with other elements; control units must not be too large and should not be mechanically connected to the fixing structures.

PERFORMANCES. The different components must be connected in a very careful way in order to obtain the best possible performance and to reduce the energy loss.

CORRECT ENERGY AND WORKING MANAGEMENT. In order to reduce losses, that in such a system may be fatal, an integrated control device is necessary. This has to be able to:

- manage the battery charge with the best possible performance;
- optimize the use of the energy stored in the battery according to: kind of photovoltaic field, location, electrical load of the lamp, day of the year;
- support different timetables with seasonal variation of the electrical load required: these have to be synchronised with both weather factors (like temperature and insolation) and astronomic factors (like the number of light hours per day);
- support a data logger capable of storing at least 15 days of data and
- support a local or remote user interface (serial in/out) that allows the access to the on-line or logger data in order to control all the parameters both of installation and of management.



For all these reasons ENERECO srl has developed a series of photovoltaic kits for decorative and public lighting.

PHOTOVOLTAIC STREET LAMP series "STL" - DESCRIPTION

LEGEND

PHOTOVOLTAIC MODULES

They have a capacity power calculated in order to guarantee the autonomy of the lamp during the night.

LAMPOST TOP STRUCTURE

It is built with hot-galvanized steel profiles (complete with stainless steel nuts and bolts) in according to the dimensions of the photovoltaic modules and to the windiness of the site.

CONTROL UNIT

It manages the charging and discharging of the battery and the night/seasonal working of the lamp.

LAMP HEAD, BALLAST, LAMP AND SUSPENSION ARM WITH FIXING BRACKET

Cut-off head to reduce light pollution. The ballast is chosen according to the features and capacity of the lamp and it is fixed in the lamp head making the installation easy. Hot galvanized suspension arm with adjustable fixing bracket for lamppost.

LAMPOST

Adjusted to customer needs, weight and dimensions of the photovoltaic panels and to the features of the site.

RS232 SERIAL PORT

The RS232 serial port is placed in an apposite cavity of the lamppost and protected by a proper cover. The RS232 serial port allows to control the working of the photovoltaic street lamp and to download the data logger. A laptop where the user interface DATALINK 1.0 is installed can be connected to this port to force the lighting of the lamp.

PLINTH

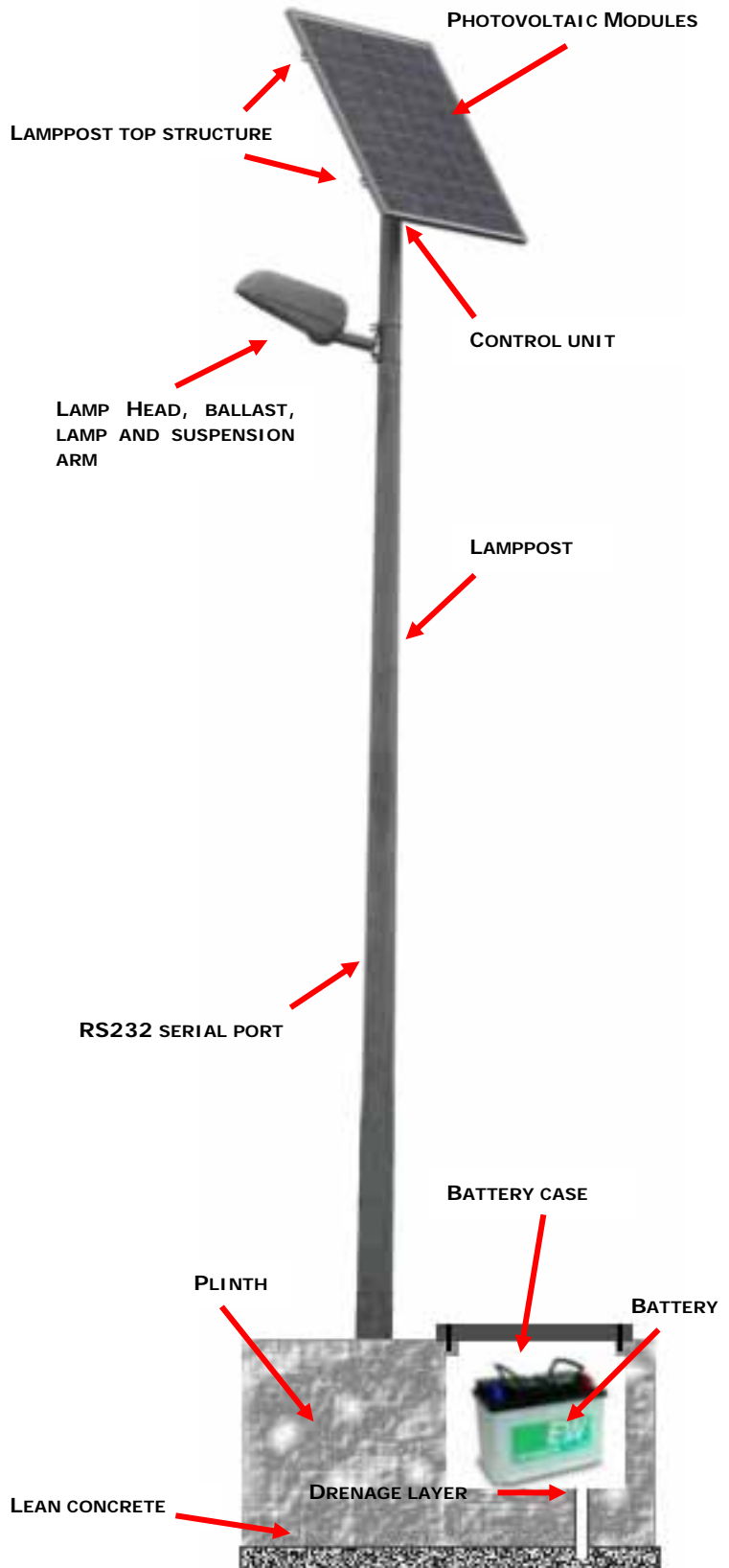
It will be built on site and, like the post, will be adapted to the lamp street and installation site features.

BATTERY CASE

Its dimensions depend on the battery. It can be made of plastic, resin or obtained directly during the building of the plinth. It has to guarantee the rainwater run-off in order not to damage the battery (draining pipe on a drainage layer).

LEAN CONCRETE AND DRENAGE LAYER

They are important to guarantee the run-off of water, in case it enters the battery case



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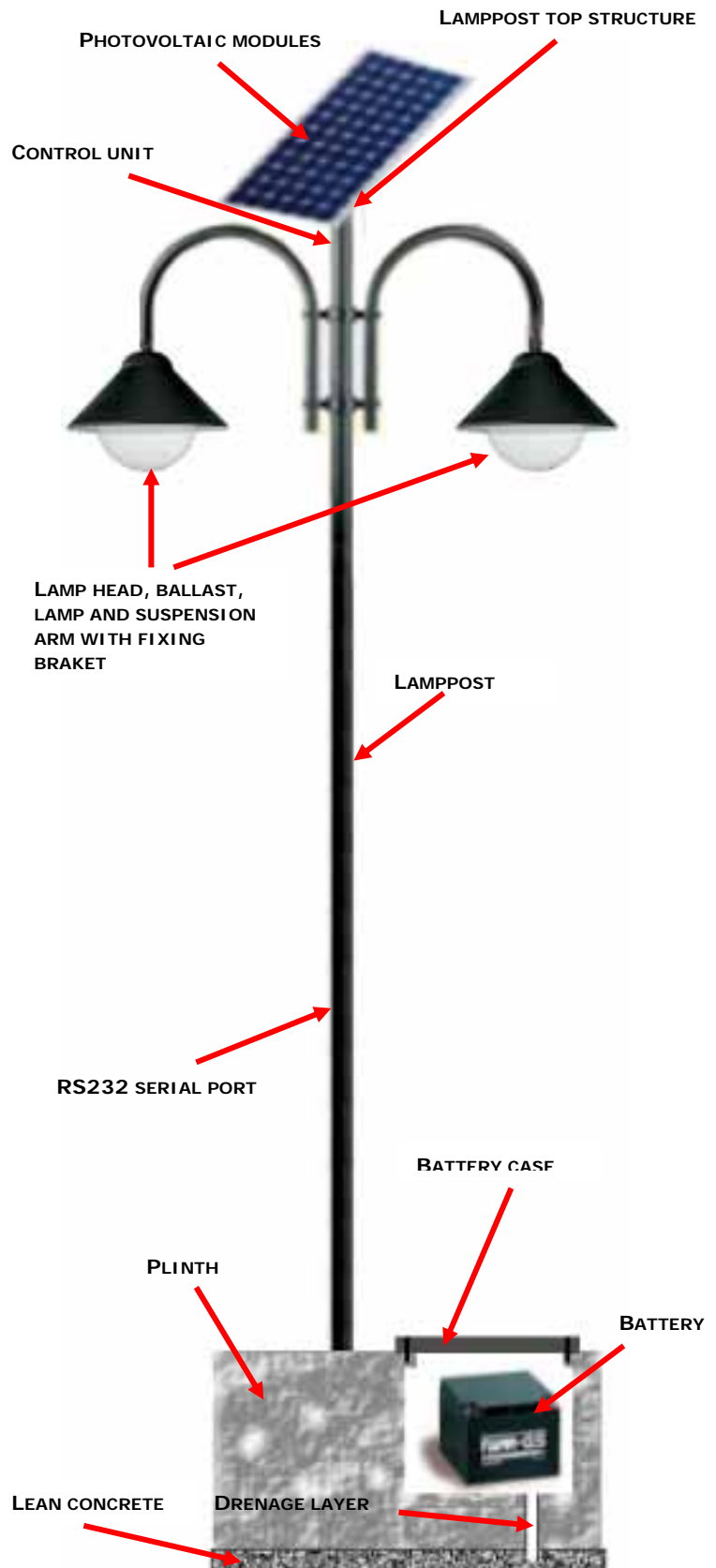
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CONTROL UNIT – STL01

Features of the control unit for photovoltaic street lamp

FEATURES	VALUES
Working voltage	24Vdc
Maximum input PV current	2x5A
Maximum output current	1x10A
Timer	Adjustable -15 min.
Seasonal variation timetables	2 – summer/winter
Data logger	10,5 days – 96rec/day
Light dimmer control	4 levels- Digital
Case	IP56 with cable gland



CHARGE CONTROLLER

PWM algorithm control using power MOSFET transistors. The low RDS coefficient of the selected MOSFET, together with the PWM algorithm assure a high charge efficiency of the battery.

MANAGING SYSTEM

Last generation microprocessor, 16 bit.

TIMER

Cyclic (afternoon/night/morning) from 3.00 pm to 8.00 am. Can be set with intervals of 15 minutes (4 actions per hour). Possibility to control the lamp power for every action.

TIMER CONTROL

Synchronization with PC clock or (optional) with DCF receiver (standard hour of Mainflingen – D).

LIGHT MANAGEMENT

Through an internal DipSwitch with 4 switches it is possible to set the STL01 device for several types of night lamp working.

sw1 – OFF: the system works with a fixed timer; ON: the system work according to the night lighting timetables.

sw2 – Selects the maximum time of 100% capacity lighting of the lamp per night. ON: 7 hours per night for <35W lamp; OFF 5 hours per night for >35W lamps. Requires SW1 on ON.

sw3 – allows working with timetables. ON: the system works with two timetables SUMMER/WINTER; OFF: the system works only with the WINTER timetable. Requires SW1 ON

sw4 – custom working. Requires SW1 ON



Internal DipSwitch with 4 sw for the night lighting setting of the lamp.

TIMETABLE

STL01 can work with a night lighting timetable with intervals of 15 minutes. This table can be programmed either by the user or before the installation on request. The system can upload



TECHNICAL SPECIFICATIONS

more than one table for a seasonal programming. A particular algorithm allows the managing system to recognise the present season and then to use the proper timetable.

LIGHT DIMMER CONTROL

Digital with two leads (for connection to the ballast). There are 4 default dimmer levels. These levels can be chosen in the default table or automatically by the battery state of charge (to activate this option an apposite flag can be selected in the DATALINK 1.0 software).

LOCAL DISPLAY

With a "working"/"out of order" indicator.

USER INTERFACE

Connectable through the integrated serial port RS232 or trough the radio modem (optional).

DATA LOGGER

Integrated. 32 queries per sec. and 1 record (with the average results of the queries) every 15 minutes for every quantity measured. 10.5 days loop memory – when the memory is full the system eliminates the first record of the series (so the memory contains always the last 1000 records).

SOFTWARE

DATALINK 1.0 – data delivery on Excel worksheet.

ON LINE DATA AND VISIBLE DATA LOGGER

Hour, date, battery (V), battery (°C), photovoltaic modules (Amp), battery SOC, lamp (Amp), lighting times, lamp working power (%); connection efficiency (cabling, cable resistance), type of timetable used (summer – winter), other alarms and flags.

OPTIONALS

Time radio receiving system (from Mainflingen – D), hardware clock, radio modem, proximity sensor, radio control.

BALLAST – ALX01

Photovoltaic street lamp ballast features:

FEATURES	VALUES
Working voltage	24Vdc
Maximum absorbed current	Depends on the lamp
Light dimmer control	4 levels
Levels	100%-80%-60%-40% - 20%
Efficiency max	95%
Case	With internal resin layer
For LOW PRESSURE SODIUM LAMP	ALX01/LS-P(*)
For HIGH PRESSURE SODIUM LAMP	ALX01/HS-P(*)
For HALIDE VAPOUR LAMP	ALX01/AV-P(*)
For FLUORESCENT LAMP	ALX01/FL-P(*)



(*)P= lamp power. Example: ballast lamp NAV70 high pressure sodium of 70W: ALX01/HS-70

COMPATIBLE LAMPS

Low pressure sodium 18-26-36-55W; high pressure sodium 50-70W; halide vapour 35-50-70W; fluorescent (either compact or linear) from 18W to 80W. A suitable ballast will be provided according to the lamp type.

LIGHT DIMMER CONTROL

4 levels for high and low pressure sodium lamps: 100% - 80% - 60% - 40%. For halide vapours lamps the brightness value must not be inferior to 80%. If less the light colour will tend towards a green gradation. For dimmerable fluorescent lamps, the brightness reduction (and its relative energy consumption) can be up to 20%. This option allows a battery energy saving according to the general conditions (time, season, type of installation).

TURNING ON

With controlled HV impulse in order to increase efficiency and lighting security also in very low temperature periods.

FUNCTIONING

High frequency >30khz in order to guarantee maximum efficiency.

EFFICIENCY

Max. 95% with >36W lamps. Average 90%

OPTIONALS

ENERECO srl has completed the control and managing unit STL01 with some **OPTIONALS** that allow the improvement of the performances:

STANDARD HOUR RECEIVER: "RX77" FOR DCF77 – "RXTDF" FOR TDF

According to the location, it is possible to use some standards for the synchronising of the digital clock included in the STL01 unit.

The DCF77 standard allows an automatic update of hour and date according to the radio signal emitted by the atomic clock of MAINFLINGEN (D), while the TDF is a synchronisation radio signal coming from ALLOUIS (F).

Thanks to this receiver both the night lighting timetable and the data logger records are precisely synchronised, also during the solar hour/summer-time change



— DCF77 signal from MAINFLINGEN (D). Covered area: within a range of 2000 Km
 — TDF signal from ALLOUIS (F). Covered area: within the range of 3500 km

FEATURES COMPARISON

FEATURE	DCF77	TDF
Location of time transmitter	Mainflingen (D), near Frankfurt	Allouis (F), 150 km South of Paris
Transmission frequency	77.5 kHz	162 kHz
Transmitter type	Dedicated time transmitter	Radio transmitter with additional time signal
Modulation type	Amplitude modulation	Phase modulation
Range (official)	2000 km	3500 km
Operator	PTB ⁽¹⁾	LPTF ⁽²⁾



RX77 UNIT

ENERECO srl can use other synchronisation standards for those countries not included in the DCF77 and TDF range limits. We can provide the customer with proper receivers on request.

⁽¹⁾Physikalisch – Technische Bundesanstalt (Federal Institute of Physics and Metrology)

⁽²⁾Laboratoire Primaire du Temps ed des Fréquences (BNM – SYRTE) – Osservatorio di Parigi

RADIO MODEM XTR-434

In order to make the check of the data logger easier and to read the STL01 data on-line, ENERECO srl provides a radio modem that allows the connection to the STL01 unit. It is possible to have access to the data regarding the photovoltaic street lamp system using two XTR-434 devices. One of them will be connected to the STL01 unit and the other one will be connected to a laptop to be placed within a range of 50 or 100mt, depending on the place where the system has to be installed - countryside or city centre.

FEATURES	VALUES
TX current	28mA
Stand by	100nA
Frequency	433.92MHz
TX out power	10dBm
Max speed	100Kbps



PROXIMITY SENSOR MS20 (ONLY FOR FLUORESCENT LAMP SYSTEMS)

The possibility to lower the lamp brightness of a 20% is essential in cases in which compact or tubular fluorescent lamps with white light are needed or in other occasions such as for decorative street lamps in parks, pavements and seafronts. Actually, the MS20 device can avoid the energy waste of the photovoltaic street lamp system by making the lamp work at the best of its capacity when there is someone passing by while reduces its capacity to 20% if it does not detect any presence within the range of 12 metres.



FEATUREA	VALUE
Time control	1s - 5m
Sensor range	12m/2m/130°
Working temperature	-25°C +70°C
Dimensions	100x77x97mm



REMOTE CONTROL TERMINAL UNIT

The TER15 terminal unit allows to communicate with the STL01 unit without the use of a laptop. ENERECO srl developed this terminal unit to meet the needs of the installers who find the use of a laptop during the installation difficult and bulky. The TER15 terminal unit - connected to the STL01 serial port - makes possible to display the photovoltaic street lamp working.

It also shows fundamental electric data such as: battery tension, current produced by the photovoltaic panels, battery SOC and current used by the street lamp.

Moreover, it is possible to force the lighting of the street lamp and to download the last data logger records so to display them on your computer sit comfortably in your office.



USER INTERFACE SOFTWARE DATALINK 1.0

Thanks to the RS232 serial port of the STL control unit it is possible to use the DATALINK software that allows to display the street lamp working.

The software can download the functioning records and start up the night lighting timetables.

As you can see from the pictures DATALINK is extremely easy to use.

The first picture shows the SYNOPTIC TABLE.

It display all the on-line data about the functioning and allows to force the street lamp lighting also during the day in order to check the cabling after the installation.

The synoptic table allows also to check if date and hour are correct and synchronised with the DCF atomic clock or others and if the battery has reached the maximum and minimum charge.

Another essential value shown in this table is the battery SOC that is the battery State Of Charge in percentage.

Through this value the installer can check if the system is well-balanced just a few days after the installation.

The second picture shows the DATA LOGGER.

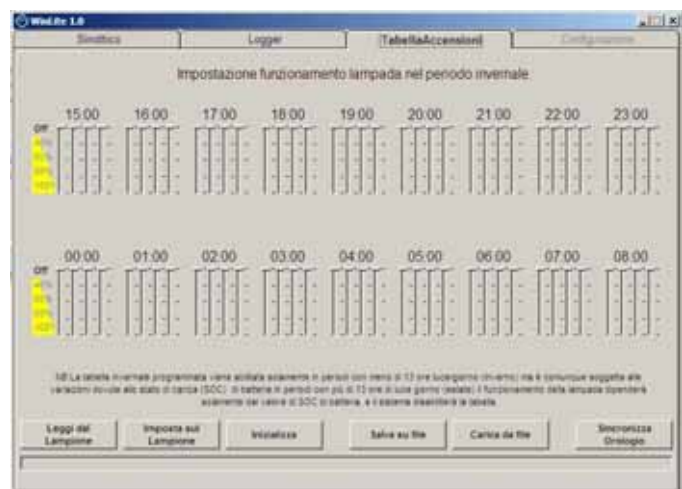
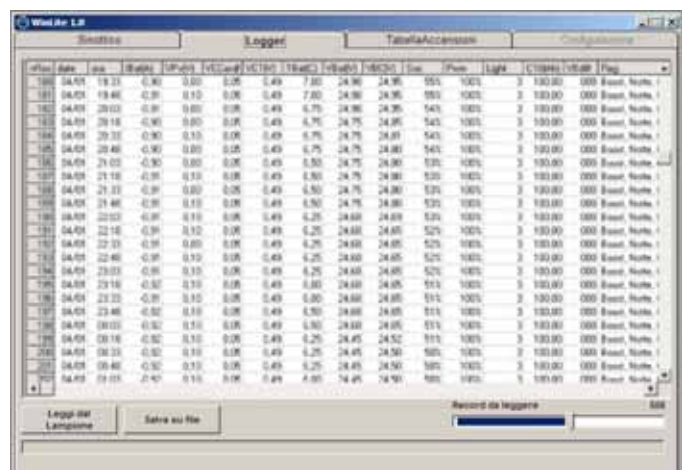
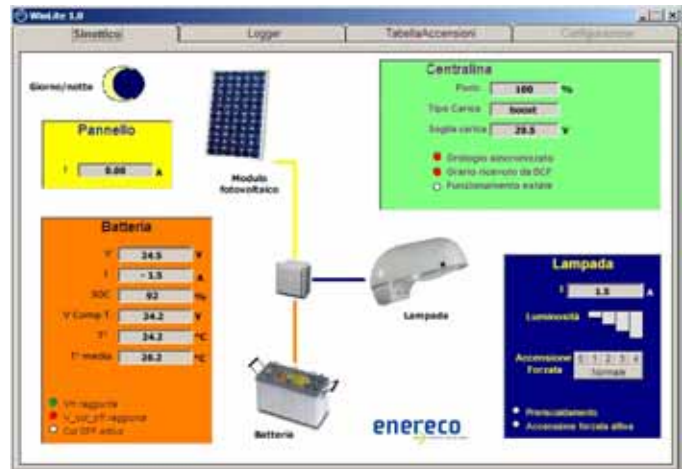
It contains up to 1000 records that refers to the street lamp working of the last 10 days.

The data logger stores not only the working data, but also all the STL01 functions -both activated and deactivated.

The third picture shows the NIGHT LIGHTING TIMETABLES to be set.

Through a series of sliders it is possible to set the suitable kind of lamp functioning (100%, 80%, 60% or 40%) with intervals of 15 minutes.

This procedure allows to save a lot of energy by storing it in the battery in periods when there are more dark hours (winter and spring) and the daily insolation coefficient is low.





TECHNICAL SPECIFICATIONS

“PHOTOVOLTAIC STREET LAMP” KITS⁽³⁾

KIT	LAMP ⁽⁴⁾	LUMEN ⁽⁵⁾	PV FIELD	BATTERIES	CENTRAL UNIT	BALLAST	OPTIONALS
LOW PRESSURE SODIUM LAMPS – YELLOW LIGHT							
STL 18SOX 110	SOX18 – 18W	1800 lm	110Wp	24V/100Ah	STL01	ALX01/LS-18	XTR434 – TER15
STL E26SOX 150	SOX E26 – 26W	3500 lm	150Wp	24V/120Ah	STL01	ALX01/ LS -E26	XTR434 – TER15
STL E36SOX 175	SOX E36 – 36W	5750 lm	175Wp	24V/150Ah	STL01	ALX01/ LS -E36	XTR434 – TER15
STL 55SOX 220	SOX55 – 55W	8100 lm	220Wp	24V/150Ah	STL01	ALX01/ LS -55	XTR434 – TER15
STL E66SOX 220	SOXE66 – 66W	10700 lm	220Wp	24V/200Ah	STL01	ALX01/ LS -55	XTR434 – TER15
HIGH PRESSURE SODIUM LAMPS – WHITE LIGHT							
STL 50NAV 220	NAV T50S – 50W	4400 lm	220Wp	24V/150Ah	STL01	ALX01/HS-50	XTR434 – TER15
STL 70NAV 350	NAV T70S– 70W	6500 lm	350Wp	24V/200Ah	STL01	ALX01/ HS -70	XTR434 – TER15
HALIDE VAPOURS LAMPS – WHITE LIGHT							
STL 35HCI 175	HCI TC35 – 39W	3300 lm	175Wp	24V/150Ah	STL01	ALX01/AV-35	XTR434 – TER15
STL 70HCI 350	HCI TC70 – 72W	6500 lm	350Wp	24V/200Ah	STL01	ALX01/AV-70	XTR434 – TER15
FLUORESCENT LAMPS – WHITE LIGHT (small decorative street lamps)							
STL 2.18DLX 165	2xDULUX D/E 18 – 18W	2x 1200 lm	165Wp	24V/150Ah	STL01	2x ALX01/FL-18	XTR434 – TER15 – MS20
STL 26DLX 150	DULUX D/E 26 – 26W	1800 lm	150Wp	24V/150Ah	STL01	ALX01/FL26	XTR434 – TER15 – MS20
STL 32DLX 175	DULUX T/E 32 – 32W	2400 lm	175Wp	24V/150Ah	STL01	ALX01/FL32	XTR434 – TER15 – MS20
STL 2.32DLX 220	2xDULUX T/E 32 – 32W	2x 2400 lm	220Wp	24V/200Ah	STL01	2x ALX01/FL-32	XTR434 – TER15 – MS20
STL 42DLX 220	DULUX T/E 42 – 42W	3200 lm	220Wp	24V/200Ah	STL01	ALX01/FL-42	XTR434 – TER15 – MS20
STL 2.42DLX 350	2xDULUX T/E 42 – 42W	2x3200 lm	350Wp	24V/200Ah	STL01	2xALX01/FL-42	XTR434 – TER15 – MS20

NB: Other “Photovoltaic Street Lamp Kits” are available on request

⁽³⁾ In the described kits the photovoltaic field and the battery have been calculated in order to allow the lighting during the whole night in every season in sites with an average coefficient of solar radiation of 4,5kWh/m²/g.

⁽⁴⁾ Lamp acronym and power as defined by the producer in the technical specifications.

⁽⁵⁾ Brightness at 35°C as defined by the producer in the technical specifications