TrafiCam - GREEN

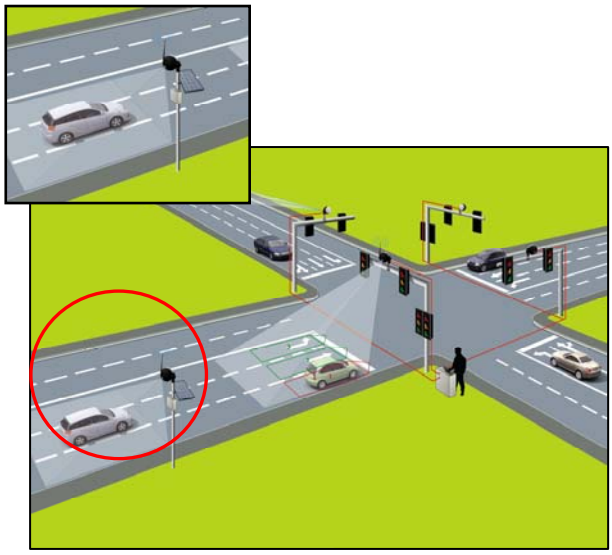
- SPECIFICATIONS -

TrafiCam- GREEN

COMPLETE STAND-ALONE VIDEO DETECTION SENSOR, POWERED BY RENEWABLE ENERGY!

1 - THE TRAFICAM SENSOR, SOLAR POWERED

TrafiCam is a video sensor for ***Vehicle Presence Detection*** at and nearby signalised intersections.



Due to its **low power consumption** TrafiCam is very suitable to be powered by solar energy! **No slot cutting** is required and cable connections are limited to a minimum.

Imagine it only takes the combination of a TrafiCam wireless sensor, a solar panel, a charge regulator and a battery to have a complete stand-alone application for **advance detection**. This is what TrafiCam Green offers! It is a cost-effective alternative for inductive loops and other technologies, **powered by the sun**.

Traficon has already multiple TrafiCam Green applications running in the field. TrafiCam is here used for advance detection at a certain distance from a large intersection.

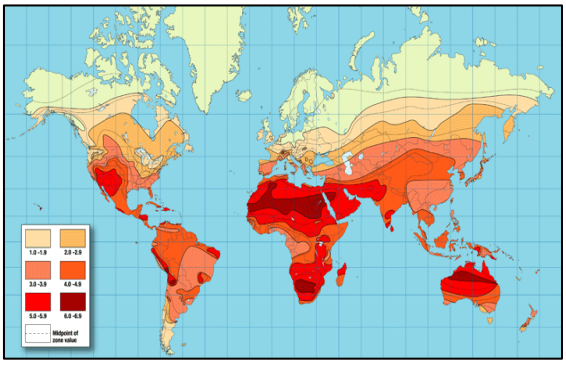
The photovoltaic panel is mounted on the side of a gantry, where TrafiCam is monitoring traffic over two lanes. This application was installed, configured and running in no more than 2 hours. Due to the MTBF of 11 years, TrafiCam offers a very low overall lifetime cost.

2 - CALCULATION OF A PHOTOVOLTAIC PANEL

The intensity of the sun radiation changes with the *hour of the day*, *time of the year* and *weather conditions*. To be able to make calculations in planning a system, the total amount of solar radiation energy is expressed in hours of full sunlight per m², or Peak Sun Hours. This term, Peak Sun Hours, represents the average amount of sun available per day throughout the year.

TrafiCam- GREEN

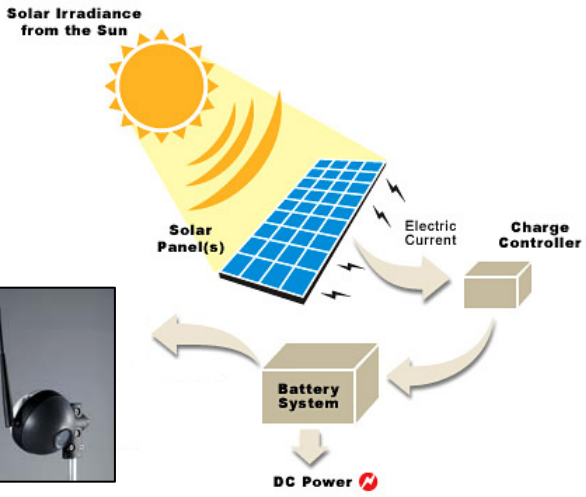
COMPLETE STAND-ALONE VIDEO DETECTION SENSOR, POWERED BY RENEWABLE ENERGY!



(Example of global insolation map)

The daily average of Peak Sun Hours or *solar insolation values*, based on either full year statistics, or average worst month of the year statistics, is used for calculation purposes in the design of the system. A global insolation map is therefore used. The area values are marked in different colours; the darker the colour, the smaller the photovoltaic panel needed for your load.

3 - THE SOLAR PRINCIPLE



Photovoltaic principles are used to produce electricity. A solar panel is made of the natural element silicon which becomes charged electrically when subjected to sun light.

The electric current then passes through a charge controller which charges up the battery. The battery is in fact the actual power source!

4 - CONFIGURATION

What is needed to assemble an off-grid photovoltaic system?

- ***Solar or photovoltaic panel:***

The function of the solar panel is to work as a charger for your battery. It has the same function as an alternator in your car.

- ***Charge regulator:***

This item is very important in a solar system; it does not only help to charge up your battery but also prevents it from discharging completely. It is a full electronic protection of your system.

- ***Battery:***

The battery is functioning as your actual power source. This means that the battery has to give the necessary power for the consumer. It is a key item in your solar project. It must have optimum supply performances, cycle stability and a long life.

- ***Consumer:***

In this case it is the TrafiCam wireless sensor.
(DC consumer 1,5W on 12 V DC)

5 - DIMENSIONING

Important in every stand-alone system is an efficient use of the produced energy.
Only energy deducting DC-consumers should be used.

* An example:

1. Calculation of the daily load

TrafiCam Wireless – 868 MHz ***= 12VDC*** ***1.5Watt***

DC – Consumer	***Input***	***Daily operating time***	***Consumption***
TrafiCam Wireless	1.5 Watt	24 h/day	*36 Wh*
Addition for the battery and system losses (20%)			*+ 7.2 Wh*
Average daily DC need			***43.2 Wh/day***
Average daily Amperage			***3.6 Ah/day***

2. Calculation of the photovoltaic panel

The second step now is to determine the insolation value of the region where the off-grid system will be implemented. These values can be found on various insolation maps or websites. They are often marked in different colours, going from light yellow to dark red, each with their corresponding values: http://www.solar4power.com/solar-power-global-maps.html

Example:

a) TrafiCam wireless in Marseille (FR): › Average daily Amperage= 3.6 Ah/day
› Averages Sun Hours = / 3 h/day
› Required Peak Current = **1.2 Amp.**

To cover your daily consumption we need to have a panel that produces 1.2 Amp in peak sun hour. *(Information from Sunset Solar PV panels)*

- **SM30/36**	Pmax = 30Wp	Immp = 1.74 A	height/width = 685/340

b) TrafiCam wireless in Berlin (DE):

› Average daily Amperage= 3.6 Ah/day
› Averages Sun Hours = / 1 h/day
› Required Peak Current = **3.6 Amp.**

To cover your daily consumption we need to have a panel that produces 3.6 Amp in peak sun hour. *(Information from Sunset Solar PV panels)*

- **AS6506**	Pmax = 65Wp	Immp = 3.75 A	height/width = 788/660

In our examples we have used Sunset Solar as a supplier for the photovoltaic panels. This is not the only manufacturer of solar panels and regulators, there are many more and are very easy to find on the web. A global overview of the required peak current per area is given here in this chart.

The calculations were made for TrafiCam wireless in a 12 V DC environment.

With the data given in the chart it is fairly easy to search for the best fitted solar panel. The parameters used for calculating are the average insolation values. This means that your photovoltaic panel will be oversized during summer months when the average sun hours are higher than in the winter months. Still you need to dimension your grid for the worst months.

Sun hours / day	*Demande peak power*	*SolarCell (Sunset)*	
h/day		Wp	/n
6.90	0.52	10	0.58
6.00	0.60	15	0.87
5.90	0.61	15	0.87
5.00	0.72	15	0.87
4.90	0.73	15	0.87
4.00	0.90	20	1.16
3.90	0.92	20	1.16
3.00	1.20	30	1.74
2.90	1.24	30	1.74
2.00	1.80	45	3.05
1.90	1.89	45	3.05
1.00	3.60	65	3.75

3. *Calculation of the battery*

The battery is the heart of the system. The size of the battery bank will depend on the storage capacity required, the maximum discharge rate, the maximum charge rate, and the minimum temperature at which the batteries will be used. When designing a power system, all of these factors are looked at and the one requiring the largest capacity will dictate battery size. Special batteries for solar systems exist: they are called Dryfit Gel Batteries. These batteries have an optimum supply performance, cycle stability and long life. They have a minimum self discharge and are clean and environmentally friendly. Of course they need to be maintenance-free.

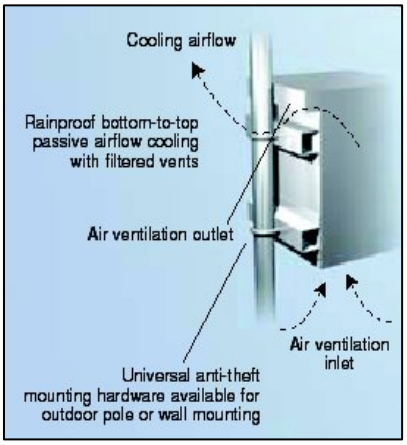
- Our Average Daily Amperage is: 3.6 Ah/day.
- Continuous working time (without recharge): 20 days non stop.
- Battery required is: ***85 Ah.***

4. Choosing a charge regulator/controller

The type of regulator/controller is chosen in function of the maximum load output current of your consumer. In our case that is TrafiCam wireless which consumes only 0.125 A. So a small controller should do the trick. What we do want to have is a controller with the option LVD Low Voltage Disconnect. It means that the controller will prevent the battery from going in to a deep discharge cycle. This will result in a longer lifetime of the battery.

- Our peak load current: 0.125 Amp.
- Controller with LVD: Steca Solsum 6.6c

5. Enclosures for the photovoltaic system



The best type of enclosure to use for the TrafiCam wireless solar system is a pole-mounted one with a front hinged door. A strong fibre glass enclosure must be chosen with enough room for an 85 Ah battery and charge controller. When installed in warmer areas make sure that the enclosure has a natural air circulation and is adapted for outdoor use.

Make sure that the mounting hardware can support the weight of the enclosure and battery (>30kg).

Anti-theft brackets are a good solution against theft and vandalism.

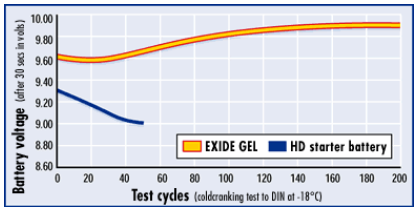
6 - TECHNICAL SPECIFICATIONS

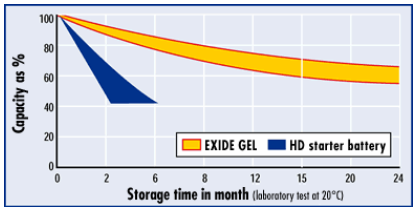
- ***Solar panels:***
  - Small modules: Monocrystalline silicon cells achieve a peak power of 10, 15, 20, 30 or 45 Wp. The solar cells are textured and non-reflective.
  - Medium modules: The cells are made of monocrystalline silicon and distinguish themselves by particularly high electricity output, even on cloudy days. The total power amounts to 65 and 80 Wp.
  - Major manufacturers for Europe: Sunset Energietechnik GmbH – www.sunset-solar.com
    Helios technology s.r.l – www.heliostechnology.info
    Atersa solar – www.atersa.com
    Solarex s.r.l – www.solares.it
    All other manufacturers can be found on: www.enf.cn/reports/market1e.html

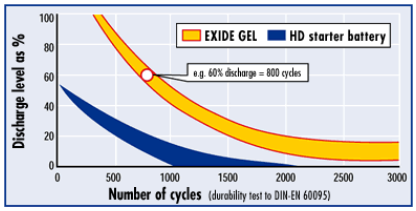
- ***Battery:***

Type	Voltage (V)	Dimensions (l x b x h/mm)	Weight (kg)	Capacity (20 h/Ah)	Capacity (100 h/Ah)	I (DIN)
G85	12	330 x 171 x 236	30.0	85	95	270

- EXIDE – Automotive Dryfit Gel Battery

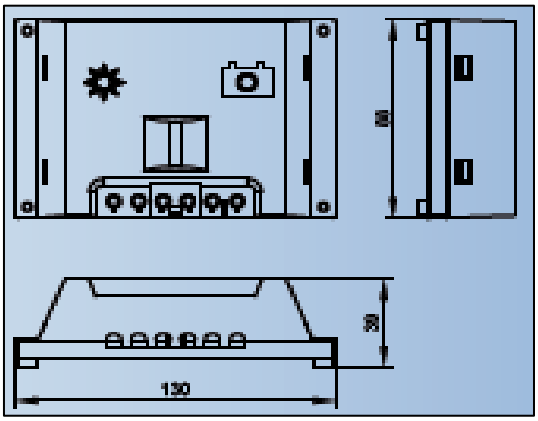






Technical details and product information can be found on: www.exide-automotive.de

- ***Charge regulator/controller:***
  - Controller for small off-grid solutions with LVD



Solar Charge Controller	Solsum 5.0c	Solsum 8.0c	Solsum 6.6c	Solsum 8.8c	Solsum 10.10c
system voltage	12 V / (24 V)				
max. module input short circuit current	5 A	8 A	6 A	8 A	10 A
max. load output current	5 A	8 A	6 A	8 A	10 A
LVD	-	-	✓	✓	✓
max. self consumption	4 mA				
end of charge voltage (float)	13.7 V / (27.4 V)				
boost charge voltage	14.4 V / (28.8 V)				
equalisation charge	-				
reconnection setpoint (LVR)	without LVR		12.6 V / (25.2 V)		
deep discharge protection (LVD)	without LVD		11,1 V / (22,2 V)		
ambient temperature allowed	-25 °C...+50 °C				
terminal size (fine / single wire)	2.5 mm² / 4 mm²				
enclosure protection class	IP 22				
weight	165 g				
dimensions l x w x h	130 x 88 x 39 mm				

Technical details and product information can be found on: www.stecasolar.com

7 - SOLAR PACKAGE

A solar package can be provided by Traficon as a test unit. This unit contains a solar panel, an enclosure with battery and a charge controller. All these items are pre-assembled on a steel frame with the mounting hardware for a pole with diameter of 114 mm. Further details/information on solar applications can be obtained from Traficon's application department.

You want to know more about solar powered video detection solutions?

Ask for:

Henk Verduyn **Tel.: +32 56/36.17.34** **hv@traficon.be**