

PRESS RELEASE

Protoscar LAMPO²: the electric sporty show car boasting “fast-charge” capability.

Executive Summary

LAMPO² is an electric sports car developed by Protoscar. It is an even more energy efficient successor to the LAMPO presented in 2009. Weight, aerodynamics and the efficiency of individual components of the BRUSA drive train have been further optimized in order to reach a world-class energy consumption of less than 100Wh/km-ton under real conditions.

LAMPO² is equipped with 4 different charging modes: a standard single-phase with an up to 3,3kW on board charger for typical overnight home-charge, a “control-pilot” equipped single-phase 6,6kW on board charger typical for public charging, a standard 9,9kW three-phase on board charger typical for charging at industrial plugs (fleet-owners) and an interface for DC fast charging (able to transmit a max. power of 80kW), where up to 100 km of additional range can be charged within just 10 minutes, by an off-board system. Protoscar will compare these different systems in terms of usability and efficiency by demonstrations in real conditions.

LAMPO² will be shown at 2nd of March at the Geneva Motorshow on the e'mobile stand together with different charging infrastructure solutions: a smart home charge device (developed with ALPIQ), the public charging station E-TOTEM and the DC fast-charging station (developed with ABB).

LAMPO² has two electric motors (allowing it to operate as a four-wheel drive with variable torque between front and rear axle for optimal handling, safety and efficiency) with a total output of 300 kW (408 HP), 640 Nm (over 50% more than its predecessor!) and 32 kWh of Lithium-Ion battery capacity. LAMPO² features real sports-car performances: approximately 5 seconds to accelerate from 0 to 100 km/h, 200 km/h of max. speed and a range over 200 km. More than enough energy for driving is produced by a remote solar plant which is installed on the roof of a farm in Tuscany, allowing a real zero-emission drive on a “Well-to-Wheel” basis.

In depth

The Car

Thanks to the lessons learned with its predecessor LAMPO in 2008/2009 which travelled more than 12.000 kilometres across Europe, the installation of components, as well as the performance and functioning of the LAMPO² could be further optimized.

Powertrain & Structure

LAMPO² has two Brusa Hybridsynchron electric motors with transaxle transmission located in the middle of the front and rear axle. Above each electric motor a Brusa EVB1 Li battery pack (Li-ion with polymeric electrolyte based on prismatic Kokam cells) supplies a total rated energy of more than 30 kWh. All other devices such as DC/DC converters, inverters, battery chargers, VCU (Vehicle Control Unit) and PDU (Power Distribution Unit) are located inside the central tunnel and in the back of the car. LAMPO² is based on the GM K platform.

All wheel drive for max. regenerative braking & safety

When accelerating, the load is shifted to the rear axle while during braking it moves to the front axle. The more load an axle holds, the more successful the traction can be transferred to the street. If the two electric motors can have differential tasks (primarily to pull or primarily to regenerate) the total efficiency of the vehicle can be considerably increased. The axles can be singularly disconnected and also be tested for comparison. This optimized traction system has been conceived, developed and implemented together with BRUSA (www.brusa.biz).

Well to Wheel approach

Protoscar not just realises zero emission vehicles, but also cares about the energy needed to let them move. In other words we look at the entire energy chain that a vehicle requires: this is the so called "Well-to-Wheel". On the entire energy chain the attention is focused on the reduction of CO₂ emissions. The energy used by these vehicles comes from 100% renewable energy sources (solar energy in case of LAMPO²).

The exploitation of solar power has been possible thanks to a remote 16 kWh photovoltaic plant located in Seggiano (Tuscany) in the facility of the farmhouse of Vitabella Palazzetto (www.sunnyportal.com/Templates/PublicPageOverview.aspx?page=c07b1bc9-afdd-4ae9-a489-8ffb4fbcea9d&plant=496a607f-3e95-44fe-bef5-4013639397a3&splang=it-IT). The energy produced by this system is put into the global grid and charged into LAMPO²'s batteries around Europe when needed. The goal is to self-produce all the energy that we need for the car getting to counterbalance the entire consumption.

Charging Modes

LAMPO² will be shown with three different charging infrastructure solutions: a smart home charge device, the public charging station E-TOTEM and the DC fast-charging station.

1. Home Charge Device (in association with Alpiq)

90% of the charging process of electric vehicles is done at home during the night. The car gets parked, plugged in the evening and the next morning the batteries are full. In order to avoid an overload for the power supplier, power utilities will have the capability to interrupt or delay the charging process for a short period of time to optimize the recharging process. This interruption can be overruled by the user by paying a small extra charge. For the home charge device Alpiq, the biggest power utility in Switzerland, is Protoscar's partner.

2. Public Charge (in association with Fraunhofer IAO)

Public stations will be introduced more and more in strategic locations in cities, as measures to improve the air quality and reduce urban noise. Also, private companies will provide public stations for their clients and employees. The charging stations can, of course, propose different shapes and solutions. As Fraunhofer IAO promotes a fast and smooth introduction of electric vehicles into cities (Elektromobile Stadt), it is the main partner of Protoscar concerning public charge. E-totem is shown together with LAMPO² at the Geneva motor show 2010 has been developed by Protoscar www.protoscar.com/e-totem and has been installed at more than hundred public charging points in Switzerland.

3. Fast Charge (in association with ABB)

The ABB DC fast charge station is conceived to dramatically decrease the charging time of electric vehicles. According to battery type and their status, an additional range of up to 100 km can be achieved within 10 minutes of charging. This charging solution is mainly intended as range extension, not as a recharge system for full charges, although this would be possible as well (at least between 20% and 80% DOD - according battery type and status).

The ABB DC fast charge follows the CHAdeMO standard. Two characteristics define this standard: protocol and connector compatibility - both will be made available by CHAdeMO, and no IP will limit the diffusion of such systems. Nissan, Mitsubishi, Subaru, Peugeot, Citroen, Think and Protoscar already support this standard from an OEM point of view, while TEPCO is the main driver from a user/public utility point of view.

Public charging & payment system

Several highly sophisticated public charging stations, including power metering and billing per chip cards or other techniques, have been proposed recently, yet their relatively high investment and running cost - causing also high cost per kWh delivered - does not facilitate their widespread application.

The "Park & Charge" concept (www.ecs-five.ch/parkcharge/d/index.htm) has been created in order to avoid high costs of metering and billing. It is a very simple system, and it is based on a flat-rate payment, combining low investment cost with low operation cost - exactly like it happens with the well known yearly "sticker", allowing to pay for the use of

Swiss highways. This service is offered by the Swiss Electric Vehicle Association (ECS) and has been in operation for over 10 years, counting 600 charging points all over Switzerland. At the moment, in EU, there are 1'346 public charging points: over 100 of them are also "Park and Charge". A detailed list of public charging points in Switzerland and Europe is available at: www.lemnet.org.

LAMPO² Features

Dashboard

On the dashboard the "power button" switches the car: so it's ready to move silently. Using the arrow buttons on the left hand side of the steering wheel, the driver can choose the driving direction. Using the "+" and "-" buttons at the same side of the steering wheel, he can optimise his driving mode by choosing between 4 steps of energy recuperation (D1 to D4) as well as the E mode where the car rolls maximizing the benefit of its optimized aerodynamics. When hitting the brake pedal, the car brakes using first the regeneration capability of the electric motors, and then the power of the classical hydraulic circuit.

To control the speed, the driver will refer to the unique digital instrument panel of the LAMPO². In addition to the typical speed functions this device allows to immediately evaluate the power flow (in a separate circular display), which can be positive (accelerating) or negative (regenerating while braking or downhill driving). Maximal power is 300 kW in acceleration and 160 kW in braking. Vehicle and battery status are also shown using "emoticons".

A touch screen for the control of the entire car is installed in the centre of LAMPO's dashboard. It includes the Electric Vehicle Application (EVA), see below.

LAMPO²'s interior is electrically heated. A woven and knitted heating material developed by ITP GmbH with integrated power lead is used for the heating of the seats. Inside the headrest an electric fan blows warm air on driver or passenger's neck in order to guarantee a maximum driving comfort while driving open top. All these functions can be controlled using the central touch screen.

From the outside of the car the perception of the state of charge (SOC) is indicated by 2 LED rows on the front and the rear end of the car. While charging, they progressively light on to indicate each 20% step reached, from 0 to 100%. The SOC can be sent on the driver's mobile phone whenever he wants to know about the charge status of his car.

The research and practical presentation of new, more efficient energy features is carried out in cooperation with various partners and relates to several areas:

EVA Range estimator (in association with VirVe)

For a battery-driven vehicle the accuracy of the possible residual range is absolutely important, and with a simple 0-100% indicator, it is impossible to be precise enough. In fact the range depends on several highly variable factors, e.g. topography (upward/downward slopes) or environmental temperature. These variances should be included in the residual autonomy indication – but they are not considered in today's EVs. Thanks to an interactive advanced navigation system, the Electric Vehicle Application (EVA) found in the LAMPO² series vehicles provides drivers with real-time information on how far they can drive based on their current battery charge and future driving conditions, drastically improving the consumer acceptability of battery electric vehicles. The distance

to the nearest charging station, as well as extended route planning, among other functionalities are also provided. The EVA system is being developed in cooperation with Virve (www.virve.ch).

Intelligent charging system

Some charging parameters like the earliest charging time/last charging stop, maximal charging yield and charging status to be achieved by the end of charging, will regulate the onboard chargers.

The user of the vehicle is able to choose and set - directly in the vehicle - some charging parameters which will control the onboard battery charger, e.g.

- Earliest charging time/ latest charging stop
- Maximum charging yield
- Charging status to be achieved by end of the charging

Exterior Design

LAMPO²'s style follows the philosophy of the whole project that combines two apparently opposite characteristics: ultimate performances & maximum efficiency. The lines of the car are very masculine and dynamic, but the surfaces are gentle, so that the feeling created is a mix of power and smoothness. In addition to that, some elements complete the "efficient look" of the vehicle, like the "rear wheels cover" and the hard wrap around aerodynamic edge on the rear with integrated spoiler.

LAMPO²'s ecological water-based colours have been developed by "BASF coating". Once again they underline the two facets of the car represented by its ultimate performances and record efficiency. The mat yellow body colour in contrast to the dark anthracite areas and the dark interior emphasizes the sportiness and stylishness of the roadster.

Protoscar

Protoscar SA (www.protoscar.com) is a design company founded in 1987 specialized in CleanCars and based in Rovio (Ticino, Switzerland). It presently employs 14 specialists. We act like a "Minergie-architect", but apply the efficiency-concepts to cars, mainly by introducing electrification.

Our unique experiences and holistic approach allow us not only to develop forward looking strategies and outstanding vehicle concepts, but also to support the market introduction of CleanCars and the communication activity of these technologies.

We are proud to include worldwide companies like Alpiq, Fraunhofer IAO, ABB, Daimler AG, GeneralMotors, Rinspeed-Esoro and Nissan among our faithful clients.

Vehicle's name and logo

LAMPO² - "2" because it is not just the second car within the LAMPO project developed by Protoscar, but it is even more efficient than its predecessor. In the Italian language LAMPO means „lightning“. A lightning stands for power, especially for electric energy like the one propelling LAMPO². Moreover a lightning is fast, intense, impressive and, last but not least, LAMPO² is a product of nature.

The edgy logo of LAMPO² with its straight lines reminds the lightning and emphasizes the electric spirit of the car.

Innovative top-down approach

With LAMPO² we clearly apply a top-down approach, instead of a bottom-up strategy. In fact, the automobile sector is normally based on this approach which consists in initially showing trendy characteristics in exclusive, premium, vehicles. Unavoidably, at first the price of such products is very high but with growing production the prices decrease, allowing a large number of people to have access to the new technology (in other words the first buyers allow the technology to circulate). However, in the electric vehicles market the strategy is often contrary based on a bottom-up approach. This is the reason why electric vehicles are not always successful. In today's market the majority of the EV promoters try to sell electric cars as a "rational vehicle" and forget the emotional aspects. But as a matter of fact, for most buyers a car is essentially an emotional object and not only a means of transport. The LAMPO² as well as its predecessor LAMPO shall demonstrate that electric drivetrains can be perceived positively and totally accepted if placed and launched in a different way.

Sponsors & Partners

Protoscar would like to thank all partners and sponsors who have allowed such an ambitious project as LAMPO to become reality: In addition to BRUSA, which supplies the components of the whole drive train, the main partners and sponsors of the LAMPO² project are ALPIQ (the leading Swiss company in power generation and distribution, which is actively promoting the goal of 15% of electric vehicles in Switzerland by 2020), the German Fraunhofer Institute IAO (EV-specific features and MMI, as well as optimization of the ergonomics), ABB (DC fast-charging technology), Credit Suisse (one of the world's leading financial services providers) and the Swiss Federal Office of Energy as well as the technical partners Metaltool and Q11.



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