



## PORSCHE 919 HYBRID: DEVELOPING AN INNOVATIVE HEADLIGHT

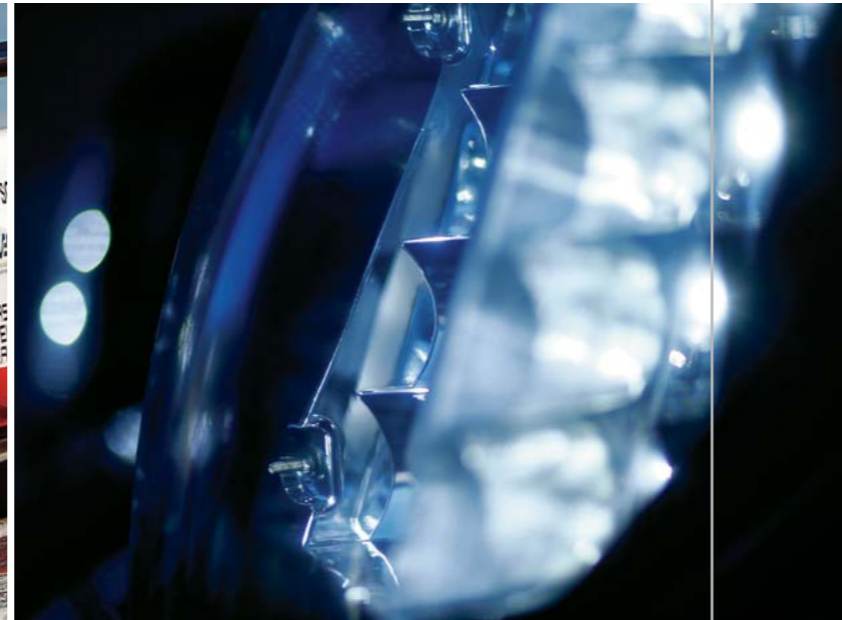
### A NEW LIGHT FOR A PRESTIGIOUS RACING CAR

Bertrandt has worked with Porsche for some time on development projects for its production models. Recently it was asked to take on an innovative motor sport project which involved developing and manufacturing a much brighter and lighter-weight headlight with an improved design using carbon fibre. The innovative light unit was created specifically for the Le Mans 24-hour race. >





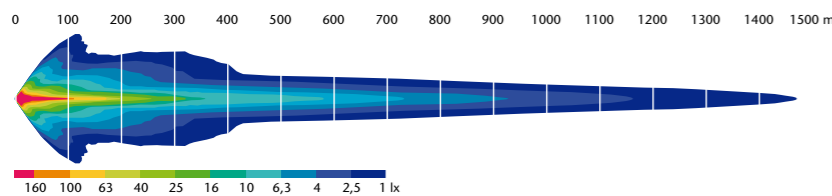
Each headlight has twelve pairs of LEDs and reflectors.



The latest hand-picked LEDs in the new lighting unit.



Impressive side lighting and range in the 919 Hybrid.



Range and distribution of the light from the 919 Hybrid headlamp.

Speed was needed to complete the entire development process for the 919 Hybrid, from the initial concept through to the small-scale production of 30 headlight units per year. Bertrandt had only a few months to develop a completely new headlight, including the design specifications, the concept and detailed design, the layout of the lenses, the thermal simulation and testing, followed by the structural and joining systems and ultimately production. In addition, suitable suppliers had to be identified and managed.

#### The special requirements of motor sport

The particular requirements for the racing car included a very robust, lightweight design, together with high-performance components. These demands could only be met as a result of Bertrandt's comprehensive expertise and long-term experience of designing lighting systems and lenses, using new materials and creating lightweight components in carbon fibre. Other success factors were Bertrandt's interdisciplinary network of highly motivated

specialists from its simulation, testing and prototyping teams, the problem-free internal cooperation and the competent supplier management service, all of which allowed the headlights to be produced quickly and cost-effectively. The early involvement of all the internal and external partners in the project proved to be another beneficial factor. The first headlights were delivered only five months after the project kick-off. The high quality of the products ensured that they functioned perfectly throughout the entire racing season. The main milestones in the development process were the creation of the first sample components and the assembly of the first headlights from individual parts. The excitement reached fever pitch when the headlamp unit was used for the first time during a light test on the Porsche skid pan. With its high-performance lighting, the revolutionary headlamp put every other light in the shade. It also proved to be highly robust, which boded well for the legendary Le Mans race, where the tough conditions mean that materials are exposed to extreme stresses.

## IN BRIEF

### PORSCHE 919 HYBRID HEADLIGHT



#### Lighting technology

- Analysis of the previous year's headlight, lighting concept, design of individual reflectors, selection of the type of LED, lens simulation, lighting measurements

#### Thermal management

- Cooling concept, thermal simulation, thermal tests

#### Design

- Use of lightweight technologies, CFRP components, design for ease of production, tool design, drawings, assembly documentation

#### Prototypes/small-scale production

- 3D printing, tool making, plastic injection moulding, coating CFRP, joining CFRP components, assembly equipment, final assembly

#### Project management

- Project coordination, supplier management (electronics, CFRP components)

#### At the limits of what is technically feasible

The revolutionary headlight unit was a huge success in its first endurance race at the Spa-Francorchamps circuit. The luminous flux emitted by each light amounted to 12,000 lm. The maximum light intensity was more than five times that permitted for road vehicles and gave the lights a range of 1.5 km. The system is equipped with the latest LEDs from Osram, which were hand-picked, and has three different functions: pencil beam (ultra-long-distance light), main beam and side beam. Twelve pairs of LEDs and reflectors per headlight unit are split into seven individually controlled strings for long-distance and cornering light. The characteristic Porsche four-spot light design has been retained when the lights are in daylight mode and the control unit is fully integrated into the headlamps. Special features of the new lights included improvements in side lighting and range, an almost 30 percent weight reduction, a simplified assembly process and better cooling functions.

Compared to the previous year's version, the number of LEDs was doubled, while the weight of each headlight unit was reduced by 1.1 kilograms. In addition, each headlight has 20 coloured LEDs which allows the two cars to be distinguished from one another. The light unit can be installed and removed quickly because it consists of one robust, easy-to-handle module. The development of the new lighting unit made a significant contribution to Porsche's 18th overall win at the Le Mans 24-hour race and to its victory in the FIA World Endurance Championship (in the team and driver rankings).

#### The next GT racing project

After the success of the headlight in the World Endurance Championship, Bertrandt was commissioned to take on another project. A new, robust headlight system has to be developed for the Porsche 911 RSR which will be taking part in a number of different endurance racing series in 2017. ■

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