Tue, 24 January 2023
Weekly Newsletter

DVN
Lighting & ADAS

NEWSLETTER #787



# Editorial

## Lumileds: Car Light Sources And Solutions Galore


It's reasonable to assume every DVN reader knows about Lumileds; they're a super-major global supplier for all vehicle lighting tier-1s. As the pioneer of red LEDs for automotive rear applications, have built up a complete portfolio of white and amber LEDs for front lighting as well over the years. Recently I visited the Lumileds team in Aachen. Alexander Dijk; Holger Weinert; Dirk Vanderhaeghen; Lars Dabringhausen, and Christian Kalkschmidt gave me a warm welcome and showed me their latest product application demonstrators in their Application Lab. We also had some interesting conversations and discussions about the company's new products and innovations.

The team introduced me to their extensive portfolio of LEDs. The white 1 $mm^2$ single LEDs are one of the most important products. To adapt to diverse customer needs, Lumileds can change the size of the light emitting area and the characteristics, yet still keep the product based on the same chip during the conversion process. Lumileds, as the pioneer of red LEDs for automotive rear applications, has built up a complete portfolio of white and amber LEDs for front lighting over the years.

A highlight of the visit was the tour of their new production facility for Luxeon Go and Luxeon 3D LEDs. The Luxeon Go product portfolio is a modular set of standardised light sources with precise positioning of the LEDs and a simple referencing system. These are

now in series production. Another new product innovation with very interesting vehicular application possibilities is the Luxeon 3D LED, a flexible and very compact light strip embedded in silicone, which emits light in a very homogeneous way and can follow contours on the vehicle.

During the day, we talked at great length about other very interesting products under development or pre-development, such as microLEDs and an ADB matrix array called Luxeon NeoExact. It is quite apparent that Lumileds will continue to surprise us all and remain a giant presence in the development and manufacturing of light sources and lighting solutions for vehicles. Read all about it in this edition of the DVNewsletter!

Moreover:
The **DVN CES Report** goes live today. It's packed with pictures and descriptive text so you can discover the innovations we saw at the show in lighting; lidar, and car interior technology; technique, and materials. Next week we'll be publishing a terrific report on TU Darmstadt's lighting activities.
These two reports will be printed and available for every attendee of the DVN Workshop happening in just one week's time. It's going to be an exceptional event and you won't want to miss it, so if you haven't yet done so, **Register to attend here** and **Book your room here** before

*Gerd Bahnmüller*
*DVN Advisor*

# In Depth Lighting Technology



## DVN Interview: The Aachen Lumileds Team


CHRISTIAN KALKSCHMIDT, DIRK VANDERHAEGHEN, GERD BAHNMUELLER, LARS DABRINGHAUSEN, HOLGER WEINERT

DVN had the opportunity to interview a dynamic team working to bring better and better vehicle lighting to the world's roads: Alexander Dijk (VP of commercial automotive); Holger Weinert (EMEA director of business development); Dirk Vanderhaeghen (senior director of strategic marketing); Lars Dabringhausen (product marketing director), and Christian Kalkschmidt (EMEA senior application team manager) at Lumileds' Aachen facility. The team presented the latest developments and innovations in an exclusive private tech show, just for DVN.

### DVN: It's been two difficult years due to the pandemic—what impact has this had on your business, and what challenges do you face?

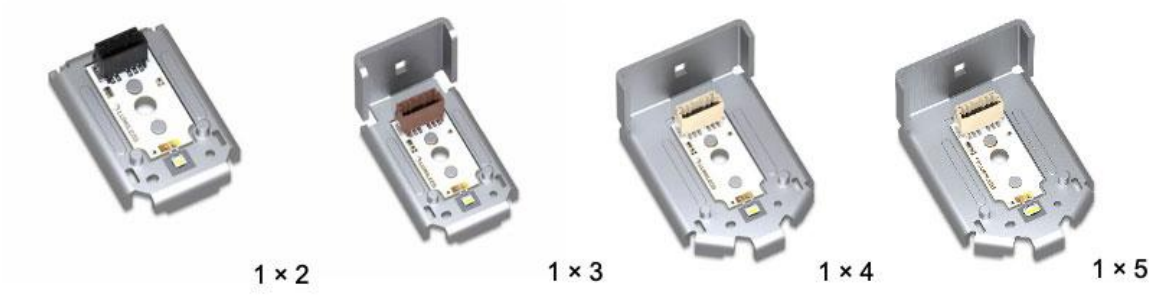
**Alexander Dijk:** The pandemic and geopolitical conflicts have put negative impact on today's global macroeconomic situation. Also, Lumileds business as a tier-2 light source solution supplier has been impacted by lower platform run rates and lower LED take-rates due to component shortages; cancelled car production builds and delayed new

program ramp-ups. Rising energy costs and materials prices have forced us to take necessary corrective measures.

The main challenge is to get back on a growth track, which secures sustainable investments in new innovations. There is plenty of opportunity for new application innovations such as digitalisation of exterior lighting; car body lighting with personalised signatures and illuminated surfaces; surround-car road projection, and light communication displays. However, all these require significant technology development and industrialisation efforts across the value chain to fuel the growth of the market.

## DVN: You have developed, in cooperation with your customers, a modular set of standard LED modules called Luxeon Go. Now you offer these products to all customers and mass production is running in Aachen and Pabianice, Poland. What makes this product sexy?

**Dirk Vanderhaeghen:** Indeed, Luxeon Go is on the road now as a modular headlighting solution in high volume car platforms worldwide, including the Jeep Renegade (Brazil); Ford Focus (Europe), and Ford F150 (US).

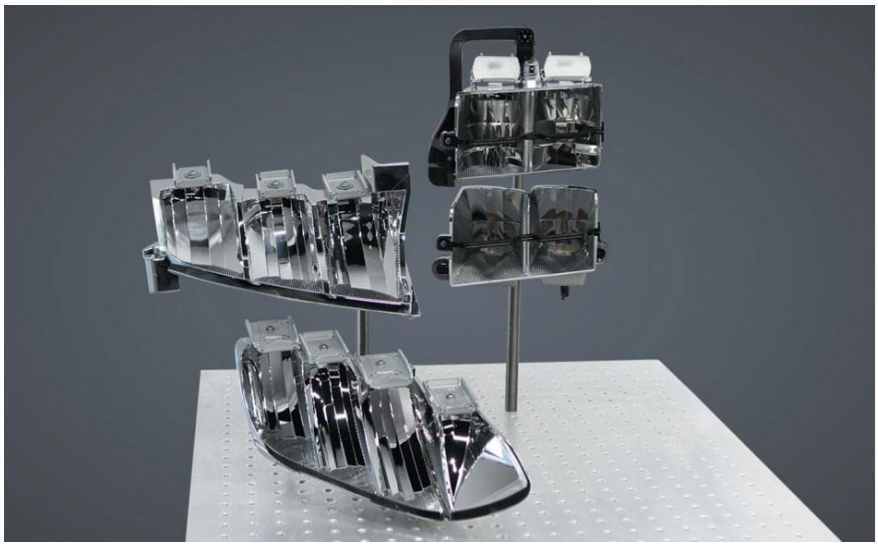



SELECTION OF LUXEON GO MODULAR LIGHT SOURCES FOR REFLECTION TYPE APPLICATIONS

In the coming months, many more platforms will be added to this list. Some of the first headlamps equipped with Luxeon Go were presented at this year's SIA Vision Conference in Paris. To fulfill the increasing demand, Lumileds continued to invest and opened a third production location the middle of 2022 in Jiaxing, China, focusing on the local Chinese market and the ASEAN region. Together with our two existing production sites in Aachen, Germany and Pabianice, Poland, we are even better prepared to serve all setmakers worldwide.

**Christian Kalkschmidt**: Our customers appreciate that Luxeon Go is an off-the-shelf solution offering outstanding optical and thermal performance; compactness, and mechanical accuracy, while at the same time helping them avoid capital spending and reducing the effort needed for development; validation, and release. Next to the product itself, we are offering on request also professional design-in support via our regional TechCentre teams.

**Holger Weinert:** The current product portfolio is designed to cover a wide range of reflector-based headlighting functions like low beam, high beam and cornering light, but it is not limited to this. The special benefits of Luxeon Go, especially superior thermal performance and compactness, can also be applied for projection and light guide applications. Corresponding studies are currently running in close alignment with potential customers. Hence, we are very confident that our Luxeon Go portfolio will further grow to cover more and more applications in car headlighting all over the globe.



HEADLAMP REFLECTORS WITH LUXEON GO LIGHT SOURCES

## DVN: I was impressed by the first production line for small batches of your '3D LED'. Can you tell us more about this product and your expectations?

**Holger Weinert:** We extended our industrial footprint to add an additional fully-automated high-volume line to serve the first two platforms on the road, the Audi Q8 e-tron and Hyundai Grandeur. Luxeon 3D LEDs provide excellent homogeneity under any viewing angle, in a very compact package beating any conventional solution for build-in depth. The geometrical flexibility allows lamp designers to create never-seen-before designs. We have several projects in the pipeline hitting the road soon, and we expect more to come.

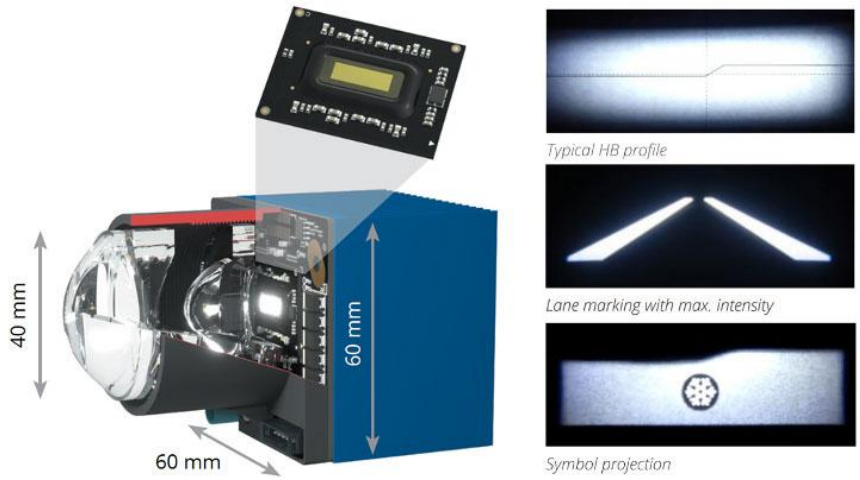
LUXEON 3D LED PRODUCT RANGE WITH APPLICATION EXAMPLE

## DVN: What are the next steps the lighting family will see within this product family?

**Holger Weinert:** The first two applications, position and tail/stop lights, are obviously realised by Luxeon 3D LEDs in white and red. Colour proliferations to cover the full range of automotive applications, including indication for autonomous driving, are the first steps for product extension. Lumileds' Versat LED packaging allows also establishing bi-colour functionality in the same Luxeon 3D LED packaging. Already today, Luxeon 3D LEDs support a large variety of animation scenarios, and a range extension is under development. And to match Luxeon 3D performance better to the application needs of position and tail light functions, a version with lesser brightness is on its way, planned for SOPs in 2024.

**DVN: You started developing µLED arrays a few years ago. What are your views and thoughts on this product and on LED arrays in general?**

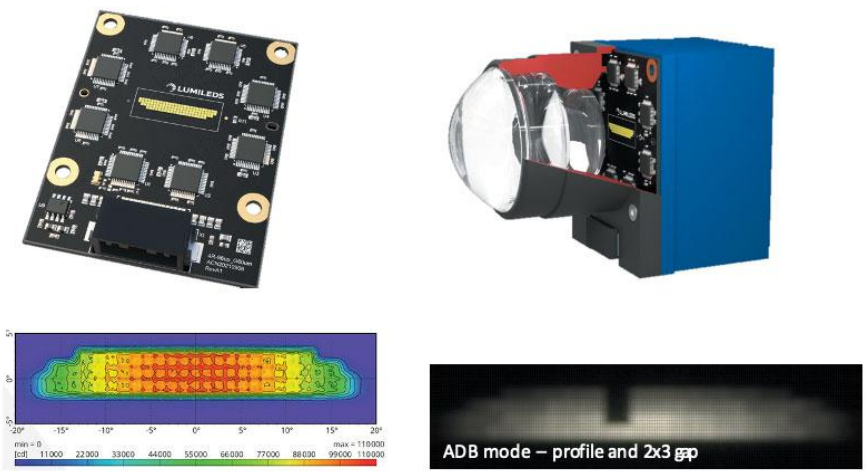
**Lars Dabringhausen**: MicroLED is clearly acknowledged as future winning light source technology for digital headlighting solutions, due to its superior energy efficiency and the compact system size. The compactness is enabled by direct imaging of the microLED light-emitting area (LEA) onto the road. Our µLED has a relatively small LEA which enables smaller lens diameters or optimised optical system efficiencies. Our first-generation µLED solution development is already at a progressed stage, and will soon be ready for design-in of customer series projects. Learning from the first projects will lead to further product feature improvements in the coming years, like higher efficacy and resolution of the microLEDs and field-of-view improvements of the systems. So, there is attractive roadmap potential, however smart choices and priority settings for the related investments are needed.




LUMILEDS' MICROLED FOR DIGITAL HEADLIGHTING (20 KILOPIXELS; ASPECT RATIO 1 × 3)

While µLEDs can serve in optional headlamps and in premium cars, LED arrays or matrices are needed as base solution for the ADB application. Luxeon NeoExact pixel count customisable LED array-on-board configurations enable direct imaging solutions for this application space, with the same benefit of system compactness.

Currently, we are working to show that direct imaging optical systems using Luxeon NeoExact can also be a solution path to fulfil the transition zone requirements of the new ADB requirements for North America. This will certainly further increase the market potential for direct imaging light source solutions.




LUXEON NEOEXACT ADB MATRIX: REFERENCE DESIGN FOR A 4-ROW, 96-PIXEL MATRIX SYSTEM

## DVN: What Lumileds surprises for the vehicle lighting community are in the pipeline that you can share with us?

**Dirk Vanderhaeghen:** As mentioned earlier, many new lighting applications are emerging and will offer additional safety and comfort functionalities and styling features to the end user. These new kinds of lighting solutions all require innovative light source technologies. The digitalisation of exterior lighting functions demands higher resolution and individually-addressable LED lighting solutions. Digital headlighting beam (HD-ADB) is a first of a kind application use of microLED technology. However, the market potential is much bigger and many future applications will benefit from this next generation of LEDs.

Today microLEDs are emerging in various consumer applications—display and augmented reality—and we are exploring such synergies across multiple markets to fuel and accelerate development. MicroLEDs will offer our automotive customers opportunities to create never-before-possible solutions in the era of interactive; communicative, and automated cars.

HIGH-BRIGHTNESS LED SOLUTIONS FOR SURROUND PROJECTION (APPLICATION EXAMPLES: LUXEON FX2-L SERIES FOR GOBO PROJECTION; LUXEON ALTILON INTENSE FOR MLA PROJECTION

# Lighting News

## CES 2023 Report Published Today

LIGHTING NEWS


Below few innovations presented in the CES report published today

### BMW i Vision Dee Concept


The front, rear panels become displays with emotional content. Lighting are used to be emotional.

## Peugeot Inception Sets EV Design Direction

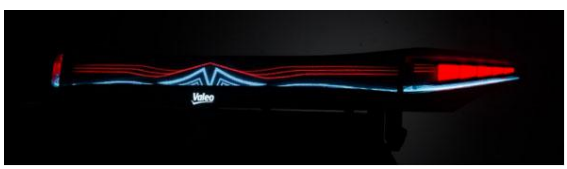
Grilleboard includes Peugeot's signature claw shaped DRLs, with single piece of glass incorporating lighting and sensors. A 'tech bar' running horizontally along the door sends messages to the driver.


## New Sony-Honda EV Brand, Prototype Unveiled

Front and rear exterior includes what SHM are calling a 'Media Bar' which will use light to communicate with people in the car's vicinity. The Lidar sensor is placed on the roof in a central position above the interior mirror. A perfect position for the function.

## Valeo: Dynamic OLED and Front/Rear Ends


Vehicles will have to communicate with their environment, making lighting a key tool. Intelligent pixelated surfaces can be used to share clear, real-time information.

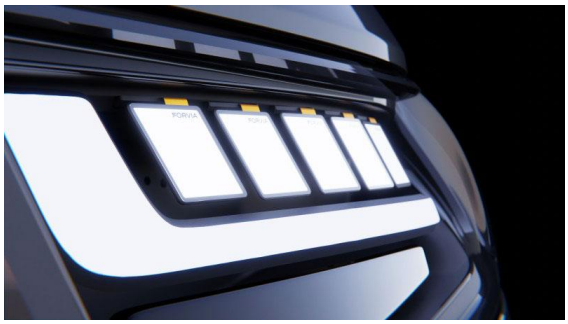



Extended lighting features offer ways for customers to get creative and personalise their space.

## FORVIA/HELLA


**World's first SS HD headlamp**
The technology offers the ability to project
digital symbols in front of the vehicle that can
define vehicle width within a construction zone or driving path illumination

**Dynamic Lighting with superior styling.**
It provides up to 80% reduction in energy consumption compared with conventional taillights, and digital, flexible integration options configurable for automaker-specific design needs, including the Digital Headlamp Solid State Lighting High-Definition.



**FlatLight in Production as DRL**

Based on micro-optics
Size of 15µm

## Mobis: Prism module and lenticular grille lighting

New product called prism module.
Lighting product combines low beam and DRL
into a single module just 12 mm thick,
Gives headlamp designers a much greater
degree of freedom.
Also presented lenticular grille lighting.

# NALYSES Project for Sustainable Headlamps

LIGHTING NEWS

Together with partners, Hella are researching how headlamps can be made more climate-friendly, and have started NALYSES, a three-year project is funded by the German Federal Ministry of Education and Research.

The results of the project are to flow into the development of future headlamp generations and to be made usable for other application and product areas.

The aim of the research project is to design and produce products that are more resource-friendly and lower in emissions. Within the framework of the NALYSES project, the participants are looking at the possibilities for reducing the $CO_2$ footprint of a headlamp over its entire life cycle. Essentially, the project will use headlamps to research how products and raw materials can be used for as long as possible in the sense of a circular economy. The project is especially relevant because the findings go far beyond the headlamp as a product. For example, the approaches from the project are also to be transferred to vehicle components from the electronics sector and to other industries, such as the production of household appliances.

The investigations begin with the selection of sustainable, low-emission materials. The researchers are looking at how recycled or bio-based plastics can be used. Michael Kleinkes, responsible for development in the lighting sector at Hella, says product design also plays a decisive role: a sustainable headlamp should be both repairable and recyclable to increase service life; conserve resources, and contribute to the circular economy. Individual components should be able to be reprocessed and recycled at the end of the headlamp's life.

Among the other partners, BMW define the overall system requirements of the automotive manufacturers, while Covestro and Hamm-Lippstadt University of Applied Sciences contribute their expertise in sustainable materials. The University of Paderborn and Fraunhofer IEM are developing a digital product twin that can be used to quickly and efficiently evaluate recyclability and the impact of material selection or design on the carbon footprint. Household appliance manufacturer Miele are involved in the research project in order to transfer findings to other industries.

# LG-ZKW Superintegrator Combines Lighting, Display

LIGHTING NEWS


LG Electronics Vehicle Component Solutions and their Austrian subsidiary ZKW have jointly developed a combined lighting and exterior display system for vehicles. Their Superintegrator concept opens up new design and communication options for vehicle designers and automakers.

Among other things, the concept makes it possible to put any lighting design or display message on the grilleboard of a vehicle. The light guide technology for the DRL; position light, and turn signal comes from LG. The complete lighting technology, including the communication display, was developed by ZKW. The futuristic design of the Superintegrator was created by LG Electronics' Design Department.

The system makes it possible, for example, for the vehicle to greet its driver on the display ("Hello Mr. Smith") when the driver approaches the vehicle. It can also show the battery level and status messages for EVs. In the case of cabs or rideshares, the system could greet the passenger by name and provide a light carpet to find the ordered vehicle. Thanks to software control, part of the display can also be used for customisable DRLs, allowing passengers to travel with their own light appearance.

In the future, the concept will be used for communication with other road users. This is particularly interesting for automated vehicles. With additional sensors, the functions of the Superintegrator could tell other road users that the vehicle is currently in automated mode or communicate messages such as 'I see you', to ensure safety. ZKW CEO Wilhelm Steger says "With the integrated display, the Superintegrator fills the gap of the lack of communication between AV and other road users".

See below, the ZKW team present at the CES.


*U. HORNFECK (CTO), D. LINGO, C. BRENT, J. AMRHEIN, G. BÖHM (HEAD PRE-DEVELOPMENT ZKW GROUP), V. HOSKO, W.STEGER (CEO ZKW GROUP), A. WIMMER, A. PANDEY*

# Mind's Brilliant Technology and Process

LIGHTING NEWS

Mind have a Magic Cube module to realise the matrix integration of signal and illumination through nine optical lenses of 20 × 25 mm, able to provide low beam; high beam; DRL; position light; and ambient lights. It uses Mind's latest innovative processing technology of "brilliant optical pattern mold processing". Thickwall parts give the lamp a more refined lit and unlit appearance.

In addition, it provides more freedom in the design of complete lamp, and it can match the arrangement of modules according to the styling of complete lamp.

Customised DRL signatures can be used to display different driving modes; different car models, or even express the mood of the owner. At the same time, it supports personalised dynamic welcome scenarios; provides abundant lighting combinations, and enables the headlamp to form a variety of personalised patterns.

Hossein Nafari, VP and R&D director of Mind, will give a lecture entitled *Lighting Evolution From Digital to Meta* at the DVN Workshop on 31 January-1 February in Paris.

# Tokyo Salon: Japan's automakers get Creative, Funky

LIGHTING NEWS


The Tokyo Auto Salon started on 13 January.
Here is a look at what is going down at Japan's annual motorhead event.


HONDA MUGEN ZR-V COMPACT CROSSOVER


TOYOTA CROWN


LEXUS RX OUTDOOR CONCEPT


LEXUS GX OUTDOOR CONCEPT

LEXUS RZ SPORT CONCEPT


MITSUBISHI DELICA MINI SNOW SURVIVOR

MITSUBISHI DELICA MINI COLEMAN

NISSAN GT-R

NISSAN FAIRLADY Z


NISSAN ARIYA

# Bentley design chief Mindt to head VW brand styling

LIGHTING NEWS

ANDREAS MINDT

JOZEF KABAN

VW brand is replacing its design chief, Jozef Kaban, with Bentley's design boss, Andreas Mindt, according to company sources.

Mindt's successor at Bentley will be Tobias Suehlmann, who currently heads exterior design at the VW Group ultraluxury brand, people familiar with the matter said. Suehlmann joined Bentley in October 2021, having previously worked at Bugatti, Aston Martin, McLaren, and VW brand.

Andreas Mindt, 53, is also a VW Group veteran. He grew up in Wolfsburg, home of VW's global headquarters. His father was a designer at VW.

# Driver Assistance News

## New Lumotive Chip is Better All Around

DRIVER ASSISTANCE NEWS

Every automaker (except the one led by scornful denier Elon Musk) considers radar and lidar crucial for effective, safe enhanced automated driving beyond $L^2$ automation. Lidar is transitioning from electromechanical systems to solid-state devices.

Despite improvements made in the areas of cost, size, and reliability, there have been unacceptable tradeoffs in range; resolution, and field of view. Now Lumotive say they have an optical semiconductor to meet those challenges, called a light control metasurface. At the core of the Lumotive microchip is a patented metamaterial with 'smart' properties capable of blocking; absorbing; enhancing, and bending electromagnetic waves to achieve sensing performance exceeding that of conventional materials. The Lumotive chip's scalable, solid-state 3D sensing architecture uses patented beam-steering technology with no moving parts to deliver best-in-class performance; cost; reliability, and compactness, says Lumotive CEO Dr. Sam Heidari.

The Lumotive chip is the key component of the company's Open Lidar API (application programming interface), a technology aimed at leading the industry towards scalable, ubiquitous and lower-cost 3D sensing. According to Heidari, more than two dozen companies currently are evaluating the LCM technology.

# Koito to Buy More Cepton Shares

DRIVER ASSISTANCE NEWS

Koito will buy more shares of Cepton. The two companies worked on co-development of automotive lidar in 2018, and are currently promoting the development to launch on the market and mass produce of their midrange lidar. In addition, to facilitate $L^3$ and higher ADAS and AVs, Koito and Cepton are also developing short- and long-range lidar with higher definition.

Koito have invested USD $100m in Cepton so far, and now will buy $100m worth of convertible non-voting preferred securities (CPS) convertible into Cepton common stock. Koito also will appoint another of their own directors to be a Cepton director, to extend the cooperative lidar business collaboration. Aiming to realise Koito's Management Plan 2030, the company are developing lidar, which contributes to safe and secure mobility, intending to grow it as a second pillar to their already-strong vehicle lighting equipment business. In addition to development of lidar itself, Koito will commercialise lamps with inbuilt lidar sensors, and apply their expertise in the increasingly-linked lighting and lidar fields to other sectors, such as smart infrastructure.

# General News

## Jeep Avenger is European Car of 2023

GENERAL NEWS

The new Jeep Avenger has won the coveted European Car of the Year award for 2023. It's the first-ever electric Jeep, and the first Jeep ever to win this prestigious award in the competition's 60-year history.
The Avenger was shortlisted along with six other finalists: the Kia Niro; Nissan Ariya; Peugeot 408; Renault Austral; Subaru Solterra / Toyota bZ4X, and Volkswagen ID.Buzz.

The winner of the trophy was chosen by the votes of 57 automotive journalists from 22 countries. The Avenger had 328 points and 21 top votes, and won with an 87-point lead over the second-placer. 56 of the 57 journalists ranked the Avenger on the podium.

Søren W. Rasmussen, the new chairman of the Car of the Year jury, says of the result: "The Jeep Avenger has more than earned its title of Car of the Year 2023. It convincingly reflects the era into which the automotive world has entered, and through its design it heralds the great change that the brand is about to face. [It] is a real European car, and its excellent characteristics make the jury very satisfied with this title of Car of the Year 2023".

# Opels Scoop Up Awards

GENERAL NEWS


Opel have once again proven successful with the public and with experts and award-juries alike. This is evidenced by commercial successes such as their Corsa, the best-selling city car in Germany in 2022, and their Mokka, the best-selling EV in its segment in Germany in the fall.

The numerous awards received by Opel for their cars and their innovative technologies and solutions include the "Golden Steering Wheel" won by the new Opel Astra and Astra Sports Tourer. In fact, virtually every Opel model received at least one award in 2022.

CEO Florian Huettl says "Emotional design, practicality suitable for everyday use, and above all electrified: this is the standard that defines an Opel today. Models like the new Astra, the Grandland or the Mokka show how we convince people with forward-looking mobility solutions".

At the start of 2022, Opel received the ONE award for Most Prominent Passenger Car Brand of the Year in Turkey. The Opel Corsa received several awards last year in the important British market: Best Mini City Car" by Fleet World; Used City Car of the Year and Used Car of the Year 2023 in all categories by Carbuyer. The Mokka was voted Car of the Year 2022 in Latvia; Irish Small SUV of the Year 2022, and the Mokka-e electric version received the Erin Baker Award in the UK.

The new Astra was awarded the Golden Steering Wheel award by winning over readers of German auto magazine Auto Bild and the Sunday newspaper Bild am Sonntag, as well as an expert jury—won one of the most prestigious awards in the automotive industry, in the category Best Car Up To €50,000.

# '22 Automotive Market Was a Downer

GENERAL NEWS

The 12.8-per-cent rebound in sales in December was not enough to save the year. In 2022, the European automotive market contracted yet more, with a serious loss of market share for Stellantis. According to figures published by the association of European manufacturers (ACEA), registrations of new cars in Europe fell by 4.6 per cent compared to 2021, which was already a disaster year.
Only 9.3 million vehicles were sold in Europe, barely more than in 1993 (9.2 million), which remains in the memory of manufacturers as a catastrophic vintage. These poor results are linked to the inability of manufacturers to meet demand, due to the persistent semiconductor shortage. Most manufacturers reported midyear order books at a historically high level, but the supply of chips—still deficient despite an improvement in the second half of the year—does not allow factories to run sufficiently.

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|---|---|---|
| Volkswagen Group | 2.447.943 | -5,2 |
| Stellantis | 2.122.729 | -14,1 |
| Renault Group | 1.028.884 | -4,3 |
| Hyundai Group | 828.411 | +2,6 |
| BMW Group | 658.788 | -5,1 |
| Toyota Group | 615.083 | +7,7 |
| Mercedes-Benz | 548.965 | +0,01 |
| Ford | 389.421 | -2,3 |
| Volvo | 212.084 | -9,7 |
| Nissan | 172.591 | -10,2 |

SALES IN EUROPE IN 2022 (ACEA DATA)

Over the year, the German market posted a limited increase of 1.1 per cent. All the other European markets dropped; France by 8 per cent; Italy by 10 per cent; Spain by 5 per cent, and Poland by 6 per cent.

Volkswagen group ended the financial year with 2.3 million vehicles registered in 2022, and a stable market share of 25 per cent. Stellantis declined 14 per cent in sales, with a bigger 17-per-cent drop for Fiat and Citroën. Japanese and Korean brands rallied; Toyota posted sales up 7 per cent and market share up nearly one point to 7.6 per cent, and Hyundai-Kia had a solid year building on a remarkable 2021. Renault group held on, falling by a relatively small 4.3 per cent while retaining a market share of 10.6 per cent; the poor performance of the Renault brand was countervailed by good performance of their Dacia brand.