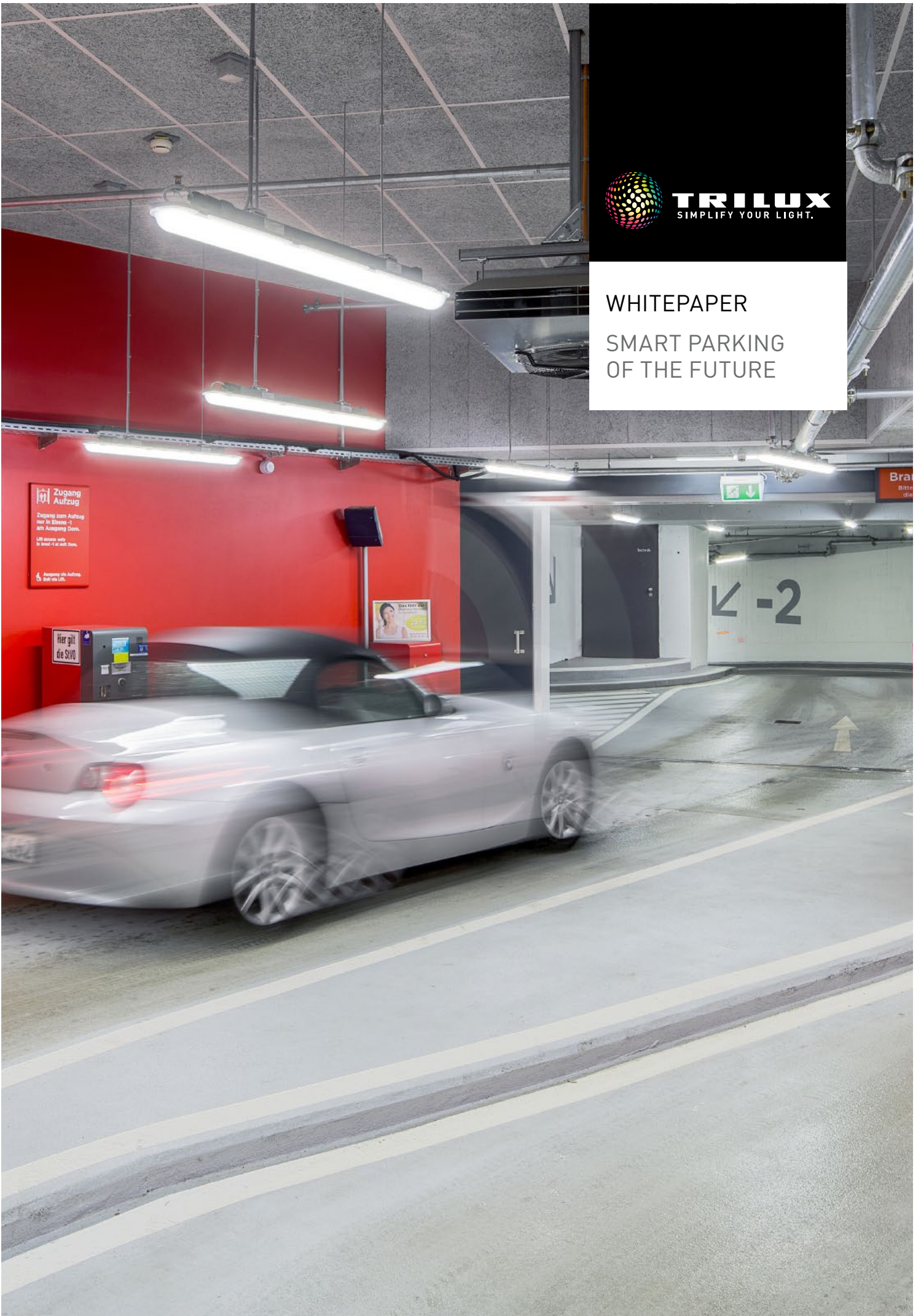


TRILUX
SIMPLIFY YOUR LIGHT.

WHITEPAPER
SMART PARKING OF
THE FUTURE



OPPORTUNITIES AND POTENTIAL OF INTELLIGENT, NETWORKED CAR PARK

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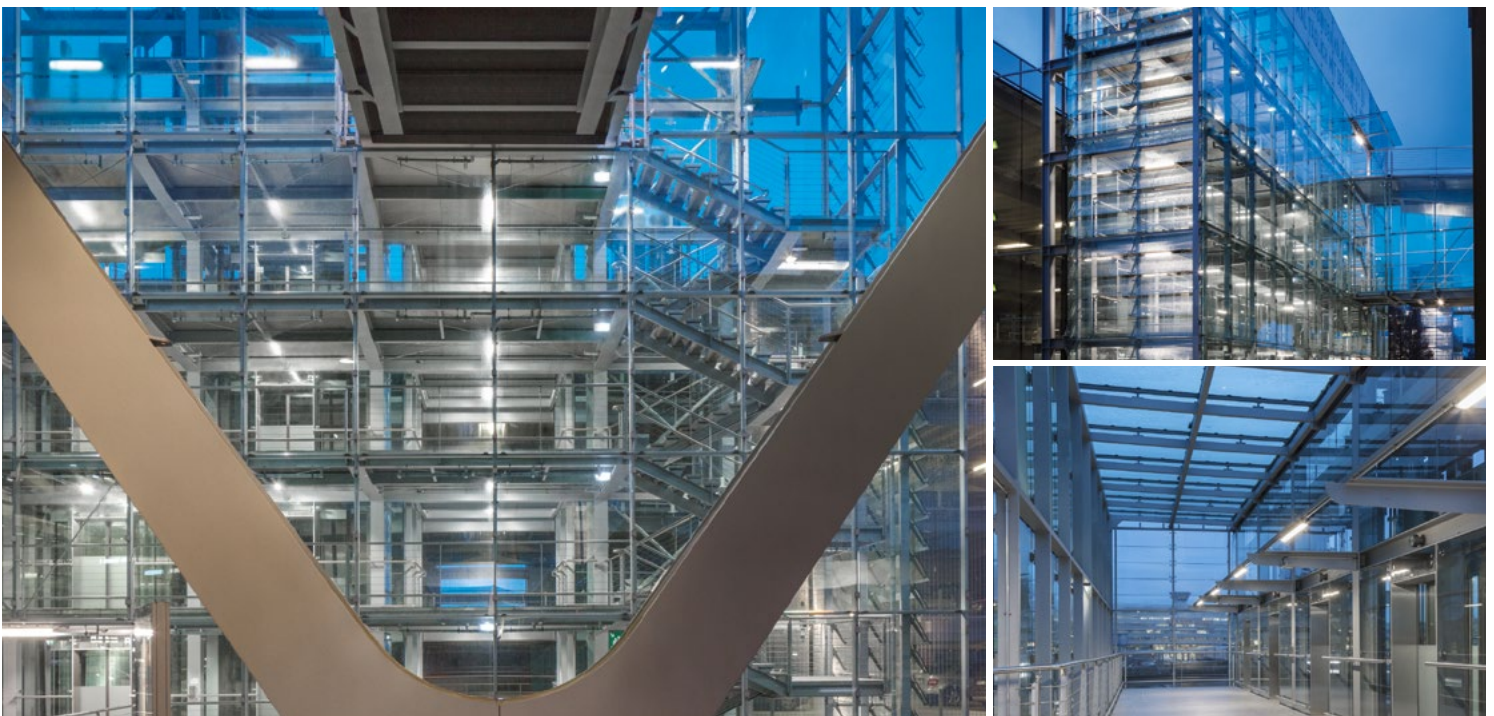
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Opportunities and potential of intelligent, networked Car Park lighting

Digital, networked, smart lighting contributes to profitability, competitiveness and sustainability in industry, office and retail. On top of that it provides parking garage operators with a host of opportunities for meeting current challenges and getting ready for the future.

Car parks are a complex environment for lighting systems. In addition to maximum requirements in terms of durability and quality of light, cost-effectiveness is a central selection criterion in the search for a suitable lighting system. LED transformation and digitalisation, the demand for higher levels of sustainability as well as increasing user requirements in terms of the “car park experience” have fundamentally changed the framework conditions in the market. TRILUX, the German market leader in technical lighting, demonstrates the opportunities provided by state of the art and future-proof lighting systems for car parks in practice – and how this can be implemented in a quick, simple and risk-free way. Here is an overview of the five key points.



1

Efficiency and durability via LED technology

The LED transformation is in full swing everywhere. An upgrade in car parks is rewarding as well – and the sooner the better. Just the simple conversion of conventional T8 lighting systems to energy-efficient LED technology reduces the connected load by up to 62 percent. This means that refurbishments can often finance themselves through operating cost savings. In combination with a sensor-controlled light management system the energy potential savings even increases to 85 percent. The service life of the luminaires is also important for the overall profitability assessment. This is where close attention should be paid because manufacturer specifications often vary significantly. TRILUX luminaires such as Nextrema G3 LED combine high energy efficiency of up to 170 lm/W with an extremely long, low-maintenance system service life of 85,000 hours. Excellent materials and high-quality workmanship make this luminaire stand the test of time.



LED transformation in [car parks](#) – 1:1 refurbishment, 3:0 in terms of costs

50 light points in a municipal car park with 100 parking spaces in the German Sauerland region were upgraded from conventional T8 luminaires to LED technology. The matching weather-proof luminaire was quickly found: Aragon Fit LED made the grade with its high efficiency of up to 170 lm/W. In addition, the optics and luminous flux levels could be modified allowing for 1:1 utilisation of existing light points. New lighting design and complex installation work were not required and the conversion was completed very quickly. This refurbishment reduces operating costs for the lighting from EUR 5,984 to EUR 2,811 per annum. These significant savings in terms of energy consumption meant that the refurbishment paid for itself. A further benefit: the TRILUX Cloud displays the operator’s savings in terms of operating costs and CO2 consumption. In this case, the conversion to LED technology reduced CO2 emissions by 8.2 tons per year.

Efficiency Calculation Multi-Storey Car Park, Area with 100 Parking Spaces

*The basis is a nominal work price per kWh of 0.18 in year 2019 and a yearly inflation rate of 3 %/annum. A lifespan of 10 years with 8760 operating hours (365 days x 24 h) is assumed.

Multi-storey car park, area with 100 parking spaces	Old system	New TRILUX system
luminaire	Obsolete weather-proof luminaire 1 x 58 W, LLCCG	Aragon FIT P-XW 4,000lm 840 ET
Power consumption per luminaire	66 W	31 W
No. of luminaires in building	50 Pcs.	50 Pcs.
Total power consumption	3.300 W	1.550 W
Energy consumption p.a. **	28.908 kWh	13.578 kWh
Energy costs Ø p.a.*	5.984 €	2.811 €
Savings potential		53%
Energy saving p.a.		15.330 kWh
Energy cost saving Ø p.a.*		3.173 €
CO ₂ saving p.a.		8,20 t

2

The quantum leap to a digital lighting network

Another major step towards more efficiency is achieved through precise luminaire control, for example dimming or regulating via sensors. Here, digital technology is clearly superior to analogue control via a 1-10 V control line since it enables flexible control of each individual light point as well as groups of up to 64 light points per control line. All DALI-compliant TRILUX luminaires can be combined with sensors most quickly and simply via plug & play and then connected to form an intelligent lighting network via the LiveLink light management system. However, DALI systems usually require five-core wiring which is not available in every building. Even under these conditions light management can still be set up in a simple way: if the building has no DALI control lines the luminaires can be connected wirelessly by means of the LiveLink [light management](#) system.



Precise control of every single light point in the network makes it possible to implement smart, sensor-based applications such as “running light”. The principle: if nobody is detected in the sensor range, illuminance is reduced to a freely adjustable basic lighting level, e.g. to 20 percent. Whenever the sensor detects a person, it does not activate the lighting in the entire car park but instead targets the luminaires in the user’s walking direction. In car parks with an ingress of daylight, sensors can also measure the level of daylight to make the lighting solution only add the quantity of light required for the desired lighting level. This increases the system energy efficiency without negatively impacting the user’s feeling of safety and security. With sensor-based light management the energy consumption can be reduced by another 25 percent compared to an unregulated LED installation. Compared to a conventional, unregulated T8 lighting system, the overall energy potential savings is as high as 85 percent.



3

More transparency with reduced costs thanks to digital services

The next step – connecting the lighting network to the cloud – also makes sense for various reasons. In the lighting network a large quantity of data is continuously generated, such as the control gear operating parameters or sensor information. This data can be transferred to the cloud through a secure connection and collected and processed there by downstream systems. This provides valuable insights into the functionality and efficiency of the lighting system and can be used to optimise the installation. TRILUX Monitoring Services make the data available quickly, simply and effortlessly. With just a few clicks an existing TRILUX lighting network can be connected to the cloud. With the free-of-charge TRILUX Energy [Monitoring service](#), operators can check the operating status, energy consumption and operating time of each individual light point. Based on this they can optimise their lighting installations in terms of energy. In addition, the system also allows for comparison of various parking levels or car parks.



Cloud-based TRILUX Light Monitoring goes even further. This service continuously transmits and analyses a multitude of further data such as the dimming level, temperature at the control gear unit or error messages in the system. Based on this ad-hoc data, operators can adjust their maintenance precisely and effortlessly to actual requirements. If for example a luminaire reaches a temperature threshold or a certain operating duration, the operator or a service company is informed automatically via mail or text message. Such predictive maintenance is not just significantly more cost-efficient than fixed maintenance intervals. It also achieves increased safety and security. Predictable failures are avoided and unpredictable defects in the lighting system are immediately discovered and reported – and can be corrected in a similarly rapid manner.

Another central benefit of cloud connection consists in the uniquely convenient configuration and control options. These make it possible to e.g. remotely control light scenes and simply plan them in the calendar. For this purpose the

luminaires can be flexibly selected and configured via intuitively operated software and a graphic user interface, either as individual light points or as a custom-defined group. In this way, dimming levels as well as factors such as light colour and operating status can be modified flexibly and, assuming internet access, from anywhere in the world.



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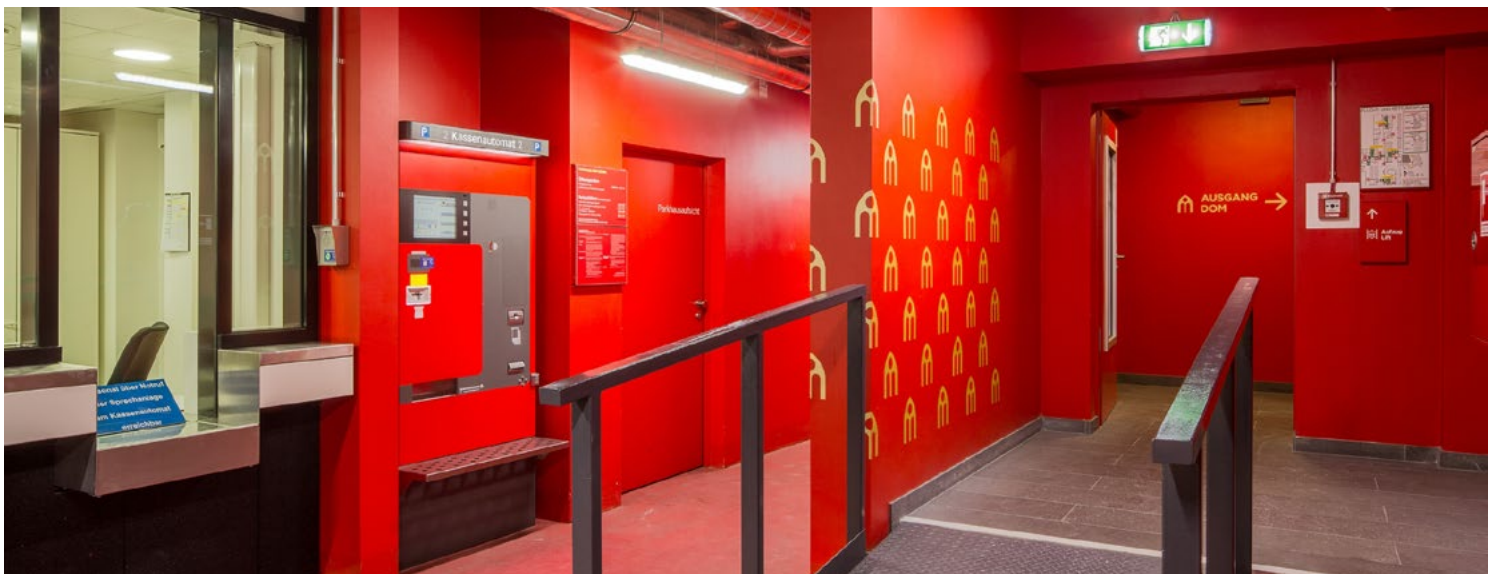
Outstanding quality of light for safety, well-being and image

Anyone going to shop at a shopping centre by car knows one thing: the shopping experience starts right in the car park. The feeling of safety or comfort in a car park primarily depends on the lighting which in this case does not only mean the lighting level, but also the quality of light. This is why an increasing number of operators utilise lighting to create a comfortable, safe and secure atmosphere in their car parks.

However, each area of the car park poses certain, often highly particular requirements in terms of lighting. On a ramp for example the viewing angle in relation to the ceiling or wall lighting changes, and the curves in the access and exit ways are often narrow and confusing. For this reason, particularly strong glare limitation is required in these zones.

Pay station areas also require special attention – they are a point of encounter for pedestrians and car drivers which means that perfect illumination is essential. In addition, modern pay systems with touch screens must comply with the same normative requirements as VDU workstations: they have to be glare-free according to UGR19. Signs and posters in the car park, either for advertising or orientation purposes, also need to be illuminated cleanly and as naturally as possible.

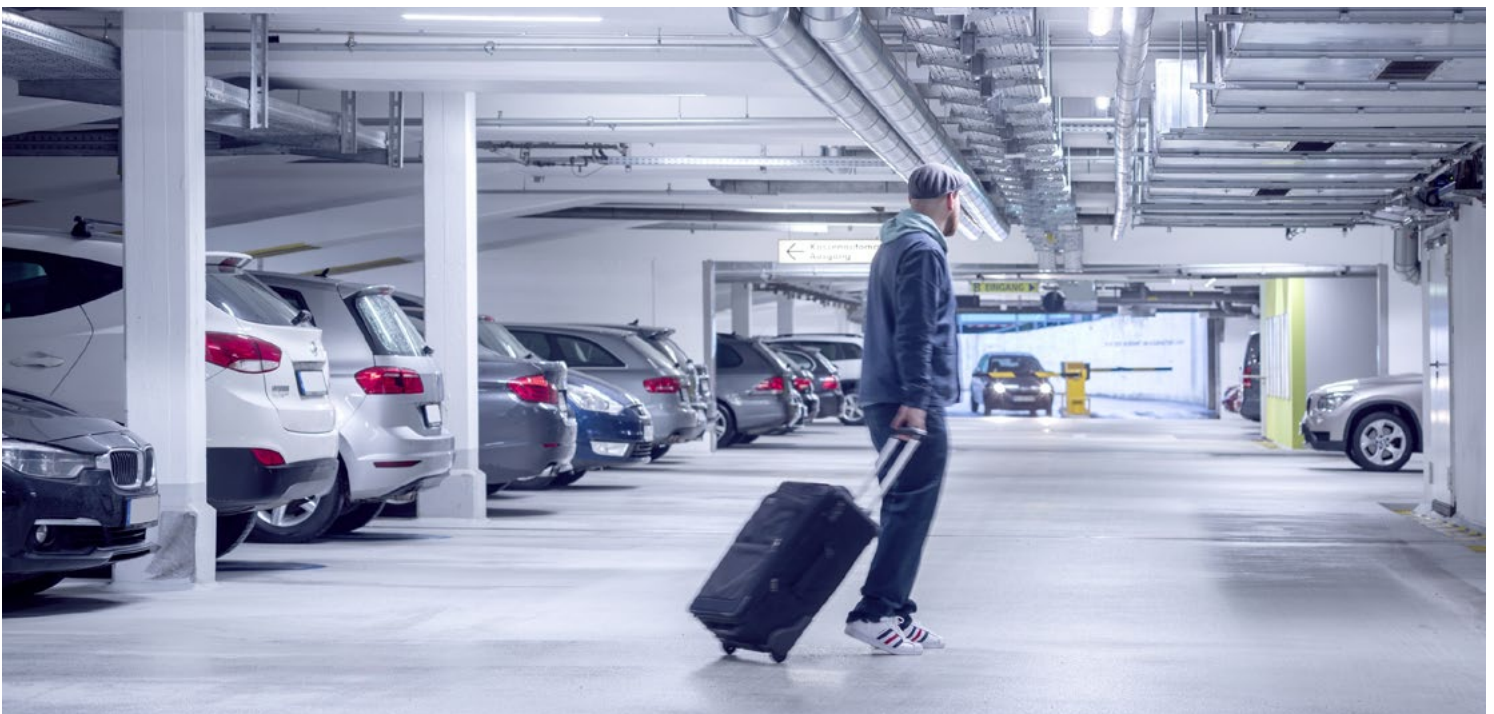
There is a simple solution for these complex and highly nuanced requirements: the extremely flexible, modular-design Aragon Fit LED weather-proof luminaire. Its version with asymmetric light distribution and CRI >90 stages signage perfectly. For illuminating corridors, stairways, outdoor areas and more the TRILUX portfolio also provides the ideal lighting solution, meaning that even extensive projects can be implemented from a single source with minimum effort.



5

Networked weather-proof luminaires as an IoT infrastructure

A smart and networked lighting system provides operators with enormous opportunities far surpassing mere technical lighting tasks. TRILUX weather-proof luminaires are IoT-ready and feature a standardised interface which can be flexibly equipped or upgraded with IoT modules. This transforms the lighting network in a car park into the perfect IoT infrastructure for effortlessly realising digital applications – simply via plug & play and without alterations to the building substance. Operators can set up a Wi-Fi network in the car park via the lighting for example, increase safety with camera modules or monitor air quality via multi-sensor systems. Location-based services will also play an important role in the car park of the future: proximity marketing provides operators with the opportunity to inform users about special offers or sights via push notification based on their location. Thanks to indoor positioning, navigation in closed buildings without a GPS signal is also no longer an issue. Users are specifically guided to the shop of their choice and back to their parking space via a building floor plan, meaning that wandering through car parks in search of the car is a thing of the past. For maximum future-safety, TRILUX systems also feature an API interface which facilitates communication between the lighting installation and e.g. a superordinate municipal parking guidance system. This quickly and simply integrates the car park into the Smart City where traffic flows are optimally guided.





**Everything from a single source –
TRILUX as a one-stop full-service partner**

Operators intending to make their car parks fit for future challenges with customised, intelligent lighting find a competent and experienced partner in TRILUX. As a one-stop full-service provider, TRILUX can take care of all tasks concerning a new lighting installation, starting with lighting design and the search for a suitable financing model all the way to installation, operation and maintenance. Cloud services and IoT applications are also part of the TRILUX portfolio. Thanks to simple implementation and free scalability, smart, networked lighting systems make sense for smaller underground car parks in company buildings as well as for large public car parks in shopping centres. An intelligent light management system provides countless possibilities for saving operating costs and simultaneously increasing the feeling of safety and well-being. The networked lighting can also be used as a flexible plug & play infrastructure for IoT applications, so that operators can now access new, digital application areas and business models without effort or risk.

Welcome to the future of car parks!

Office for Technical, Design or Order queries

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