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For more information related to Philips LED range, please contact us www.philips.com/support or contact your local representative.

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1. General Information

1.1. What is LED retrofit? For which applications?

It's a solution for the drivers who want to upgrade their lights and replace their halogen/conventional bulbs. The range that has been developed are for all cars functions, interior and exterior lights.

1.2. What are the differences between Philips Ultinon LED and Philips X-tremeUltinon gen2 range?

Two aspects are differentiating these 2 ranges: an enhanced performance for the Philips X-tremeUltinon LED with state-of-art LED technology and a better lifetime.

Both ranges are answering to 2 different needs. Philips X-tremeUltinon range has an overall better performance in all aspects, this is a product which intends to deliver an OEM performance. On the other side, Ultinon LED is a range which answer to one need, switching from halogen to LED with a good light quality.

For H7 projector optics (and reflectors), it's best to install X-tremeUltinon because of its higher performance whereas the Ultinon works better in reflector optics.

1.1. Why does the color temperature decrease from 6 500 K for the first generation of Philips X-tremeUltinon LED to 5 800 K for the second generation?

The color temperature of an LED retrofit depends on the model of LED chips used and the performance level to be achieved. We have aligned ourselves with the ECE definition of “cool white”. According to ECE regulation, “cool white” is within a range of 5 500 to 6 000 K. Most car makers defined their LED light as 5 800 K, which provides the best white color ratio, with only a limited amount of UV light (that “bluish tint”), for superior contrast on the road.

We now follow this OEM reference for producing our Philips X-tremeUltinon LED gen2, to provide superior contrast and visibility.

1.3. Why should I buy this product?

The advantages of LED retrofit are numerous:

- You can replace a conventional bulb to get the latest technology in lighting for an affordable cost (no replacement or the full headlamp or to purchase of a new full LED car) without any modifications made to the car
- You will get a better visibility on the road for more safety for you and other drivers
- You will have a stylish white lighting to give a refreshed look to your car and match DRL on your car
- You will benefit from a higher lifetime, meaning cost saving of replacing conventional bulbs every 1-3 years

1.4. How the lifetime of an LED is calculated?

The most critical piece of an LED is the PCB (Printed Circuit Board) because it heats a lot and if not properly cooled down, its performance will decrease.

Therefore, we always calculate the lifetime of the LED based on this PCB (as opposed to the competition who's generally claiming the lifetime of the LED chip itself in an ambient temperature room)

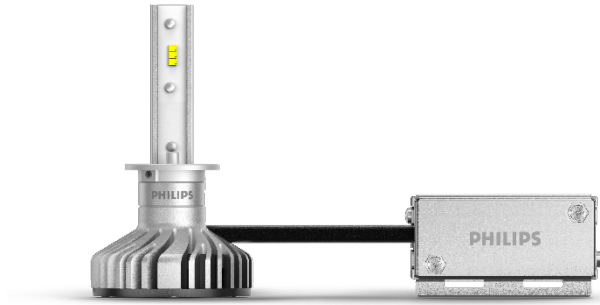
1.5. What's the difference compared to the competitors?

- The quality of the product, both in terms of raw materials used and the quality of the manufacturing process. All our products are best-in-class quality, which allows us to be an Original Equipment Manufacturer (OEM).
- We use the highest quality raw materials to manufacture our products. At every stage in production, we test the bulbs to the highest specifications for improved quality and the safety of our customers.
- Some competitors may not be able to prove their performance claims, both in terms of lumen output and product lifespan. They may indicate the specifications of the LED chips rather than the full bulb itself:
 - Lumen output: As an example, say an LED chip gives up to 1,000 lm. If the LED retrofit bulb has 8 chips in total, they might claim a total lumen output of $8 \times 1,000 \text{ lm} = 8,000 \text{ lm}$. But the lumen output cannot be calculated like this, it needs to be measured with specialist equipment.
 - Lifetime value: An LED chip can usually last up to 30,000 hours at 25°C (room temperature). However, what matters is how the LED chip is integrated within the bulb, and how the generated heat is managed when the lamp is in use. These variables can change the lifetime of the LED chip (so a claim of a 30,000-hour lifespan could be misleading in an inferior product).

1.6. What is the purpose of the control box?

It takes the car voltage (12V) and convert it into whatever voltage is required for the LED to run properly.

Depending on the performance needed, the type of the bulb, we can either include the control directly inside the bulb (Ultinon LED: performance is lower, the bulb doesn't heat that much) or outside (X-tremeUltinon).



1.7. What is generally the first failure point of an LED?

First things first, the construction of the LED lamp is critical to maintain its optimal performance over its lifetime. Since heat is a major issue for LED, the system to cool down the LED is a critical part (fan and/or heat sink). Please refer to following technical section for details on heat dissipation. The bulb needs to be properly maintained within the headlamp so that it's not moving and/or damaged while driving.

1.8. Are Philips LED range environment friendly?

Yes, Philips LED Retrofit range contributes to environment protection by:

1. Significant energy saving, consuming less overall resources and emitting less CO₂
2. Fully compliant with RoHS / REACH, which means no hazardous materials which are harmful to the environment
3. Long service lifetime which means elimination of unnecessary replacement related waste and system costs, while reducing overall resource consumption.

1.9. What is the difference between LED-FOG [≈H8/H11/H16] and LED-HL [≈H11] low beam?

The LED-FOG [≈H8/H11/H16] has been developed to fit in 3 different fog optic type: H8, H11, and H16. Therefore, the performance has been optimized for this specific application. On the other, the LED-HL [≈H11] Low Beam (LB) version is more performing to rightly project light on the road for low beam applications only. Since its performance has been increased, we are using the AirCool system instead of the AirFlux in the optic.

1.10. Can I save money by switching to LED?

Yes, Philips LED Retrofit bulbs has an extended lifetime, which means you save the cost and hassle of frequent bulb replacements which on average occur every 1-3 years. In addition, a LED bulb uses substantially less energy (e.g. halogen H4 consumes 55W where a LED-HL [≈H4] drawn around 20W).

1.11. How would I recognize fake Philips LED bulbs from a genuine?

Whenever you purchase a Philips LED retrofit bulb for your headlights, you can check the authenticity online using the code provided on the anti-fake label. This is an insurance for you that you get a genuine Philips LED.

1.12. How do I know if the Philips LED Retrofit is compatible with my headlamp?

To check the compatibility of the Philips LED Retrofit with your car,

1. Measure the diameter of your headlamp and the space that you have behind the headlight fixture. To be able to install the LED retrofit you need minimum 60mm diameter and 70mm back space behind the fixture.

2. Check if the connector is also used as a bulb holder. If it is the case, you won't be able to mount the LED Retrofit.
3. Please refer to our web page with an indicative list of cars we have tested (<https://www.philips.com/c-e/automotive-led/stunning-range.html>)

If you have any doubt, please check with your dealer/installer.

1.13. What are the advantages of the Philips LED design?

The Philips LED Retrofit design is patented. The construction of the Philips LED Retrofit bulb is unique and provides with many benefits:

1. It is optimized to ensure the benefits in terms of performance and lifetime.
2. The beam pattern is perfectly adjusted to distribute the light where needed upfront.
3. The position of the LEDs (chips) are exactly placed like on a conventional bulb reproducing perfectly the same light distribution.
4. Its gives to the LEDs extra robustness: shock-resistant, moisture proof and resistance to voltage surges.

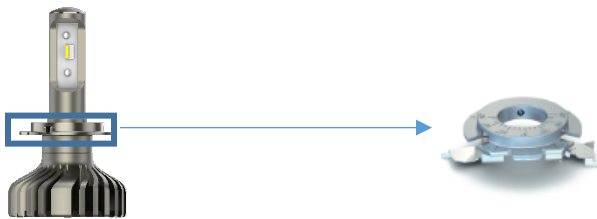
1.14. What does 'CANbus adapter' stand for?

It stands for Control Area Network Bus adapter (or CEA: Canbus Enabling Adapter), which helps to maintain the right level of wattage to the bulb, preventing detection issues for your car (such as error messages or warning lights). Most new European models are equipped with CANbus adapters, so we strongly advise you to check with your dealer if your own vehicle has these adapters before purchasing LED retrofit bulbs.

1.15. What are connector rings for?

Connector rings hold the bulb securely inside the car headlamp unit. When changing to LED-HL [≈H7] retrofit which has a heat dissipation system at the back, space is sometimes too tight for the LED retrofit.

Brackets for LED-HL [H7] bulbs can differ from one car model to the next. We provide a variety of robust exchangeable Philips connector rings to improve fit in key car models and simplify installation



1.16. Is it mandatory to use an additional connector ring while fitting LED bulbs?

Depending on the car and model, you may need to change the connector ring. The one provided in the box along with the bulb is the most commonly used type.

1.17. What are the meaning of Philips AirFlux, AirCool, CeraLight and SafeBeam?

- **Philips AirFlux** and **AirCool** technologies: the latest thermal management systems with active and passive cooling systems for increased lifetime and performance. We use passive cooling when the spacing within the headlamp is big enough to effectively dissipate the heat without the risk of decreased performance. Also, depending on the performance of the LED, we would use either a passive or active cooling. For example, On LED-HL [≈H7] headlamp, the optic is generally smaller than LED-HL [≈H4]), so the heat dissipation needs to be active to effectively direct the hot air away from the back of the LED.

For more information related to Philips LED range, please contact us www.philips.com/support or contact your local representative.

- **Philips CeraLight** technology (specific to LED-T10, for X-tremeUltinon LED range): using ceramic components for best heat dissipation management to ensure highest durability in extreme conditions.
- **Philips SafeBeam** technology: projects light exactly where you need it for your safety (no glare for oncoming racers). The Figure of Merit (FOM => light projected on the road) is in concordance with ECE R112.

2. Technical questions

2.1. How can I verify which LED to use to replace my old bulb?

Simply use the section “Find the right lamp for your car” on the Philips website to find out which lamp type you need. Each type is communicated with the corresponding ECE name. Here below some examples in the comparison table between halogen and LED retrofit:

Halogen type	LED name
H4	LED-HL [≈H4]
H7	LED-HL [≈H7]
H8/H11/H16	LED-FOG [≈H8/H11/H16]
Festoon T10,5x30mm	LED-FEST [30mm]
Festoon T10,5x38mm	LED-FEST [38mm]
Festoon T10,5x43mm	LED-FEST [43mm]
W5W	LED-T10 [≈W5W]
W16W	LED-T16 [≈W16W]
W21W	LED-T20 [≈W21W]
W21/5W	LED-T20 [≈W21/5W]
W21W	LED-T20-RED [≈W21W]
W21/5W	LED-T20-RED [≈W21/5W]
W21W	LED-T20-AMBER [≈W21W]
P21W	LED-RED [≈P21W]
P21W	LED-AMBER [≈P21W]
P21/5W	LED-RED [≈P21/5W]
-	LED-CANbus [≈5W]
-	LED-CANbus [≈21W]

2.2. How to make sure my car can be equipped with LED retrofit?

Not all the cars can be equipped with LED retrofit. At Philips, we have tested a variety of cars which are the most representative in the European market, and for which we are confident that our bulbs can be used properly.

2.3. Is it mandatory to use a CANbus adapter while fitting LED?

It's strongly recommended to use a CANbus adapter to avoid either an excessive speed of the blinking or an error message on the dashboard.

2.4. What SMD or SMT means?

It means a Single Mounted Device and Surface Mounted Technology. It refers to how the LED lamps are built and how the LEDs are used to diffuse the light within the optic.



2.5. Why most of the competitors are using Lumileds chips?

They are today the best performance chips you can find on the market in terms of performance and durability. On top of it, they are today the smallest chips you can get: 16x20mm instead of general 35x35mm or even 50x50mm which was for a long time the automotive standard.

Thanks to this size, they can almost perfectly match the shape and positioning of the filament of the halogen bulb they replace.

For the X-tremeUltinon gen2, we use exclusive automotive LED chips, which can only be used by Lumileds for automotive applications.

2.6. Binning of the LED chips. How do we chose them to make sure that we have the same CCT for each PCB?

As a manufacturer of LEDs, we have the knowledge when it comes to the best LED chips possible. All the LEDs selected to produce our lamps have the exact same color temperature, which means that whenever you purchase one of them, you're sure that you get the best light output and homogeneity.

2.7. Why Philips LED don't have integrated CANbus?

We chose to have separated CANbus for 2 reasons:

1. Most of the time the CANbus is not necessary to install
2. When needed, it's better to have it separated than integrated because if integrated inside the bulb it makes the lamp bigger and too expensive. Except for the blinkers where the CANbus is mandatory (automatically sold with CANbus in the box) so that the blinking is at the right pace, in most cases it's not required to fit one. Here below the applications where a CANbus could be/is necessary:
 - o Turn indicators (front and rear)
 - o Headlighting (low beam / high beam and Fog)
 - o Position light

2.8. Is the 24V festoon equipped with CANbus?

They are no CANbus with the 24V festoon, because it's not needed on all the vehicles. If a CANbus is needed to avoid error message or blinking, please use the Philips 21W CANbus.

2.9. Is it possible to use the 21W CANbus for 24V LEDs? If yes, how many per lamps is required?

Whether it's Philips CANbus 5W or 21W, they are not specifically dedicated for one reference. Their purpose is to increase the wattage of the LED so that it avoids having error message at the front, avoid flashing when the LED turns on and prevent the turn indicators to blink faster than they should.

2.10. Does the CANbus removes the residual current at the time when the lamp goes off?

The Philips CANbus are designed to regular the amount of wattage within the electrical system before it reaches the LED. When the LED is off, the remaining power is drawn by the CANbus. So that the LED stays off.

2.11. Does the progressive on/off of exterior lamps on certain vehicles remain after installing LEDs?

Philips LED Retrofit range has been designed to perfectly replace the current light setup that is in the car. This meaning that the progressive shutting on or off functions will continue to function after LED installation.

2.12. How does the beam geometry fit in comparison with a normal H4/H8/H11?

Each LED within the Philips range has been designed based on halogen/conventional bulb, following the specification of each certification to ensure a reliable product for the drivers and for the others while driving. The geometry of the headlighting follows scrupulously the one they are replacing.

2.13. On the driver box of the LED lamp it says: "Caution: Do not touch – Hot surface". How hot will this become? Is it getting this hot that it can damage cables or any other car parts under the hood?

We strongly recommend that the driver box is always attached safely with plastic ties provided to avoid to move while driving and that the box is attached on a metal part in case it gets hot.

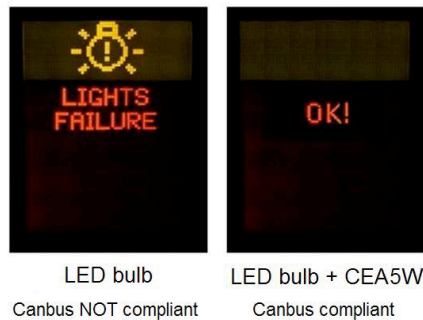
3. During installation

3.1. After installing an LED light, would I get an error message on the dashboard?

The LEDs have a wattage (lower power consumption) lower than conventional lights.

Some cars are equipped with light detection system to warn the driver that one of the light has failed. Meaning the system sends electric impulses in the electrical system to check the functioning of lights. Hence when the systems checks, the power emissions are too low to be detected.

In such cases, we have developed a CANbus adapter which converts the power and avoids any error message.



3.2. What do happen if the blinkers fail?

If the blinkers fail but not the CANbus adapter, the blinking will still be normal (the CANbus adapter will still draw enough energy for the blinking) but the LED won't work anymore. In this case a visual check is necessary to detect if the lamp is still functioning.

3.3. How do I replace the incandescent bulb with a LED bulb? Is it difficult?

The entire Philips LED Retrofit range is a retrofit of halogen and conventional bulb, making it easy to replace without any modification needed to the car. Just need to follow the guidance on or in the package, and making sure prior to purchase there is enough space into the bulb housing.

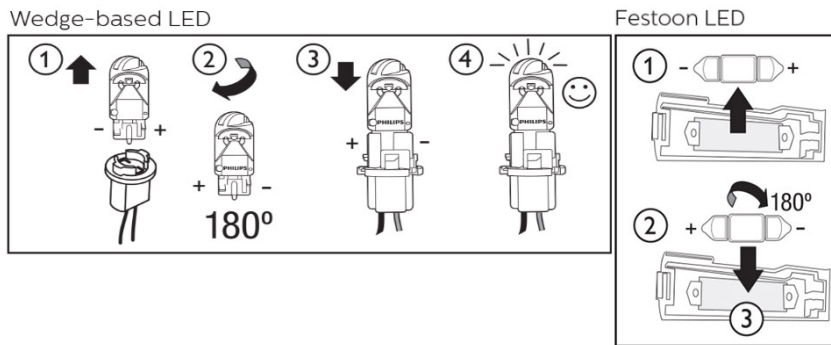
3.4. The LED does not light up after installation. How can I resolve this issue?

If your Philips LED Retrofit doesn't light up, it's likely that you need to "reverse the polarity" by flipping the LED. Philips LED Retrofit bulbs work like batteries with a positive and negative polarity. In case the Philips LED Retrofit does not light up, simply remove the LED, flip direction and reinstall as per explanation and illustration below:

1. Remove the Philips LED Retrofit from the socket
2. Flip the Philips LED Retrofit
3. Insert Philips LED Retrofit back into the socket.

For more information related to Philips LED range, please contact us www.philips.com/support or contact your local representative.

4. Check to ensure the Philips LED Retrofit lights up



3.5. Which CANbus adapter do I need: 5W or 21W?

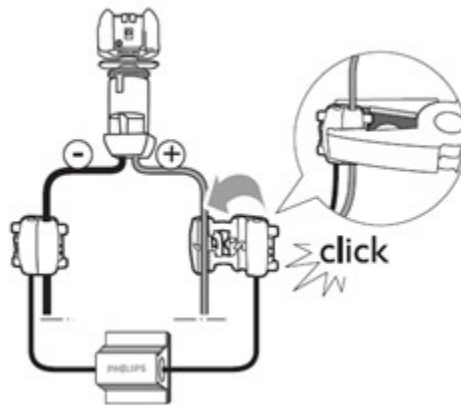
The 5W CANbus is used for interior applications, and license plate lighting. The 21W CAN-bus is used for exterior applications such as position light, low/high beam lights.

Always refers to the original wattage of the halogen/conventional lamp. As an example, a P21W usually drawn 21W, when our LED-RED [≈P21W] has a wattage of 1.9W. The gap is then $21W - 1.9W = 19.1W$. This means that to compensate this gap of wattage, you should use a Philips 21W CANbus.

3.6. How do I install a CANbus adapter?

If your car has a dashboard error message, experiences fast flash or goes in limp mode upon installation of an LED bulb, you may consider to purchase and install a Philips CANbus adapter solution.

See below image for installation instructions of the Philips CANbus adapter:



3.7. Why does this polarity issue occur with LED?

Regular incandescent bulbs can draw current in either direction, there are no "positive" or "negative" sides on the bulb. The bulb will work regardless of which direction it is inserted. LED bulbs, however, only draw current in one direction. Basically, this situation can be compared to batteries that have a positive and negative side. So if the LEDs are inserted incorrectly, they will not work. The solution is to simply flip the LED.

3.8. After installation of the LED, my car show fast flash errors as if my light is out or broken?

Error messages appear because the LED bulb wattage is much lower than conventional bulbs, which can make an outage warning system unable to detect the bulb.

If your car shows fast flash upon installation of an LED bulb, you may consider to purchase and install a Philips CAN-bus warning canceller solution.

For more information related to Philips LED range, please contact us www.philips.com/support or contact your local representative.

3.9. After installation of the LED, my car does not start. What should I do?

After installation of LED bulbs, some cars go in limp mode. The LED has a different resistor value than an incandescent bulb, so the car's computer is looking for the resistor value of the incandescent bulb. That is the reason why the car goes in limp mode after installing the LED: it notifies the driver that something is not working. Thankfully this happens rarely and the issue can be resolved. First verify that the limp mode is being caused by the LEDs by replacing them again with the incandescent bulbs. If the car works fine, the limp mode was most likely caused by the LED bulbs. This means that a load resistor, a CANbus adapter, is required.

3.10. Even after installation my LED with CANbus adapters, I still get an error message or flickering, what should I do?

Even if after proper installation of the LED retrofit and the CANbus adapter in order to remove any flickering and/or error message on the dashboard, you still get the mentioned issues, it is best to go back to the original halogen bulbs and ask for reimbursement at your dealer.

3.11. When installing an LED for turn indicators, is the blinking rhythm remains the same as for conventional or it becomes faster?

In each boxes of our turn indicators we provide two CANbus adapters that are necessary to install to ensure that the blinking of the LED remains at the same speed as the conventional lamp. If not installed, the LED blinking will be faster as if one of the bulb is broken.

Remember: always safely attached the CANbus adapter on a metal to avoid movement and damages for your vehicle.

4. Legislation of LED retrofit

4.1. Why is LED retrofit technology still not legal on public roads in the European Union (EU)?

Philips LED retrofit range has been designed for headlight units certified for halogen/conventional bulbs. EU member states have not yet adopted the legislation required to legalize LED retrofit bulbs, so they cannot be used on public roads in the EU.

4.2. What are the legal risks if I drive with LED retrofit bulbs on a public road?

The risks vary from one country to another, and depending on local law the sanctions may for instance include:

1. A fine and/or having to change back to certified, non-LED bulbs.
2. Your car might fail its mandatory inspection.

4.3. Which countries are considered "no trade"?

The only country in which Lumileds does not sell LED retrofit bulbs is Germany, where the authorities consider it illegal to sell unapproved products even for off-road use.

4.4. Why are LED retrofit bulbs intended for rally and race track?

Except on cars already fitted with LED lights by the manufacturer, it is not legal to replace exterior halogen or xenon bulbs by LED retrofit bulbs in vehicles used on public roads. As LED retrofit bulbs are not authorized on public roads, they can only be used on private roads or tracks.

4.5. Will a car with LED retrofit headlight bulbs pass its mandatory inspection?

Some countries have a mandatory inspection that determines if the car is fit to drive on the road. The Philips LED retrofit range has been designed to best replace the original conventional technology on the car without any

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modifications to the vehicle. Despite the superior performance of Philips LED retrofit bulbs, your vehicle may not pass the inspection with LED retrofit installed because the bulbs are not yet certified for use on public roads.

4.6. Why now sell LED retrofit bulbs in countries previously considered “no trade”?

When we first introduced LED retrofit bulbs, we decided on a limited launch. After two years’ experience of selling LED retrofit bulbs in certain EU countries, we now feel that the time has come to open up sales to other countries as well. Although regulations have not changed, we believe that we have provided our customers with sufficient information to confidently sell LED retrofit bulbs.

4.7. What is the specific regulation that LED retrofit bulbs must conform to?

Today the retrofitting of halogen, xenon and LED bulbs is not allowed by existing legislation. In the EU, automotive parts must be certified to UNECE specifications for use on public roads. Current ECE certifications only apply to halogen, xenon and LED bulbs installed in new vehicles:

- ECE R37 for OEM halogen
- ECE R99 for OEM Xenon
- ECE R128 for OEM LED

However, there are no specific homologation requirements for, or restrictions to, using LED retrofit bulbs on private roads.

4.8. What is the impact of R128, and why do Philips LED retrofit bulbs not fulfill these requirements?

ECE R128 is the certification for LED optics, meaning that the headlamp has been developed with LED as its light source. The regulation doesn’t apply to LED retrofit used to replace halogen bulbs certified under ECE R37.



4.9. Who bears responsibility when a consumer is found with LED retrofit bulbs on a public road?

Assuming the consumer has been properly informed of the restrictions that apply and that the consumer has installed the LED retrofit bulbs themselves, it is in principle the consumer’s sole responsibility. However, local authorities may take action over the sale of LED retrofit bulbs for use on public roads. The extent of that action depends on the powers given to the local authorities.

4.10. Are there any legal LED retrofit bulbs available? (Other suppliers sell LED retrofit bulbs, claiming they are legal.)

No LED retrofit products are currently legal on public roads in the EU unless the bulbs are sealed in their housings and both bulb and housing have been approved for use together.

4.11. What do these symbols on the packaging mean?

	<p>This symbol indicates that the product is not suitable for public roads. This means that it can only be used on “closed” roads.</p>
	<p>This symbol shows that the product has not been approved according to the ECE R37 regulation on halogen bulbs. We show the halogen regulation because, although an LED retrofit bulb is designed to replace the halogen bulb in the very same headlamp unit, that does not mean the LED retrofit bulb is ECE R37-approved.</p>

4.12. What does the following text mean: “It is your own responsibility to ensure that the use of LED retrofit lights complies with relevant local legislation”?

This text is intended to ensure you use LED retrofit bulbs correctly and in line with local laws. Local legislation is subject to change, so it is essential that that you check whether the product can be used where you are.

4.13. Where can I buy LED retrofit bulbs?

Please check with your local representative or on our website: www.philips.com/automotive