

## **BASIC KNOWLEDGE**

### **BEACONS**



## BEACONS: ABC

The new Beacons ABC addresses all those who work directly or indirectly with beacons, purchase them, or those who would simply like to know more about them.

Each of these groups bear in their own capacity responsibility for the safety of people, vehicles and loads. Whether in the agricultural or municipal sector, or as a driver on country roads. The right beacon on a vehicle can increase safety substantially.

With this ABC, we would like to contribute to making your decision to find the right beacon for the matching application easier. This decision is not easy and we would like you to be able to base it firmly on the knowledge in this ABC.

## WHEN CAN/MUST A BEACON BE USED AND WHY?

**The application and use of beacons in road traffic is regulated in the Road Traffic Regulations (StVO)/Road Traffic Licensing Regulations (StVZO). They indicate when and how beacons are to be used.**

### **§38 StVO Blue and amber flashing lights**

- (1)** A blue flashing light together with a siren may only be used in matters of the upmost urgency to save human lives or avert any severe threat to health, to prevent any threat to public safety or order, to pursue any person attempting to escape, or to preserve property. It rules: "All other road-users must clear the way immediately".
- (2)** A blue flashing light alone may only be used by the vehicles equipped with one and only to warn of any accident or other deployment locations, on emergency calls, or when escorting vehicles or closed vehicle formations.
- (3)** An amber flashing light is a warning sign. It can be used as a stationary warning or on vehicles. Its use on vehicles is only permissible to warn of work in progress or where an accident has occurred, or of unusually slow moving vehicles, or in front of unusually wide or long vehicles, or usually wide or long loads.

### **§52 StVZO Auxiliary headlamps and lights**

- (3)** A vehicle may be equipped with one or several beacons for blue flashing light (rotating light)
  1. Vehicles used by law enforcement services of the police, the military police, the federal police or customs services, particularly command, patrol or armoured transport, road accident or homicide division vehicles,
  2. Emergency and command vehicles of the fire brigade and the units and facilities of disaster control and emergency services,
  3. Vehicles which are approved according to their vehicle registration documents as an accident assistance vehicle of public transport services with track-guided vehicles, including trolley buses,
  4. Emergency service vehicles which are specially equipped for ambulance services or emergency services and are approved according to the vehicle registration document as ambulances.
- (4)** May be equipped with one or, if required for horizontal and vertical visibility (geometric visibility), several beacons for amber flashing light (rotating light)
  1. Vehicles which are used for construction, maintenance or cleaning the streets or facilities in public places, or for waste collection, and which have red-white warning markings (safety marking), complying with the DIN 30 710 standard, March 1990 edition,

**The German Road Traffic Licensing Regulations (StVZO) §52 (4) no. 1 states therefore if warning markings as defined above are present on a vehicle, it is possible to use amber rotating lights without any additional approval.**

2. Vehicles which are suitable for use as breakdown service vehicles according to their construction or equipment and which are approved as breakdown service vehicles according to the vehicle registration document. The vehicle licensing agency can, in the preparation of their decision as to whether a vehicle is suitable as a breakdown service vehicle according to its construction or equipment, arrange for the provision of the report from an officially appointed expert or investigator for motor traffic. Approval is only permissible for vehicles belonging to operations which provide either commercial or in-house breakdown services, automobile clubs, and associations of the transport industry and car insurers,
3. Vehicles that are exceptionally wide or long or with an exceptionally wide or long load, provided the approving authority has stipulated that be equipped with beacons,
4. Vehicles, which on the basis of their equipment, are equipped as vehicles to escort heavy duty or large capacity vehicles and which are approved according to the vehicle registration document. Other escort vehicles may be equipped with removable beacons, provided the approving authority has prescribed that they be equipped with beacons.

## WHICH BEACONS ARE PERMITTED FOR ROAD TRAFFIC? – THE ECE R65 DIRECTIVE

A beacon may only be used in public road traffic when it meets the ECE R65 directive. The ECE R65 is the European directive for beacons. It specifies the required light values, light distribution and attachment specifications, etc.

Can also be viewed at [www.unece.org](http://www.unece.org) (United Nations Economic Commission for Europe)

The large E-approval mark (here **E1**) shows whether the beacon meets the ECE R65 directive and has therefore approval.



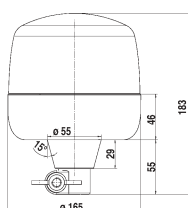
### Key:

e1 = EMV test number  
 CE = CE marking  
 E1 = Test mark

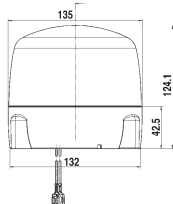
TA1  
 T = 360 °  
 A = Amber; B = Blue  
 1 = Night; 2 = Day and night  
 TA1 = amber beacon with night level in accordance with ECE R65  
 TA2 = amber beacon with day and night level in accordance with ECE R65

### Fixing

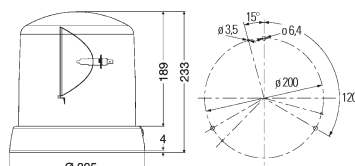
The beacon [warning light] must be designed in such a way that it cannot be adjusted after it has been fitted correctly to the vehicle (ECE R65 5.2). The design and fixing method must conform to DIN14620. The beacon itself can have the following designs: A, B1, B2 or C.



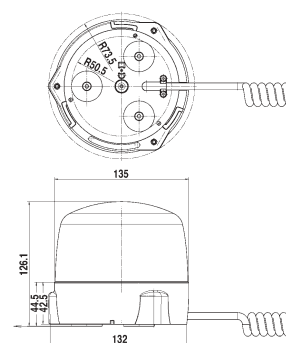
Design A



Design B1



Design B2



Design C

## LIGHT INTENSITY OF BEACONS

The luminous intensity that warning lights emit is particularly important to be visible in heavy traffic. The luminous intensity is generally measured in candela (cd), whereby this information is calculated as follows: 1 cd = 1 lux to 1 m distance.

A rotating beacon emits different amounts of light depending on the position of the reflector. For this reason, the peak luminous intensity is measured in such cases. The unit used for this purpose is peak candela, abbreviated to cd (p).

In each case = the effective luminous intensity in a specified direction for both the rotating light beam and also for the stationary, simultaneously flashing light source.

The effective luminous intensity is a decisive value for conforming to the ECE R65.

$$J_e = \frac{J_m}{1 + \frac{C}{F \cdot 2 \text{ Hz}}}$$

**Key:**

$J_m$ : Maximum luminous intensity (cd)

C: Time constant, C = 0.2 sec

T: Period duration

J: Instantaneous value of the luminous intensity (cd)

F: "Form factor"

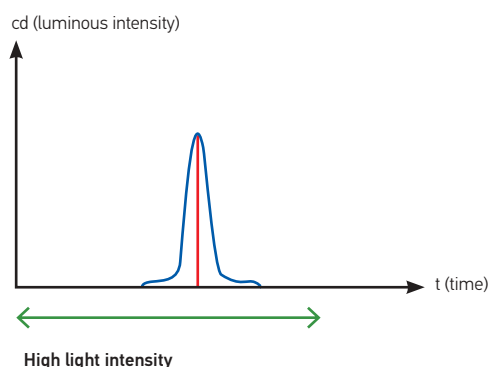
$$F = \int_0^T \frac{J \cdot dt}{J_m \cdot T}$$

This is especially known in the USA and Japan as impressive luminous value as these countries have different measuring methods. A direct comparison with European manufacturers is generally not possible.

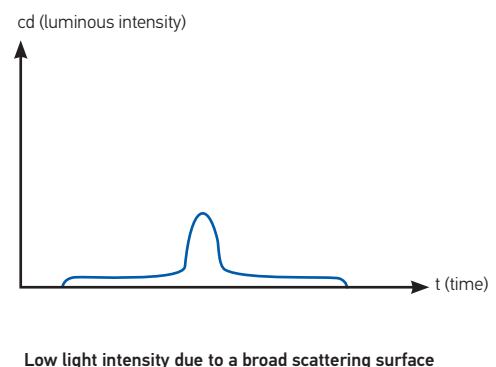
Light intensity depends on how efficiently light bulbs, Xenon flash tubes or LEDs convert the energy emitted from electronics into visible light. Another decisive factor is also the optical system including the dome which controls the light.

**As a rule of thumb it can be said:**

- In the industrial sector, warning lights should be five times lighter than the ambient light.
- When used on the street, ten times lighter than the ambient light.



- 1 Intensity
- 2 Period







## ECE R65

### Light values according to ECE R65

The light values to be obtained are indicated with the aid of the effective luminous intensity. An amber beacon must, for example, reach a luminous intensity of 70 cd (effective candela) at night at a vertical angle of  $+8^\circ$ .

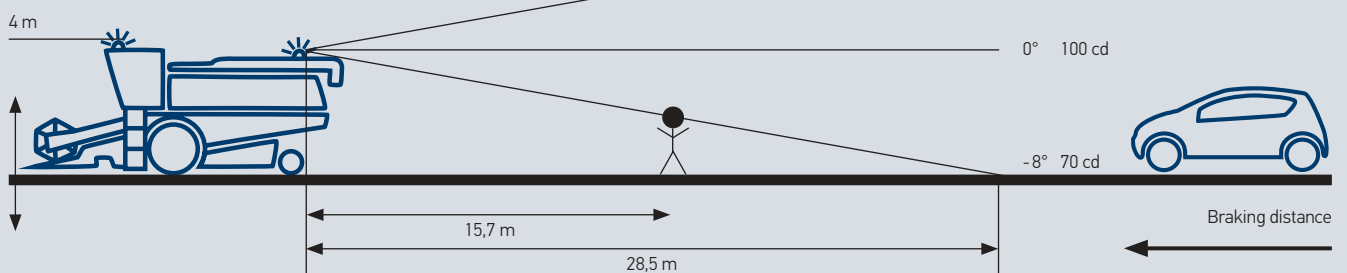
A blue beacon must, on the other hand, reach 25 cd at night at a vertical angle of  $+4^\circ$ .

Each in cd (candela)	Blue	Amber	Red
$0^\circ$	50	100 (nights) 230 (days)	50
$4^\circ$	25	–	25
$8^\circ$	–	70	–

### Light distribution as per ECE R 65

**Correct**

Graphic 1



**Positive example:** The warning signal can be seen from every direction in a radius of 25 metres.

## ECE R65

### Light distribution according to ECE R65 (E-test mark)

In accordance with the ECE R65 directive, it must be guaranteed that beacons supplied function perfectly with standard company use despite any vibrations which occur, and that the characteristics described in this regulation are maintained.

It is important that the beacon is designed in such a way that it cannot be adjusted after it has been correctly fitted to the vehicle. Incorrect installation could restrict the warning effect.

The light values are measured at a distance of at least 25 m.

Lights which are not equipped with bulbs as a light source must comply with the minimum and highest requirements which are established by taking light intensity measurements after one and after 30 minutes of operation. This shows how important temperature management is for LED beacons, as only an optimised temperature management system can guarantee optimum lighting values even after long periods of use.

A beacon must be fitted to a vehicle to enable the warning signal to be seen from a perimeter of 25 m (see Graphic 1).

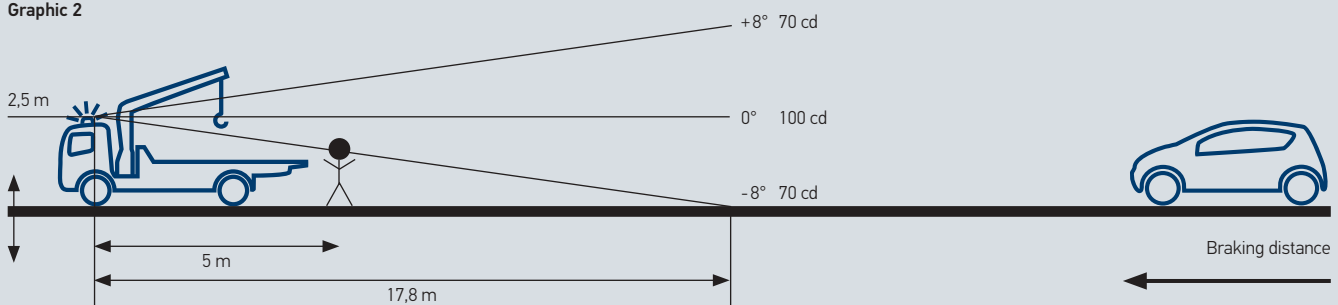
If this is not possible, additional warning systems (e.g. more beacons) must be fitted to the vehicle (see Graphic 2).

The following diagrams show the implementation of the ECE R65 (person: 1.8 m tall).

**HELLA beacons conform to ECE R-65 (except KLX-1)**

### Incorrect

Graphic 2



**Negative example:** The warning signal cannot be seen from every direction at a radius of 25 metres - in the area of the tow hook, the warning signal is interrupted. In this case, another warning light needs to be attached to the rear of the vehicle, or two beacons attached to the cabin.

## ECE-R10

### What is EMC (ECE-R10)?

Electromagnetic compatibility (EMC) describes two factors which are essential quality features for optical signaling systems:

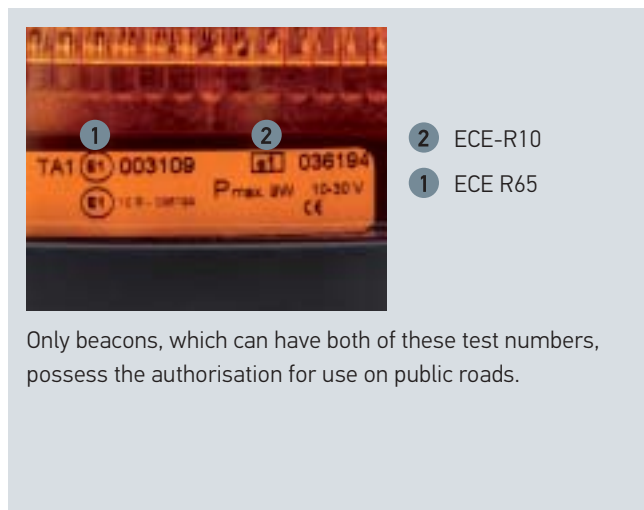
- **Radiated interference:** the limitation of radiated electromagnetic interference to a level that guarantees the interference-free operation of other devices in the environment.
- **Immunity to interference:** guaranteeing sufficiently high resistance to external electromagnetic interference

The legal foundations for this are the CISPR 25 as well as the ISO 7637 and 11452.

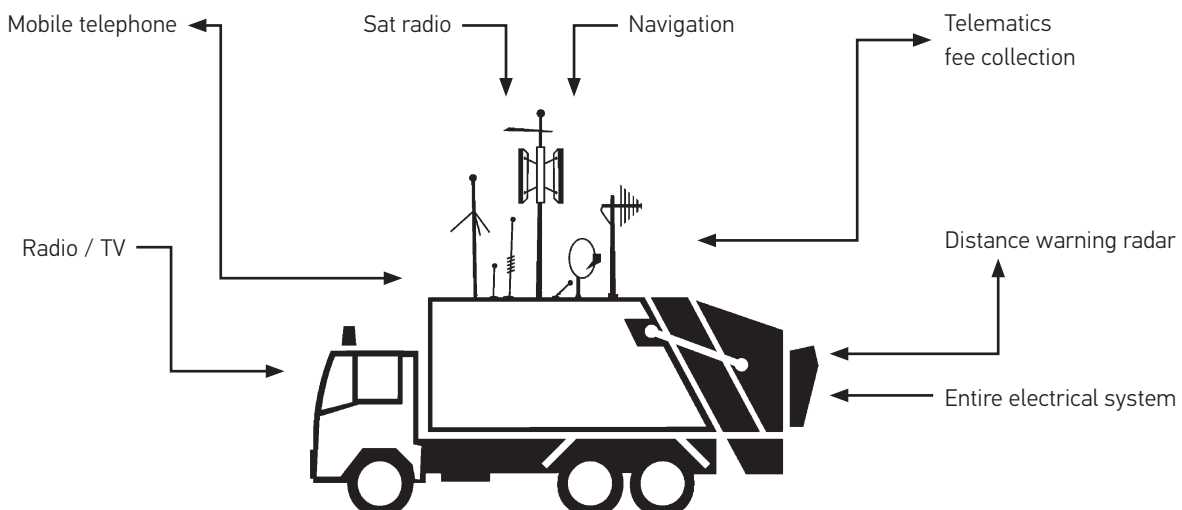


### Protective categories standard CISPR 25:

CISPR 25 is the standard for emitted interference which applies a classification of 1 - 5. In doing so, category 5 products must satisfy the most demanding requirements and are even suitable for installation situations directly next to an aerial. The statutory standards are met by category 3, which guarantees adequate protection in standard practice. (HELLA lighting systems fulfil at least category 3, many even category 5, and guarantee absolute functional safety in all application situations).



### Electromagnetic interactions





## WHAT IP PROTECTION CATEGORIES ARE THERE?

How well a product is protected from environmental influences can have a significant effect on its design life. Beacons are exposed to dust, water and other contamination.

HELLA beacons are designed in various degrees of protection.

### Protection category IP 5K4K

Dust may only penetrate to such an extent that function and safety are not impaired. Water that is sprayed from every direction at increased pressure against the housing must not have any damaging effect: water pressure approx. 4 bar.

### Protection category IP 5K9K

Dust may only penetrate to such an extent that function and safety are not impaired. Water that is directed from high-pressure / steam-jet equipment onto the housing must not have any damaging effect: water pressure approx. 100 bar.

### Protection category IP 6K4K

Dust must not penetrate. Water that is sprayed from every direction at increased pressure against the housing must not have any damaging effect: water pressure approx. 4 bar.

### Type of protection: IP67

Dust must not penetrate. No water may penetrate, even if the device is submersed for some time.

### Protection category IP 6K9K

Dust must not penetrate. Water that is directed from high-pressure / steam-jet equipment onto the housing must not have any damaging effect: water pressure approx. 100 bar.

### Overall view

K: Denotes tests for road vehicle equipment.

#### Protection against the penetration of foreign bodies (including dust)

First number	
0	no special protection
1	solid bodies $\varnothing \geq 50$ mm
2	solid bodies $\varnothing \geq 12.5$ mm
3	solid bodies $\varnothing \geq 2.5$ mm
4	solid bodies $\varnothing \geq 1.0$ mm
5K same as 5	dust protected
6K same as 6	dust tight

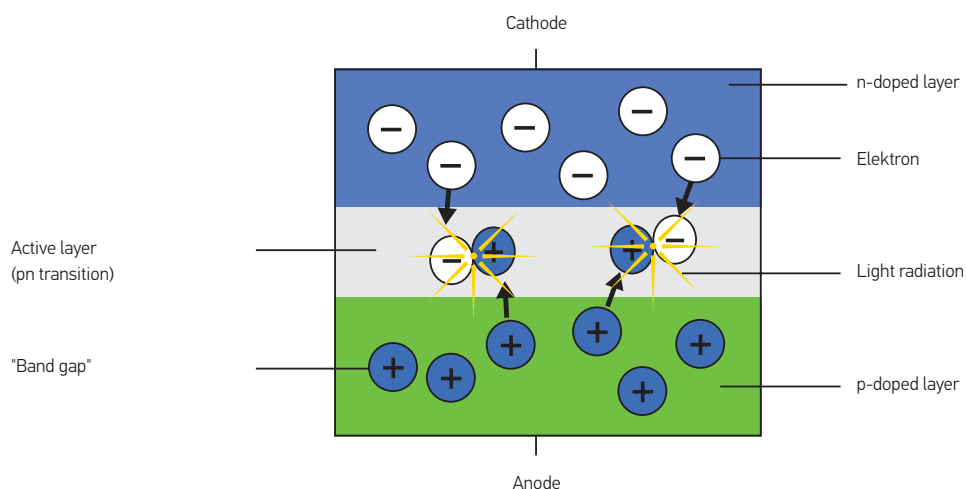
#### protection against the penetration of water

Second number	
0	no special protection
1	vertically falling drops of water
2	drops of water falling at a 15° angle
3	drops of water falling at a 60° angle
4	drops of water from all directions
4K	same as 4, but at increased pressure
5	water jet from a nozzle
6	same as 5, but at increased pressure
7	temporary immersion in water
8	sustained immersion in water
9K	cleaning under extremely high pressure

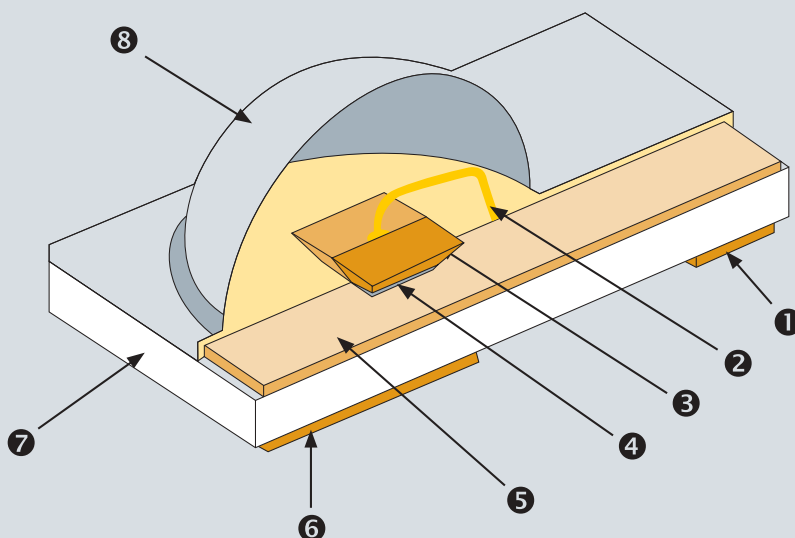
## INTELLIGENT ELECTRONICS CONCEPTS ...

... guarantee the protection the LEDs need.

Inverse polarity protection and protection from voltage peaks are necessary for the reliable realisation of extremely long LED design lives. When a current flows through the LED from the anode + to cathode –, light is produced (emitted). The diagram below illustrates how this works: A high degree of efficiency is achieved by means of the intelligent electronics concept of the LEDs.



- ❶ Cathode
- ❷ Bond wire
- ❸ LED die
- ❹ Die bond
- ❺ Metal interconnect layer
- ❻ Thermal pad (electrically insulated)
- ❼ Ceramic substrate
- ❽ Silicone lens

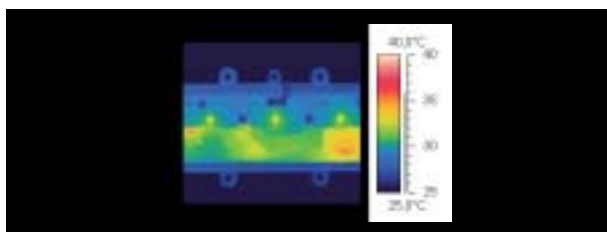


## LED'S ARE NOT ALL THE SAME

With LEDs you are investing in high-quality technology – but a significant reduction in follow-on costs and a longer problem-free design life means that this technology will pay off. The widespread use of LEDs is the best indication of their clear benefits. However, certain factors must be taken into account.

### With temperature management

Temperature management dissipates heat away from the LEDs and transfers it to the surroundings.

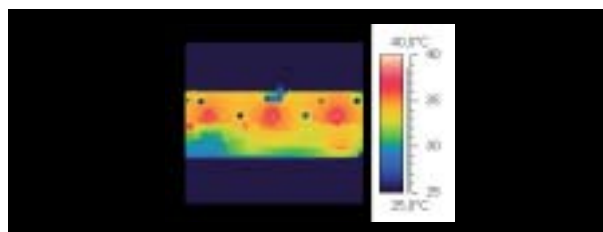


The LEDs only achieve their extremely long design lives with appropriate temperature management.

**HELLA ensures optimal temperature management during development.**

### Without temperature management

If heat is not dissipated away from the LEDs, hotspots develop. These damage the LEDs and can even cause them to fail.



If reliable temperature management is not available, the LEDs can overload and, in the worst case, even fail.

### Temperature management is an absolute must for protecting LEDs

LEDs are sensitive to heat. If the LEDs become too hot, the diodes can lose their luminous intensity and even be destroyed completely in the worst case.

HELLA's selection of heat-conducting materials and the arrangement of components ensure effective heat flow: temperature management directs heat away from the LED. This means we can guarantee the long design life of our products!

**If you want to get the best out of LED technology, temperature management is essential!**

## WHICH BEACON FOR WHICH USE?

There is no general answer to this question. Even for identical areas of application, for example, on a tractor, there is no uniform response. The selection can, however, be clearly narrowed with the help of certain criteria. To find the right beacon for the right application, you should ask yourself the following questions before purchasing.

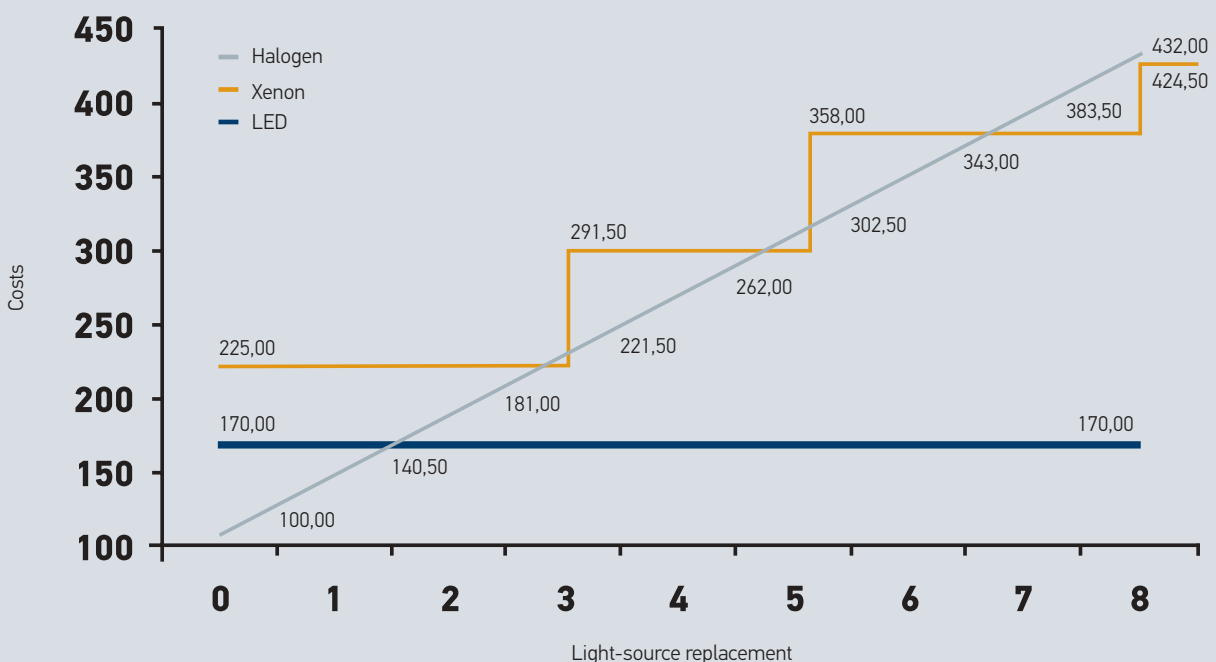
### Where or how intensively / frequently will the beacon be used?

How often the beacon is to be used in switch-on mode and especially where should also be taken into account. If the beacon is used very frequently, the advantages of LED technology such as design life, no maintenance, etc. will be clearly more important than if its use is low. The decisive factor in considering where it will be used is how demanding the area of application is.

### Initial price or life cycle costs?

#### HELLA quality always pays off in the end!

This question is closely related to the first question. If you compare the current costs of purchasing a halogen beacon with those of an LED beacon, you will be quite astonished. LED beacons are considerably more expensive due to their complex technology and thus deter many users. But their advantages cannot be dismissed. LED beacons are characterised by a considerably higher design life, no maintenance and low energy consumption. The higher initial costs are frequently already amortised after a short time due to savings on replacing the light source, lower service life, etc., as the following example calculation shows:



**What kind of warning effects do I want to achieve?**

On motorways or in city traffic, you usually want to draw the attention of approaching vehicles to a danger situation from already quite far away. In this case, we recommend using a beacon with a high warning effect (Xenon or LED). However, if the beacon is only used very infrequently and in areas that are not too dangerous, the warning effect of a halogen beacon is completely sufficient.

**How high is the vibration stress for beacons?**

The level of vibration stress for a beacon needs to be estimated, e.g. does the vehicle have suspension and already absorb a part of the vibrations, or does it not have any suspension and the beacon is exposed to the full extent of the vibrations. If there is a high level of vibration stress, it is necessary to ensure that a fixing variant is selected which absorbs the vibrations (e.g. a flexible pipe socket attachment, rubber base, etc.) and/or that a technology is selected which is not heavily influenced by vibrations (LED).

**How do I want to attach the beacon to the vehicle?**

There are four different fixing options to choose from: the decision as to which fixing variant makes the most sense depends on the vehicle. The different attachment variants are legally stipulated in DIN 14620. There are three different designs A, B and C to choose from.

**Pipe-socket attachment**

KL 7000 R

**Flexible pipe-socket attachment**

KLX 7000 FL

**Fixed attachment**

KL 7000 LED

**Magnet**

K-LED 2.0





# LED TECHNOLOGY

## Basic properties of LEDs

### Service life – how temperature development affects the service life

The service life or also the light degeneration of an LED refers to the period after which the light output sinks to half of its original value. The functioning of an LED depends on several factors. The semiconductor material used is as important as the operating conditions or the degeneration of the silicon crystal.

The actual value of the service life cannot be generally determined, though. While standard LEDs may last up to 100,000 hours, high-performance LEDs can be used for only about a quarter to a half of that time (25,000 - 50,000 hours). If both diodes were to be used non-stop, they could be used continually for eleven and more than two years, respectively.

The service life greatly depends on the location and the provided current density. The higher the current flow, the more the diode heats up. This shortens the service life. The ambient temperature is also relevant for the service life, as the diode generally fails sooner, if it is warmer. Basically, the intensity of the light radiation in LEDs continually decreases over time. This is an advantage, as unlike traditional lights (bulb, halogen), an LED does not suddenly leave you standing in the dark. Even if the light output is reduced, it normally does not suddenly fail. The plastic normally used in the lenses of LEDs gradually becomes hazy, which also affects the light yield negatively.

### Main factors affecting the service life

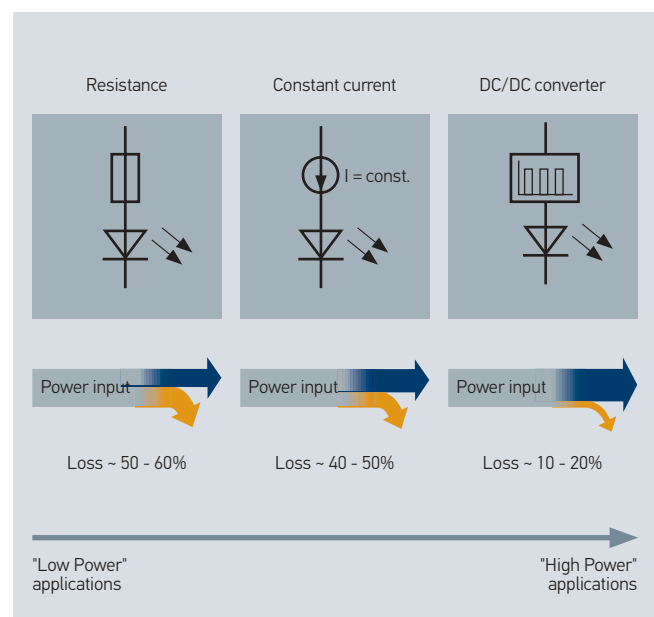
- Temperature
- Current density
- Degeneration of the silicon crystal

## LED control

As LEDs require only little current, they already illuminate when they receive only a fraction (a few mA) of the permitted forward current. This is often enough to provide light. As already mentioned, there are different ways of operating LEDs, depending of area of application.

Here are three of these options.

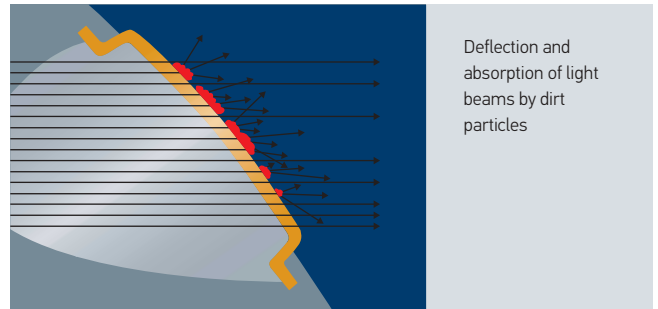
DC / DC is standard for HELLA beacons. This way, we can guarantee an extremely high efficiency so as to keep heat losses (intrinsic warming) to a minimum.



Three ways of controlling LEDs

### One example from the headlight area:

People who drive a lot know the situation. Poor road illumination due to soiled headlights. Frequent manual cleaning then becomes a must. Yet after only a short time back on the road, the headlights are dirty again due to particles being swirled around by other vehicles. This leads not only to reduced light levels but also to glare for oncoming traffic.



### Influence of dirty beacons

on the warning effect The warning signal effect of light intensive beacons is impaired by dirt. To reduce or avoid dirt deposits on the light domes, HELLA uses smooth surfaces without external lenses.

These are much less sensitive to dirt, therefore guaranteeing a optimum warning effect.

### Clean beacons

- Maximum warning effect
- No light scattering
- Optimum light aperture

### Soiled beacons

- Reduced warning effect
- Broad light scattering
- Reduced light aperture



## LED, XENON OR HALOGEN – WHICH TECHNOLOGY IS THE RIGHT ONE FOR ME?



### LED

Everyone is talking about the topic of LED technology and the trend in the area of light technology. But when considering the advantages and disadvantages of this technology, it quickly becomes apparent for what type of applications LED beacons are the right beacons:

**+ Extremely long design life (multiple of halogen)**

High-quality components, complex technology and no movable components (no mechanical wear).

**+ No downtimes or assembly times**

LEDs with an extremely long service life often last a vehicle lifetime (no maintenance).

**+ Highest functional safety**

HELLA LED products must meet the highest quality requirements before being approved for the market.

**+ Highest vibration resistance**

LEDs are composed of a few solid components and thus demonstrate a considerably higher vibration resistance as e.g. Xenon.

**+ Highest energy efficiency**

Energy consumption for operating an LED beacon is considerably lower than halogen or Xenon.

**+ Highest light value**

For optimal warning effectiveness.

**+ Modern design**

The small form of LEDs enable a modern design.

**+ Low life cycle costs**

Long design life, no maintenance and high energy efficiency ensure strongly reduced life cycle costs compared with Xenon or halogen products.

**- Higher initial costs**

The purchase price of LED beacons is clearly higher than that of halogen beacons.

One of the reasons for this is that the technology to obtain a longer design life is clearly more complex, which means that the life cycle costs turn out to be considerably lower.

**The advantages and disadvantages clearly demonstrate for what type of applications LED products are most suitable.**

**→ Extremely long design life, no failure and mounting times**

Optimal for vehicles with high periods of use (e.g. waste collection or street cleaning vehicles, trucks).

**→ Highest functional safety, highest vibration resistance**

Optimal for vehicles subject to a high degree of stress over a long period of use (e.g. mining or construction vehicles).

**→ Highest energy efficiency**

Optimal for vehicles that are frequently used with a beacon switched on (e.g. heavy goods vehicles, snow clearance vehicles).

**→ Modern design**

Optimal for drivers for whom design combined with the above-mentioned advantages are important.



### Xenon

An Xenon light offers double as much light as a modern H7 light, but has 30 % less power consumption. The increased light power achieves optimal warning effectiveness.

**+ Highest light values**

Optimal warning effectiveness due to an intense double flash warning signal.

**+ Long design life**

Clearly longer design life than halogen.

**+ No moving parts**

No mechanical wear.

**+ Very high vibration resistance.**

**- High initial costs**

Xenon beacons are considerably more expensive to purchase than halogen beacons.

**Recommendation for use:**

The use of Xenon beacons is recommended in all cases where a high level of warning effectiveness is required with medium use of the beacon.



### Halogen

Halogen beacons attain their high warning effectiveness from the use of high-sheen vapour-plated parabolic reflectors and high quality bulbs. Using special optics for the domes guarantees an efficient light yield.

**+ Bundled light**

High range.

**+ Low initial costs**

Halogen beacons are considerably more economical to purchase than Xenon or LED beacons.

**- Shorter design life**

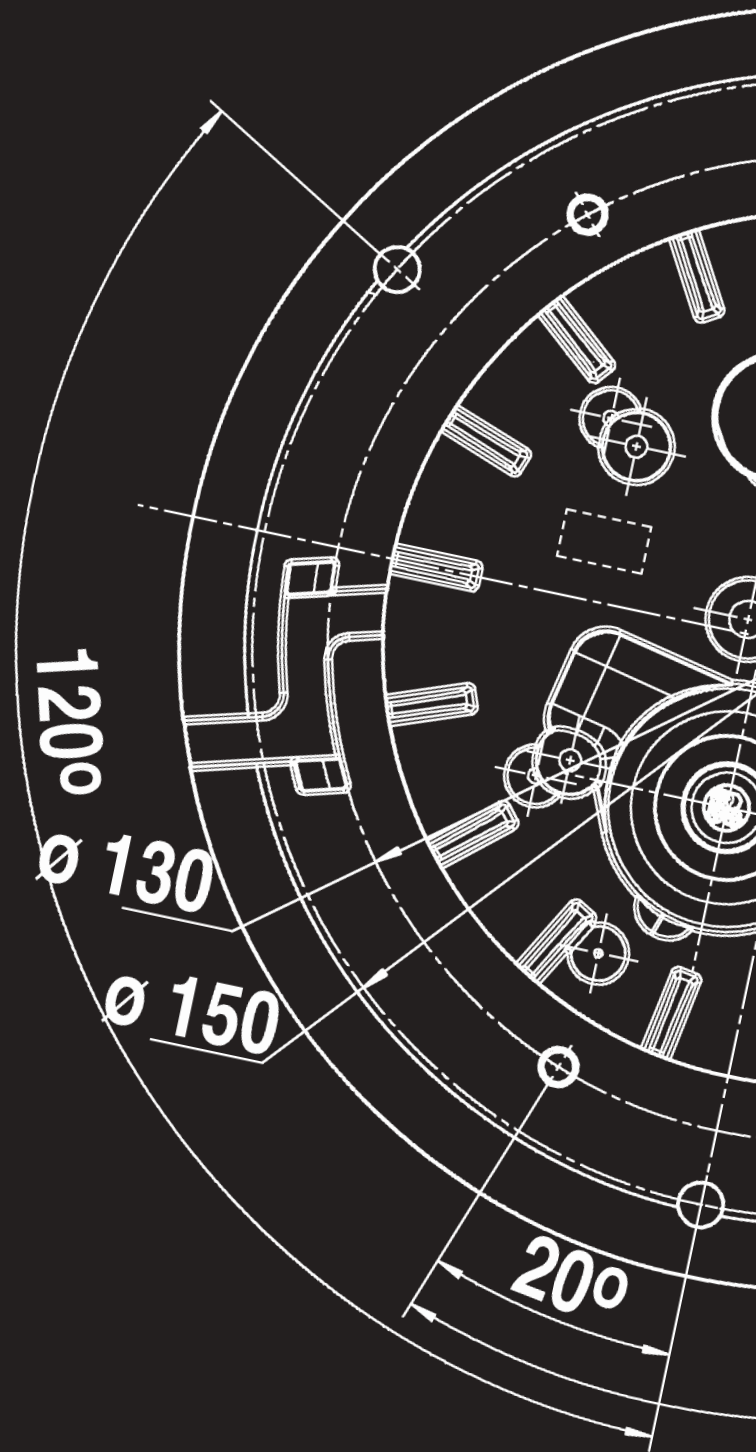
The use of movable parts causes mechanical wear, whereby the design life is considerably lower compared to Xenon or LED beacons.

**- Higher life cycle costs**

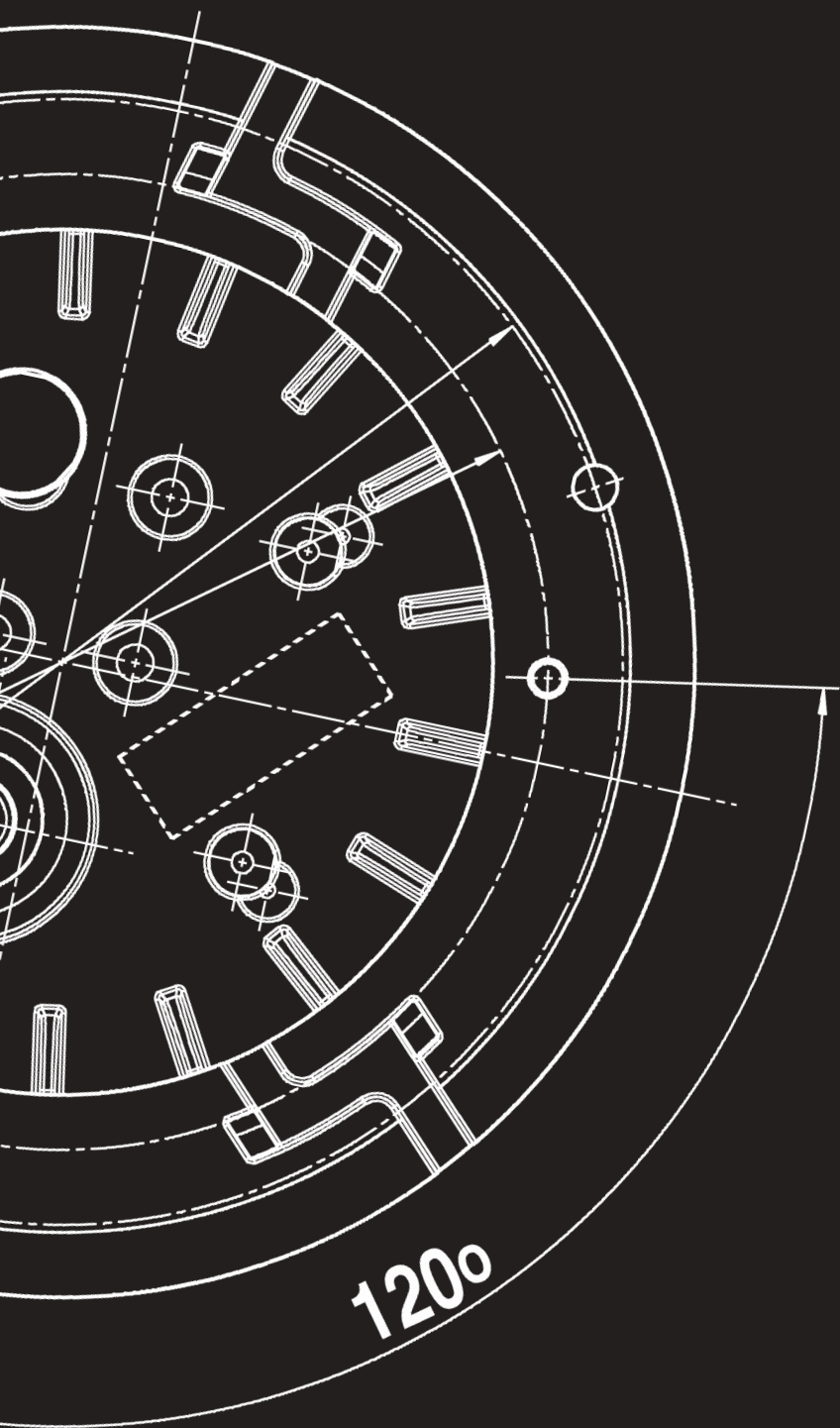
Due to increased energy requirements, maintenance and the associated failure times, the life cycle costs of halogen beacons are considerably higher than for LEDs.

**Recommendation for use:**

The use of halogen beacons makes sense in all cases where the advantages of LED are not so important, for example, if a beacon is used infrequently, or in the case of vehicles where beacons often have to be replaced due to mechanical damage.







**WHY HELLA?**

## QUALITY IS A TRADITION AT HELLA

### **HELLA has set itself the ambitious standard of guaranteeing consistently high product quality in every respect.**

This is achieved by defining quality criteria and checking every detail using carefully-selected methods throughout the entire manufacturing process. Production quality is ensured by parallel quality monitoring and testing.

Quality products from HELLA are subject to different test procedures in accordance with the HELLA standard 67101. These test procedures are conducted by the HELLA test laboratory in Lippstadt.

### **First-class quality by conviction**

HELLA guarantees the perfect, long-term functioning of its products and stands for satisfied customers in the spare parts, accessories and light sources areas.

As the long-established company from Lippstadt is an efficient partner to the automotive industry, HELLA products are manufactured to meet the respective precision, tolerance specifications. Combined with the use of sophisticated test procedures in the product development, you can depend on HELLA products in any situation.

### **HELLA products are subject to the following tests:**



#### **Splash water test**

In universal splash water cabins, HELLA products are tested under realistic environmental conditions. The cabins are equipped with devices for rain, splash water, water jets and water mist. Here, the test products are tested for tightness by undergoing an intermittent and splash water test at a pressure of up to 5 bar, and a jet water test at a pressure of up to 10 bar. (IP XK4K)



#### **High-pressure cleaner test**

In one test system, the products are exposed to a water pressure of up to 120 bar and a water temperature of 85 degrees Celsius.

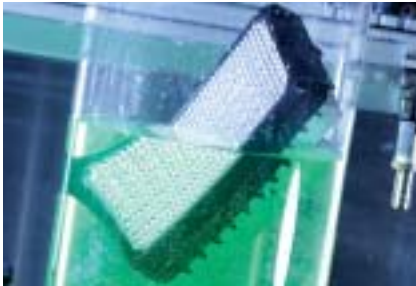
This test simulates cleaning in a carwash or with a pressure cleaner (IP XK9K). Information as to whether a customer can clean the beacon with a high-pressure-cleaner can be found under the IP protection category. For all beacons with the IP 9K protection category, water directed against the casing from a high pressure/stream-jet cleaning does not have any damaging effect.



#### **Dust test**

In this test, the products are tested for their dust tightness. Unfired Portland cement is used as a test medium for all products. The test is optionally performed in sample function operation, and with overpressure or underpressure exposure of the device under test.

The tests are evaluated by determining the photometric value before and after the test (IP 5K). This is the only way that HELLA can ensure that dust will not penetrate the product and can guarantee the long service life of the product.



### Immersion and pressure tightness test

Depending on requirements, this test is carried out for all lighting technology products.

An immersion pipe can be submerged to a depth of 1m in water. Another test system can reach a depth of 6 metres. Also, an overpressure test up to 1.6 bar is conducted in an immersion pool.

All tests are carried out in accordance with the HELLA standard, 67101, as well as the legal requirements (IP 67).



### Heat, moisture and cold test

In temperature cycle tests, HELLA products are exposed to temperature fluctuations of -40 degrees Celsius to +100 degrees Celsius in climatic chambers which have a volume of 600 - 1000 litres. In addition, thawing and de-thawing tests up to max. 95% air humidity and up to 80 degrees Celsius are conducted. In the so-called "shock chamber", the temperatures changes within seconds (intervals of max. 6 seconds) between -40 degrees Celsius and +100 degrees Celsius.



These tests signify utmost stress on any material, both for lighting as well as for the individual electronics components. The heat and cold tests last up to 48 hours.



### Vibration test

This test simulates the behaviour of the products over a "poor stretch of road" and shows, for example, responses to potholes, gravel tracks, gravel, stones, fields and dirt roads. Special rally profiles are tested for selected products, like for example, auxiliary lights.

The wide band random vibration test is used to test the mechanical endurance strength in the vertical and horizontal axes. Here, the frequency range extends from 10 to 1000 Hertz. Alongside the vibration test, the products are subjected to a temperature overload of -40 degrees Celsius to +80 degrees Celsius. This includes a check on the ageing process of the plastic. All products are tested for function for up to 24 hours.

Furthermore, a mechanical shock test is conducted during this procedure. This simulates the behaviour in the event of jolts (products in packaging during shipping) with an acceleration of between 300 and 500 metres per second<sup>2</sup>.



More information on HELLA quality criteria  
can be found under: [www.hella.com/quality](http://www.hella.com/quality)

## DID YOU KNOW THAT ...



Rotating sound combination  
Model year 1972

... the KL-1 by HELLA from the 1950s, is the forebear of the rotating HELLA beacons?

... the RTK1 (rotating sound combination) from 1972 represented the first combination of a blue beacon and loudspeaker?



KL 700  
1st generation



KL 7000  
2nd generation



KL 7000 LED  
3rd generation

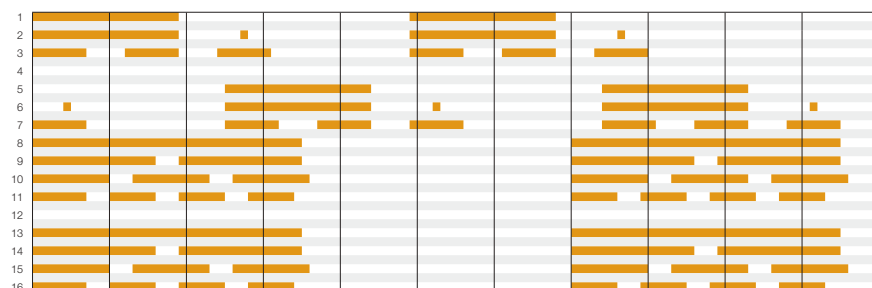
... there is a HELLA "beacon family"?

This can be recognised by their similar appearance and their different technology levels. An example is the KL 700- 7000- 7000 LED family.



... Hella beacons are also available in different colours?

Including amber, blue, red and green.



4 and 12 = rotating warning signals  
Orange = on  
White = off

... it is possible to change the warning signal pattern on certain HELLA LED beacons?

There are, for example, nine different flash sequences to choose between with the K-LED FO or the K-LED 2.0. The flashing sequences can be programmed with little effort and are described in detail in the installation instructions of the respective beacon.



... in addition to beacons, HELLA also offers a wide range of different light bar solutions for blue light (RTK7) and amber light (OWS7)?



... all HELLA beacons are delivered with comprehensive installation instructions?

These instructions provide information about the scope of delivery, accessories, the necessary installation tools, wiring and much more.



... HELLA also offers a range of accessories for the different beacons?

such as socket pipes, stand holders, vehicle networks sockets, etc.



... there are control units?

These can be used for the functional monitoring of rotating beacons and flashing beacons.



... HELLA has an extensive range of spare parts?

This includes domes in different colours, bulbs, flash tubes, drive belts and much more.



... HELLA offers a tool that enables you to compare the different beacons and their properties?

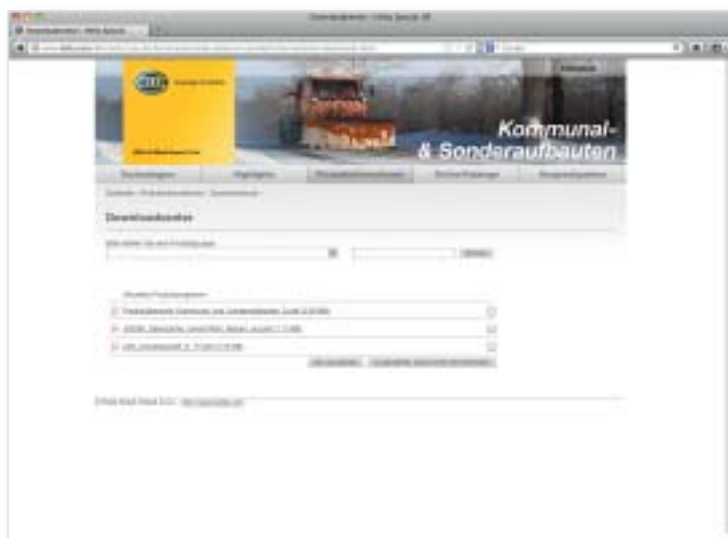
To find out more go to [www.hella.com/municipal](http://www.hella.com/municipal) or [www.hella.com/eliver](http://www.hella.com/eliver)



## MICROSITE MUNICIPAL



Visit [www.hella.com/municipal](http://www.hella.com/municipal) for information on technology, highlights, product information, online catalogues, as well as contact partners.



The download area offers you the latest product brochures.



Your fast link to our world of world of experience

## ONLINE TOOLS



[www.hella.com/eliver](http://www.hella.com/eliver)

**ELIVER. The online comparison tool for beacons, optical warning systems, worklights and auxiliary lights.**

HELLA beacons and optical warning systems are a prime example of quality, practicality, safety and cost-efficiency. For all types of municipal superstructures and special superstructures (e.g. refuse lorries, road salt vehicles, sweeping machines among others) as well as emergency vehicles, HELLA can provide the correct beacons or warning systems.



Continuous research and development as well as customer-specific solutions for small- and large-scale production make HELLA the ideal partner for ministries, local authorities and the private sector. The LED products designed by Hella are particularly resistant to vibrations, dirt and water. In addition, the use of LED technology has a positive effect on the efficiency and ecological balance (reduced CO2 emissions). By using our ELIVER tool for beacons and optical warning systems, you can compare selected products in practical, realistic scenarios to make sure you make the right decision for each application. You can choose from the most varied of vehicles and scenarios.



HELLA has the right worklights and auxiliary lights for every kind of agricultural machinery, such as tractors or combine harvesters, construction machines, forestry machines, special vehicles as well as lorries and heavy goods vehicles. Use our ELIVER tool to compare our outstanding products and select the perfect worklight or auxiliary light for you and your working life. View the light distribution on a dirt track, on a country road or in an off-road scenario. ELIVER also provides you with all the relevant information about performance and technical specifications.

[www.hella.com/eliver](http://www.hella.com/eliver)



### OWS 7 configurator

With the new OWS 7 configurator, you can assemble your own, individual OWS 7. From the vehicle selection (compacts, transporters, sprinters, and breakdown vehicles) to a variety of roof beam widths to individual light modules. Of course, you can also choose other equipment, such as worklights, chaser light signals, and the side close-range illumination.

Afterwards you will see a preview of your individual OWS 7 in order to test all the functions selected.

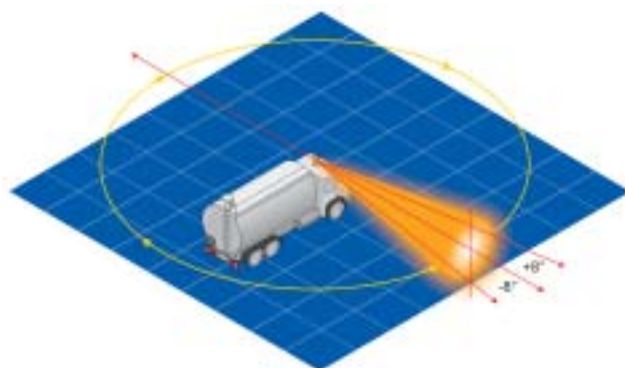
Configure your individual OWS 7 here:  
[www.hella.com/ows7](http://www.hella.com/ows7)

## HALOGEN TECHNOLOGY

IN BEACONS AND OPTICAL WARNING SYSTEMS

### Advantages:

- Bulb and reflector form a rotating unit – the full light power of the halogen bulb is used
- Optimum light bundling and distribution – considerable range and maximum warning effectiveness
- A reflector system and a sturdy bulb holder for a simple, fast light source replacement – no soiling or incorrect adjustment of the reflector
- Favourably priced product solution – low maintenance costs e.g. for light source replacement



Product example: OWS7

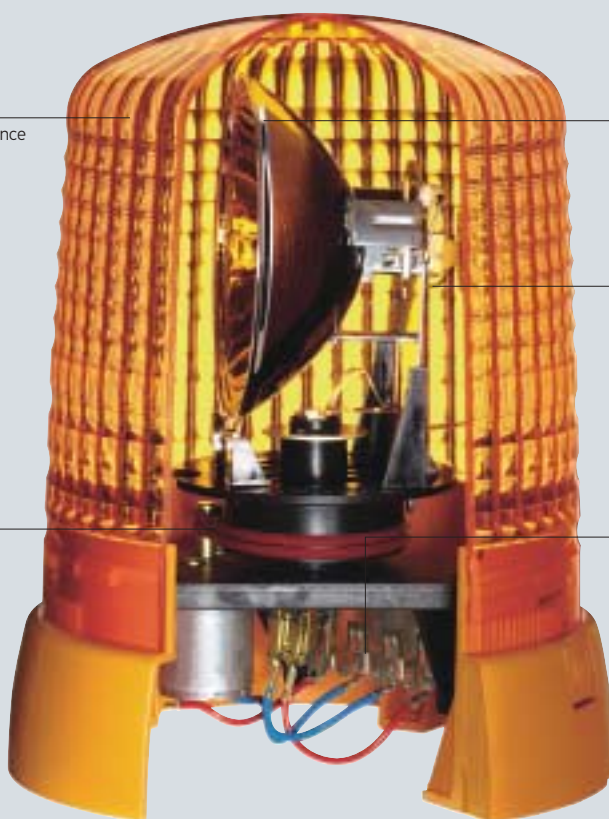
Cover with a special appearance for optimal light distribution

High-shine vapour-plated parabolic reflector for optimal light yield

Spring contact

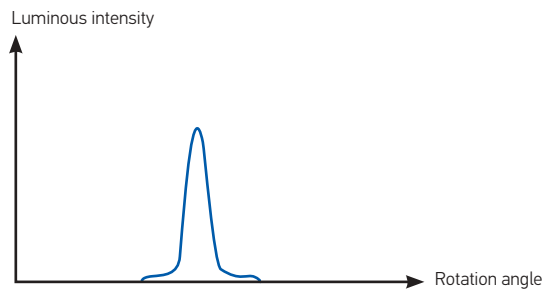
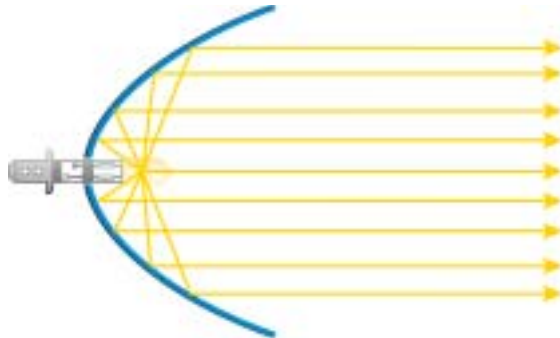
Double-belt drive for a high degree of operational safety and maximum running smoothness

Electronic motor control enables multivoltage operation



Product example: KL 7000

## HELLA

**HELLA "rotating system":**

- Best possible light yield
- Optimally directed light
- Homogenous light distribution
- Highest luminous intensity

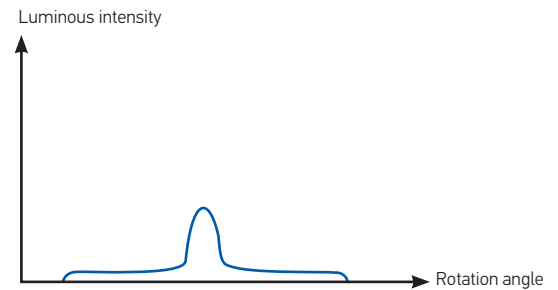
**Customer benefits: safety and reliability**

HELLA products guarantee maximum own- and third-party safety by means of an optimal, very intensive warning effect. This safety is achieved by the optimum light bundling and distribution, the resulting high range as well as the very high luminous intensity. In addition, our products are particularly reliable due to their excellent quality in terms of workmanship and stability - their long design life proves it!



Bulb and reflector form a rotating unit

## COMPETITORS

**Competitor system with "standing bulb":**

- Inefficient light yield
- High scattering loss
- Light loss: reflector surface is shadowed by the light bulb base
- Low luminous intensity



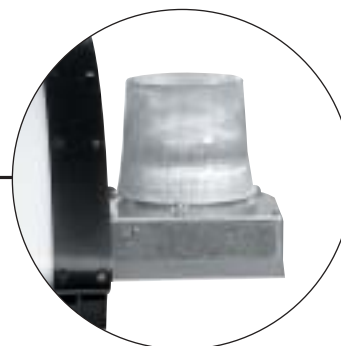
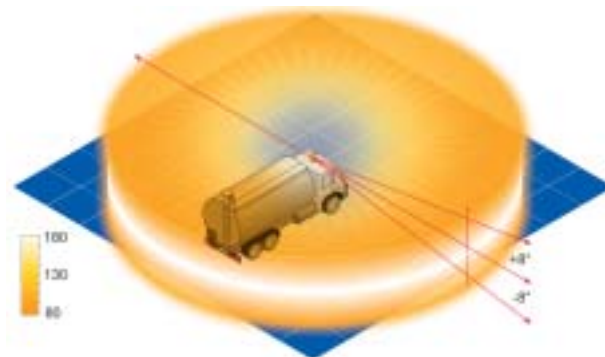
Reflector rotates around a stationary bulb

## XENON TECHNOLOGY

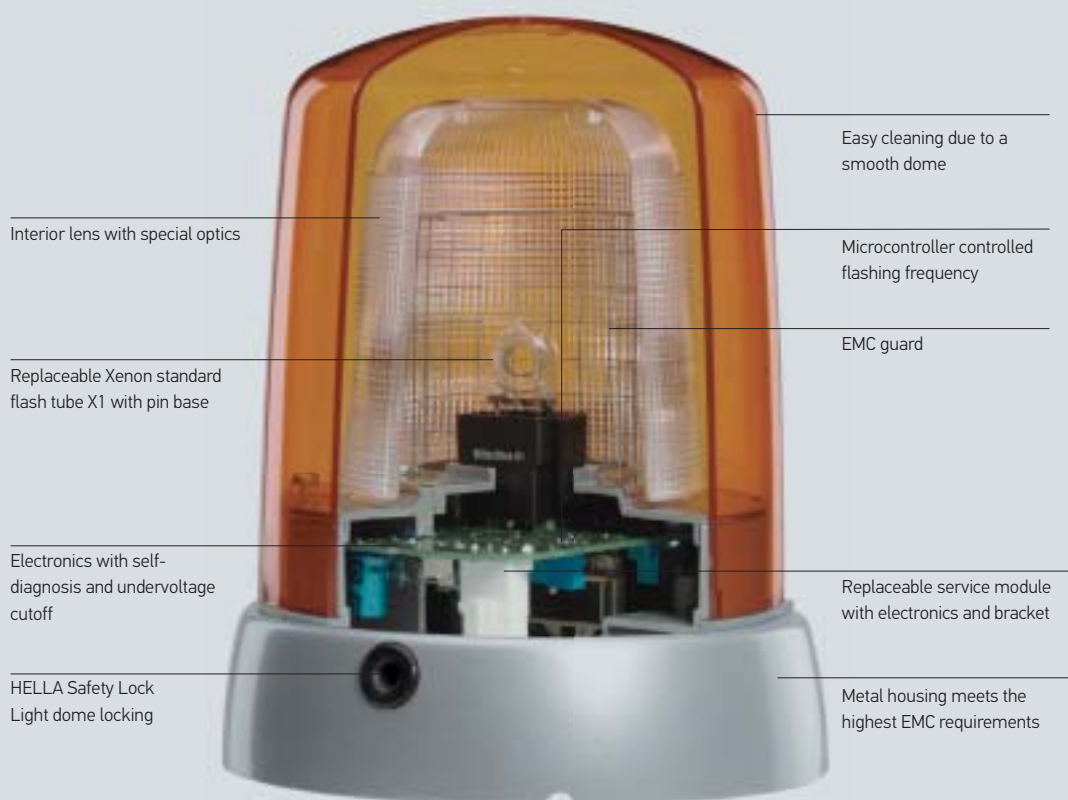
IN BEACONS AND OPTICAL WARNING SYSTEMS

### Advantages:

- Rapid increase in luminous intensity – can be seen immediately
- Double flash signal - intensive warning effect clearly above the statutory requirements
- Optimum warning effectiveness even in daylight – even in direct sunshine
- Extremely resistant to vibrations – suitable for applications involving intensive vibrations
- No moving parts – no mechanical wear, low-noise operation
- Low current consumption - ideal solution for permanent use



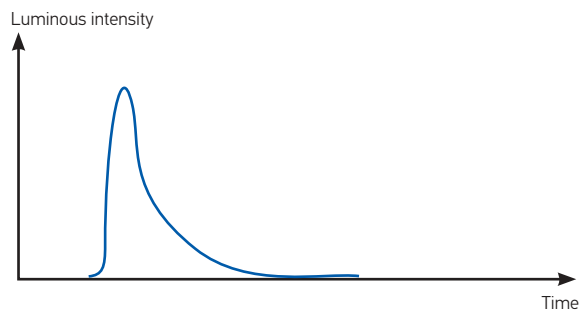
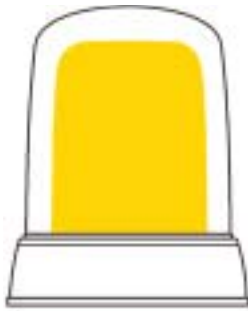
Product example: OWS-X



Product example: KLX 7000



## HELLA

**HELLA System:**

- Homogeneous, large-surface illumination
- Very steep rise of the light values
- Signal immediately perceivable
- High peak values  
(light values clearly above the statutory requirements)

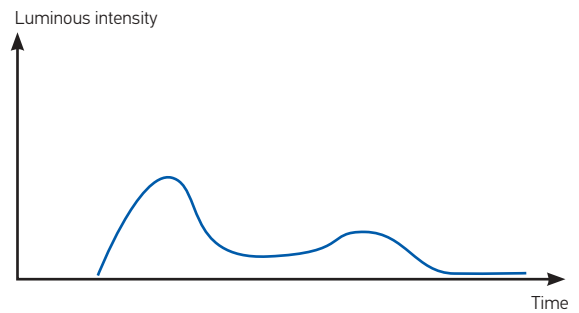
**Customer benefits: safety and reliability**

HELLA products guarantee maximum own- and third-party safety by means of an optimal, very intensive warning effect. This safety is achieved by the short response times, as well as optimal light distribution and luminous intensity. In addition, our products are particularly reliable due to their excellent quality in terms of workmanship and stability - their long design life proves it!



Complex designed interior lense; guard and metal housing for the highest EMC protection

## COMPETITORS

**Competitor system:**

- Inhomogeneous light distribution, reduced luminous area
- Moderate rise in the luminous intensity
- Blurred perception of the pre- and after-flash of the double flash signal
- Low luminous intensity



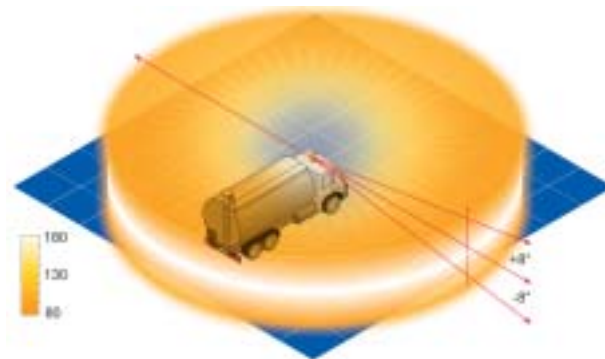
Simple interior lens; low EMC protection measures

## LED TECHNOLOGY

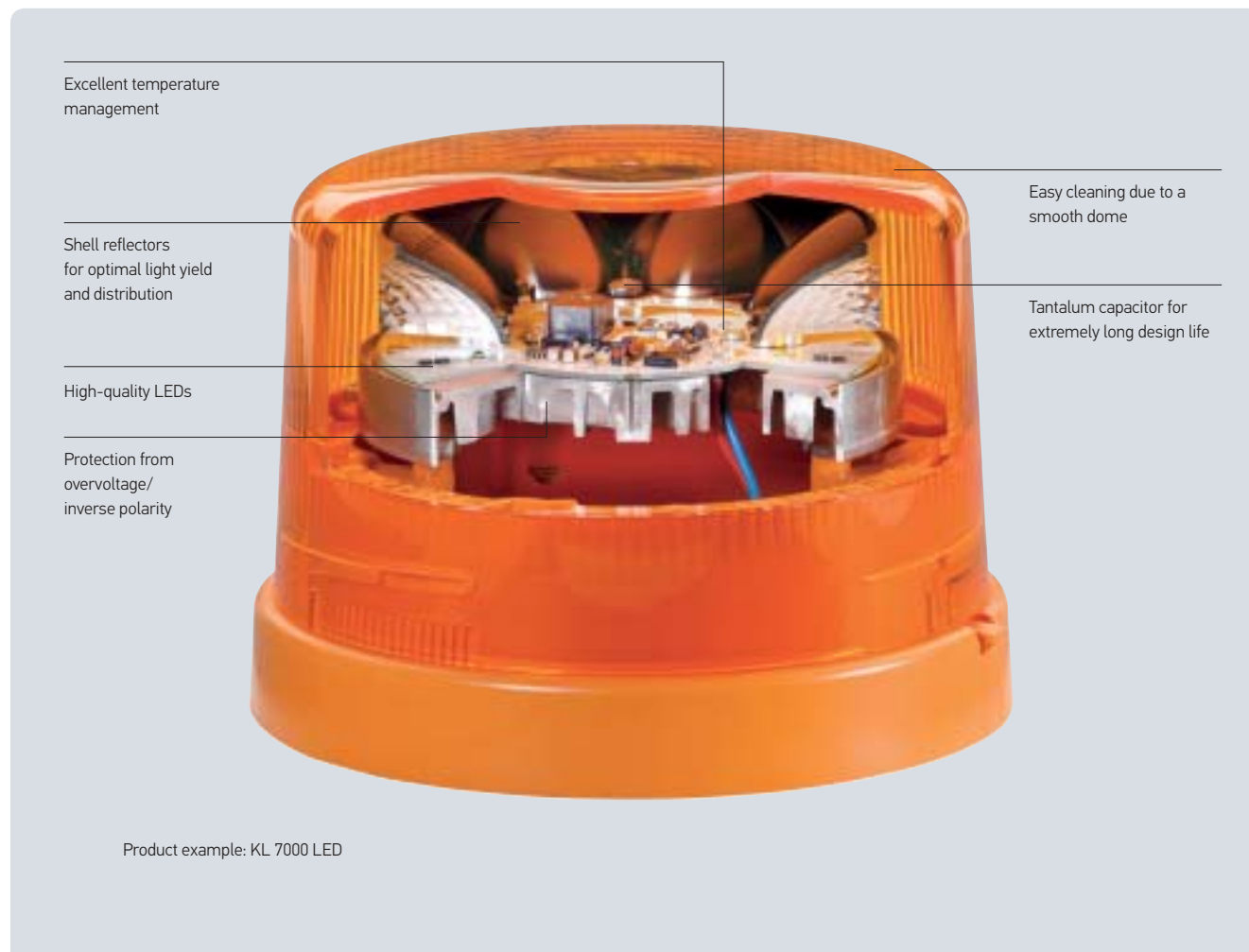
### IN BEACONS

#### Advantages:

- Very long design life – maximum reliability
- Insensitive to vibrations and impacts – ideal for applications involving intensive vibrations
- Low current consumption – ideal for permanent use
- Intelligent electronics – wide range of flashing sequences can be programmed
- Extremely short response times – optimum safety effect
- Modern design

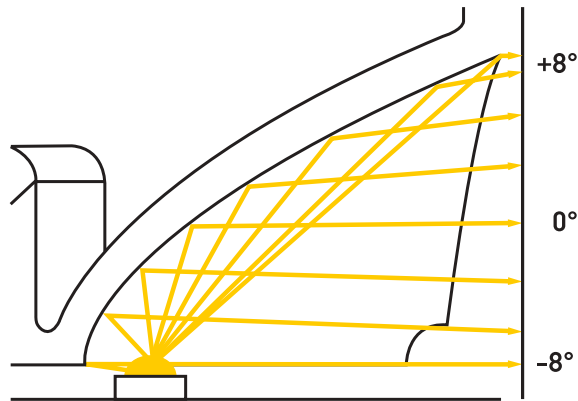


Product example: OWS7

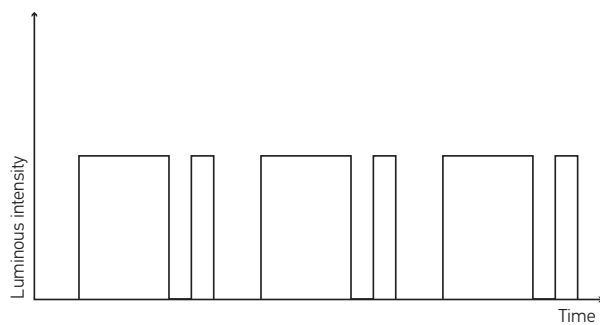


Product example: KL 7000 LED

## HELLA



## Flashing function



Intensive perception thanks to double-flash signal, 360° warning effect, rapid increase in light values, signal can be perceived immediately.

**HELLA "flashing" system:**

- Intensive perception thanks to a double-flash signal,
- Warning effect 360°
- Steep rise of the light values
- Signal immediately perceivable
- Intensive light colour
- Use of high-quality LEDs
- Protection from overvoltage and inverse polarity
- First class temperature management
- Tantalum capacitor for extremely long design life

**Customer benefits: safety and reliability**

HELLA products guarantee maximum own- and third-party safety by means of an optimal, very intensive warning effect. This safety is achieved by the short response times, as well as optimal light distribution and luminous intensity. In addition, our products are particularly reliable due to their excellent quality in terms of workmanship and stability - their long design life proves it!

## COMPETITORS

Extensive information  
on competitors' beacons  
will be provided by Benchmark  
at the end of 2013

**Competitor system:**

- Unequal light perception
- Warning effect 360°
- Light values partly lower
- Signal immediately perceivable
- Pale light colour
- Partial use of LEDs with low quality
- Protection from overvoltage and inverse polarity
- Temperature management at times missing
- Electrolytic capacitors = shorter design life

## MODULES OWS7

Fully modular from the basic version to maximum features.

- Ready for any use
- Housing widths from 900 mm to 2000 mm increments (in 100 mm increments)
- 12 or 24 V



### 1 Main beacons

- **LED KL-LM 2:** 360 ° module, flashing warning signal, high-power LEDs arranged in a semi-circle
- **LED KL-LM 4:** like LED KL-LM 2 module, rotating warning signal
- **LED KL-LR 2:** flash module, reflector in trough formation, option to use front and rear signal separately
- **KL-ER:** classic halogen rotating-mirror module

### 2 Alley lights

- with 4 LEDs
- Intensive close-range illumination along the side

### 3 Worklights (ASW)

- 12 V-Version with H3 bulbs
- 24 V-Version with H9 bulbs
- Also available in LED technology
- Multiple light assembly possible

### 4 Hazard warning

- To the front, to the rear or to the rear
- LED module with high intensity
- Synchronisation with other indicators possible
- For installation under dome



Configure your individual OWS7 here:  
[www.hella.com/ows7](http://www.hella.com/ows7)

<b>5</b> Chaser signal: LED signal bar (LSB)	<b>6</b> Light dome (depending on light module)	<b>7</b> Panels
<ul style="list-style-type: none"><li>→ Integrated amber chaser signal for rearward warning and security</li><li>→ Traffic control possible thanks to different signal directions</li><li>→ Daytime / night-time mode switchable via control unit</li><li>→ Please observe country-specific regulations during use</li></ul>	<ul style="list-style-type: none"><li>→ Transparent</li><li>→ Amber</li></ul>	<ul style="list-style-type: none"><li>→ Milky white</li><li>→ Transparent amber</li><li>→ Transparent clear</li></ul> <p>Beyond a width of 1,200 mm, partitions are installed in order to cascade the panels.</p>





## STRAIGHTFORWARD ANSWERS TO TECHNICAL QUESTIONS

### What cable diameter is required for a beacon?

The cable diameter can differ depending on the beacon, but is generally 1.5 mm or 2.5 mm. Please always refer to the installation instructions included in the delivery for the relevant cable diameter for your beacon.

### How do the light dome materials polymethylmethacrylate and polycarbonate differ from each other?

PMMA

+ High UV resistance

- Low impact resistance

→ Optimal for applications where the beacon is seldom mechanically damaged (e.g. on a lorry)

Polycarbonate

+ High impact resistance

+ Low UV resistance

→ Optimal for applications where a beacon can be damaged by branches or similar objects (agricultural/construction machinery)

### What do the German Carriage of Dangerous Goods on Road and Rail Regulations (GGVSE) say?

The German Carriage of Dangerous Goods on Road and Rail Regulations (GGVSE) regulates the national and cross-border carriage of dangerous goods (from and to member states of the European Union) for road and rail traffic. When transporting dangerous goods, it must be ensured that only beacons are used which are approved for this type of transport. These beacons meet special test specifications to ensure safe use during the transport of dangerous goods. The new HELLA KL 7000 LED, for example, meets these requirements.

### What do watt, Kelvin, lux, lumen and candela mean?

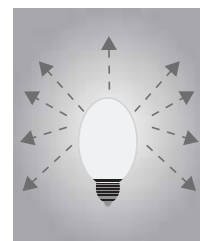
**Watt (W):** unit of measurement of electrical power

**Kelvin (K):** unit of colour temperature

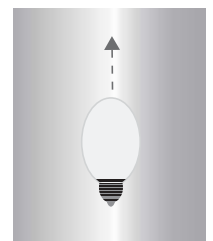
**Lumen (lm):** unit of luminous flux

**Candela (cd):** unit of the luminous flux emitted in a given direction

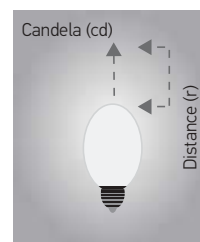
**Lux (lx):** Unit of illuminance The unit of illuminance specifies the ratio of the impinging luminous flux to the illuminated surface.



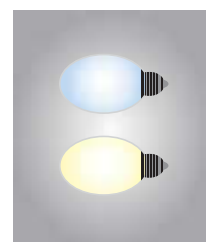
Lumen (lm)



Candela (cd)



Lux (lx)



Colour temperatures

6500 k

2700 k



**Are there any legal regulations which apply to worklights?**

There are no specific regulations for type approval, as worklights can only be used while driving off public roads.

**Who is allowed to install worklights on their vehicles?**

Worklights can be installed on any vehicle.

**Can I use worklights in road traffic as well?**

Yes, if the vehicle is stationary (e.g. loading and unloading).  
Exception: vehicles used for building, maintaining, street cleaning or refuse collection, if the trip is part of the working process. Worklights may then only be switched on if they do not dazzle other road-users.

**Can other headlights also be used as worklights?**

For vehicle lighting, special headlight types were developed depending on their area of application: dipped beam, spotlights, fog lights and worklights. Only worklights can provide sufficient illumination to illuminate the field of work. A good worklight is characterised by the even illumination of as large a surface as possible and gentle transition into the edge area. (see Fig. 1)

**Can I switch on worklights in public traffic when it is foggy?**

No. Worklights must not be used while driving on public roads.

**When can I use a worklight as a reversing spotlight?**

When an approved reversing spotlight is involved - only with the 00AR approval mark. HELLA also offers a reversing spotlight variant from several ranges: Ultra Beam, Power Beam 1000 (LED), ECO21.

**What do GGVSEB and ADR stand for?**

GGVSEB (previously GGVS) stands for the Ordinance on the Carriage of Dangerous Goods on Roads, Railways and Inland Waterways. This ordinance implements the European Parliament and Council Directive 2008 / 68 / EC dated 24th September 2008 on the inland transport of hazardous goods. Worklights with this mark are approved for installation on conveyance facilities which must comply with the provisions of GGVSEB / ADR.

**Does the light yield of headlights double with two bulbs?**

The light power depends on the light source and the reflector lens system. Two bulbs therefore signify a plus in light power.

**What is the difference between the three different types of illumination?**

Long-range illumination:

rather narrow diffusion (approx. 12-15° to the left and right), range between > 40 m - 150 m (depending on the installation height and inclination angle).

Close-range illumination:

designed for the area near the vehicle, range approx. 20 m to 40 m, wide diffusion.

Terrain illumination:

combination of close-range and long-range illumination, may also be referred to as illumination of the surrounding area or off-road illumination.



Dipped headlight



High beam



Fog light



Worklight

Fig. 1

**Why is the installation height of a worklight important?**

The light appearance changes depending on the different installation heights. A uniform installation of 2.5 m was taken for the light diagrams in the catalogue. (Fig. 2 and 3)

**Can I use worklights designed to be mounted upright with suspended mounting?**

That is only possible if mentioned in the article description or installation instructions. This is the only way to achieve optimal illumination and guarantee tightness.

**When are upright and suspended versions of a worklight available?**

If the light distribution is not symmetrical, there are different varieties for suspended installation. Please refer to the HELLA product text or to the installation instructions to check whether a headlight is suitable for suspended installation.

**How long is the service life of a HELLA LED worklight?**

The design life of the entire worklight system depends on environmental influences such as vibration, exposure to salt, temperature, etc. The design life of the LED itself is usually very long, but decreases under the influence of temperature.

The illumination unit of HELLA's high-power LED worklights is designed in such a way that 70% of the original light power is still available after 60,000 hours. (In the case of "Low Power LED Worklights", for example, the flat beam LED, this value is reached after 10,000 hours).

**Do I need an additional relay to install an LED worklight?**

Protection is required particularly for LED devices with higher power. More detailed information is listed in the installation instructions for the respective HELLA LED worklight.

**Can I activate worklights at the same time as other headlights (e.g. spotlights and worklights)?**

No. It must be possible to switch on worklights independently from all other headlights and lights.

**Do I need an additional relay to install a Xenon worklight?**

Yes, because the current required to ignite the burner briefly reaches 20A (at 12V) or 10A (at 24V), so a fuse is required (15A for 12V systems, 7.5A for 24V systems).

**What cable diameter is required for a Xenon worklight?**

Please observe that cables with sufficient cross-section are used. The recommendation is to use a 2.5 mm<sup>2</sup> cable with a max. length of 5 m.

**What types of connectors are there?**

HELLA offers different connector systems for electrical contact. Either the connector is integrated into the casing or mounted on to a cable (AMP/German) or depends on the bulb (e.g. H9/HB3). The German connectors and mating connectors used most in the automobile branch for H9/HB3 bulbs are not widely available on the aftermarket. HELLA offers adapter cables for this purpose to enable simple electrical contact.



Low installation position

Fig. 2



High installation position

Fig. 3

### **What does 'heavy-duty' mean?**

Heavy-duty indicates that the product can withstand extreme stress. Heavy-duty worklights go beyond the already very high standard and are equipped with additionally reinforced brackets or vibration dampers that withstand even tougher conditions.

### **Why are HELLA LED worklights shake-proof?**

LEDs are semi-conductor components, which means they do not have any fragile filaments. That is why they are absolutely shock and vibration resistant, which guarantees optimal lighting even under extreme conditions.

### **Why are all HELLA LED and Xenon worklights supplied with stainless steel brackets?**

In general, only high-quality materials are used for HELLA worklights. Particularly in the top segment of LED and Xenon worklights, the quality goes one level beyond the already very high standard requirements. A4 stainless steel brackets prevent corrosion and contribute to the longevity of these products.



## REVERSING SPOTLIGHTS

New laws for lighting equipment on newly registered commercial vehicles and trailers have applied since July 2006 (legal regulations also apply to conversions and retrofitting):

A total of four reversing headlights are permitted:  
Two reversing headlights on the rear and, in each case, one reversing headlight on the side. This is the formula for an optimum illumination when reversing.

### German legislation has permitted a total of four reversing spotlights since July 2006:

- Two additional reversing lights at the rear on commercial vehicles, buses and trailers with a length of more than 6 m.
- Additionally, one reversing light at each side for commercial vehicles, buses and trailers with a length of more than 6 m.
- The installation of fog lamps at the rear, and the use of worklights as reversing lights, are prohibited.

**For each vehicle and trailer, a maximum of 4 functional back-up lights may be attached.**

#### Key:

- Additional reversing light (rear end or side)
- Standard reversing light

**Variant A:** Two additional reversing lights at the rear.

**Variant B:** One additional reversing light on each side.

**Variant C:** Two additional reversing lights at the rear plus an additional reversing light at the side.



**HELLA KGaA Hueck & Co.**

Rixbecker Straße 75  
59552 Lippstadt, Germany  
Tel.: +49 2941 38-0  
Fax: +49 2941 38-7133  
Internet: [www.hella.com](http://www.hella.com)

**HELLA Limited**

Wildmere Industrial Estate  
Banbury, Oxon OX16 3JU  
Tel.: (01295) 225600  
Fax: 0800 7832571  
E-mail: [hella.sales@hella.com](mailto:hella.sales@hella.com)  
Website: [www.hella.co.uk](http://www.hella.co.uk)

© HELLA KGaA Hueck & Co., Lippstadt  
J00610/08.13  
Subject to technical and price modifications.