LED LIGHTING FOR AGRICULTURE AND ANIMAL HUSBANDRY
The durable polymer luminaires “Made in Germany” were already used for illumination in cowsheds in the 1950s – such as the NORKA luminaire HAMBURG on the left.
High technical requirements have to be met for the future-proof and sustainable operation of agricultural facilities. Coordinating health and safety, animal health and food safety is a great challenge. Animal husbandry for food production is a special sector. Humans and animals depend on each other and practically share their workplace.

In addition to hygienic aspects such as cleanliness in the stables/sheds and of the air, lighting is a seal of quality for a harmonious work environment. A good lighting concept is characterised by energy efficient illumination that complies with DIN standards. Different studies from renowned institutions confirm a direct relationship between a lighting system with well balanced intensity and duration of illumination and the emotional state, the development and the productivity of the animals. The rearing and keeping of cattle, pigs, horses and poultry in modern facilities consequently uses finely graduated illumination programmes to support the natural habits of the animals.

In the sector of economically used animals, the luminaires are exposed to mechanical strain, caused e.g. by impact or intensive cleaning processes using high-pressure cleaners, as well as to chemical strain from disinfectants and cleaning agents, not in the least ammonia.

As a solutions provider with over 65 years of experience and competence, NORKA supports your various applications with reliable and durable luminaires.

**MANY SECTORS – ONE SOLUTIONS PROVIDER**

- **HORSES**
  - COESFELD
  - COESFELD PLUS
  - CENTAURUS
  - POLARIS
  - URANUS

- **POULTRY**
  - COESFELD
  - COESFELD PLUS

- **PIGS**
  - COESFELD
  - COESFELD PLUS

www.norka.de
GENERAL AREAS

An agricultural facility comprises many fields of activity and therefore has various requirements for lighting. Areas for loading and unloading and for manoeuvring vehicles, entries and exits, storage areas, equipment washing areas or silage storage can form part of the requirements in the outside area. Indoors it might be workshops with work pits, equipment rooms, storage rooms, personnel rooms and animal sheds.

<table>
<thead>
<tr>
<th>Outside facilities / yard illumination</th>
<th>Illumination level*</th>
<th>Special requirements</th>
<th>Suitable luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside silo</td>
<td>15 - 20 lx</td>
<td>Pole mounting, motion-controlled, if required</td>
<td>POLARIS, URANUS (version for pole mounting)</td>
</tr>
<tr>
<td>Loading/unloading points</td>
<td>50 lx</td>
<td>Motion-controlled, if required</td>
<td>ERFURT LED, POLARIS, TALON W, URANUS</td>
</tr>
<tr>
<td>Entries and exits</td>
<td>15 lx</td>
<td>Motion-controlled, if required</td>
<td>ERFURT LED, POLARIS, TALON W, URANUS</td>
</tr>
<tr>
<td>Open tool sheds</td>
<td>50 lx</td>
<td>Motion-controlled, if required</td>
<td>ERFURT LED, POLARIS, TALON W, URANUS</td>
</tr>
<tr>
<td>Parking for vehicles</td>
<td>100 lx</td>
<td>Motion-controlled, if required</td>
<td>ERFURT LED, POLARIS, TALON W, URANUS</td>
</tr>
<tr>
<td>Traffic areas</td>
<td>10 lx</td>
<td>Motion-controlled, if required</td>
<td>ERFURT LED, POLARIS, TALON W, URANUS</td>
</tr>
<tr>
<td>Washing station (utility vehicles)</td>
<td>100 lx</td>
<td>Dirt-repellent housing, easy to clean, motion-controlled if required</td>
<td>BITBURG LED, COESFELD, COSFELD PLUS, ERFURT LED</td>
</tr>
</tbody>
</table>

* Average illuminance according to DIN EN 12464-1:2011 (D) or DIN EN 12464-1:2013 (D) and DIN EN 12464-2:2014-05
### Covered areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Minimum Illuminance (lx)</th>
<th>Luminaire Features</th>
<th>Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work pit</td>
<td>300 - 500 lx</td>
<td>Luminaire housing resistant to acid, lye and fuel</td>
<td>BERN LED, FULDA LED</td>
</tr>
<tr>
<td>Loading and operating of conveyors and machines</td>
<td>200 lx</td>
<td>Explosion protection, if required</td>
<td>ERFURT LED</td>
</tr>
<tr>
<td>Feed preparation, device cleaning</td>
<td>200 lx</td>
<td>Motion-controlled, if required</td>
<td>BERN LED EX, COESFELD, ERFURT LED</td>
</tr>
<tr>
<td>Equipment and storage rooms with special equipment (shelves and cabinets)</td>
<td>100 lx</td>
<td>Motion-controlled, if required</td>
<td>ERFURT LED</td>
</tr>
<tr>
<td>Grain storage, hay and straw storage</td>
<td>100 lx</td>
<td>Explosion protection, if required, Motion-controlled, if required</td>
<td>BERN LED EX, COESFELD, ERFURT LED</td>
</tr>
<tr>
<td>Rough installation work</td>
<td>200 lx</td>
<td>Luminaire housing resistant to acid, lye and fuel</td>
<td>BERN LED, COESFELD, COSFELD PLUS, ERFURT LED, FULDA LED</td>
</tr>
<tr>
<td>Cooling and storage rooms</td>
<td>300 lx</td>
<td>Motion-controlled, if required</td>
<td>BERLIN LED, ERFURT LED</td>
</tr>
<tr>
<td>Barn, loft, shed</td>
<td>50 lx</td>
<td>Motion-controlled, if required</td>
<td>BERLIN LED, BERN LED EX, COESFELD, ERFURT LED</td>
</tr>
<tr>
<td>Workshop</td>
<td>300 lx</td>
<td></td>
<td>BERN LED, FULDA LED</td>
</tr>
</tbody>
</table>

### Personnel areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Illuminance (lx)</th>
<th>Luminaire Features</th>
<th>Luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>General lighting</td>
<td>300 lx</td>
<td>Motion-controlled, if required</td>
<td>ERFURT LED</td>
</tr>
<tr>
<td>Common rooms, kitchens, operation centres</td>
<td>200 lx</td>
<td>Motion-controlled, if required</td>
<td>ERFURT LED</td>
</tr>
<tr>
<td>Duty rooms, break rooms</td>
<td>100 lx</td>
<td>Motion-controlled, if required</td>
<td>BERN LED, ERFURT LED</td>
</tr>
<tr>
<td>Office workplace</td>
<td>500 lx</td>
<td>Motion-controlled, if required</td>
<td>BERN LED, ERFURT LED</td>
</tr>
<tr>
<td>Escape routes</td>
<td>1 - 5 lx</td>
<td>Permitted by VDE guidelines, sufficient light for orientation</td>
<td>COBURG LED, SCHÖNEFELD LED, TEGEL LED</td>
</tr>
<tr>
<td>Washrooms, showers, WC, changing rooms, drying rooms</td>
<td>200 lx</td>
<td>Motion-controlled, if required</td>
<td>BERLIN LED, BERN LED, ERFURT LED</td>
</tr>
</tbody>
</table>

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Animal welfare and sustainability are among the prevalent issues of modern animal husbandry in Europe in the last decade.
Finding the right balance between the two requirements is a continuing challenge. Quality of life for the animals includes different factors such as genetics, keeping, feeding and care. Modern cubicle barns for dairy cows, for example, provide freedom of movement and the option of freely selecting a comfortable resting place, contributing to animal welfare.
Another component of good keeping of livestock is thermal comfort which surely also includes appropriate lighting.
Unlike human eyes, cows have difficulty seeing red light.
Good illumination can draw advantages from this fact.
During the day, neutral to cold white colour temperatures can support the animals’ natural vision. During the night rest times, red light will not disturb the animals while allowing the farmer to carry out simply tasks in the sheds.
Sudden, hectic movements or abrupt changes in illumination levels from dark to light can be unnerving for cows. They take four to five times longer than the human eye to adapt to light.
A dimmable lighting system can have a positive influence here, supporting the animals’ habitual vision.

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<table>
<thead>
<tr>
<th>Milk production</th>
<th>Illumination level*</th>
<th>Special requirements</th>
<th>Suitable luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device cleaning</td>
<td>200 lx</td>
<td>Motion-controlled, if required</td>
<td>COESFELD, COESFELD PLUS</td>
</tr>
<tr>
<td>Milk production</td>
<td>100 lx</td>
<td>Very good colour rendering, Ra &gt;90-100 at 5000K / 5400K, directed light, high illumination level, motion-controlled, if necessary</td>
<td>COSFELD PLUS, URANUS</td>
</tr>
<tr>
<td>Milk rooms</td>
<td>200 lx</td>
<td>Very good colour rendering, Ra &gt;90-100 at 5000K / 5400K, luminaires suitable for cleaning with pressure washers (IP 69K)</td>
<td>COESFELD PLUS, COESFELD PLUS, BERN LED</td>
</tr>
<tr>
<td>Device cleaning</td>
<td>200 lx</td>
<td>Motion-controlled, if required</td>
<td>COESFELD, COESFELD PLUS</td>
</tr>
</tbody>
</table>

* Average illuminance according to DIN EN 12464-1:2011 (D) or DIN EN 12464-1:2013 (D) and DIN EN 12464-2:2014-05
** Recommendation: Agricultural Chamber of North Rhine-Westphalia
*** Recommendation: Bavarian State Institute for Agriculture (LfL)

> Cows have difficulty seeing red light. During the night rest times, red light will not disturb the animals while allowing the farmer to carry out simply tasks in the sheds.
<table>
<thead>
<tr>
<th>Keeping</th>
<th>Illumination level*</th>
<th>Special requirements</th>
<th>Suitable luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calving barn</td>
<td>200 lx</td>
<td></td>
<td>COESFELD, COSFELD PLUS, BERN LED (red light)</td>
</tr>
<tr>
<td>Nursing barn, bull barn</td>
<td>80 lx</td>
<td></td>
<td>COESFELD, COSFELD PLUS, BERN LED (red light), POLARIS</td>
</tr>
<tr>
<td>Rearing and lactation (resting barn)</td>
<td>100 lx***</td>
<td>16 hours of light and 8 hours of darkness - greater daily weight gain - earlier onset of sexual maturity - positive influence on milk gland development</td>
<td>COESFELD, COSFELD PLUS, BERN LED (red light), POLARIS</td>
</tr>
<tr>
<td>Rearing of young cattle</td>
<td>100 lx***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed preparation</td>
<td>200 lx</td>
<td></td>
<td>COESFELD, COESFELD PLUS, POLARIS</td>
</tr>
<tr>
<td>Feed table</td>
<td>150 - 200 lx</td>
<td></td>
<td>COESFELD, COESFELD PLUS, POLARIS</td>
</tr>
<tr>
<td>Calf village, calf boxes and igloos</td>
<td>50 lx</td>
<td></td>
<td>COESFELD, COESFELD PLUS</td>
</tr>
<tr>
<td>Resting barn</td>
<td>200 lx</td>
<td>Day/night rhythm with 16-hour day phase and 8-hour night phase - up to 12 % capacity increase - up to 8 % feed intake - improved animal observation (heat) - earlier sexual maturity for young animals</td>
<td>COESFELD, COSFELD PLUS, BERN LED (red light), POLARIS</td>
</tr>
<tr>
<td>Rehabilitation barn</td>
<td>200 lx</td>
<td></td>
<td>COESFELD, COSFELD PLUS, BERN LED (red light), POLARIS</td>
</tr>
<tr>
<td>Dry standing time (resting barn)</td>
<td>100 lx***</td>
<td>Short days with 8 hours of light and 16 hours of darkness</td>
<td>COESFELD, COSFELD PLUS, BERN LED (red light), POLARIS</td>
</tr>
<tr>
<td>Covered outdoor areas</td>
<td>50 lx</td>
<td></td>
<td>COESFELD, COSFELD PLUS, POLARIS</td>
</tr>
</tbody>
</table>

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** Recommendation: Agricultural Chamber of North Rhine-Westphalia
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Regular checks of animals and technology are crucial for keeping poultry. These checks verify animal welfare (protection of animals), feather pecking and cannibalism among the animals. In addition to care and rearing recommendations, correct illumination also influences the number and weight of eggs for layers and the growth rate for meat producing chickens.

Birds are photosensitive – they adapt their behaviour and their physiological reactions to the changing light influences over the course of the year. Shed concepts with daylight use are designed to guide the light evenly into the room without sun spots to avoid crowding and therefore crushing of animals.

So-called intermittent illumination programs are used in windowless sheds to increase the yield of the animals. These light cycles are based on a shortened day/night cycle and can be used with so-called “step-up” and “step-down” programs for controlling sexual maturity, feed intake and laying period.

Scientific studies have shown that short-wave light ( violet-blue range) and an illumination level of 50 lx promote feather picking and aggressive behaviour. To prevent anomalies in animal behaviour, the light intensity is reduced to 5 lx in dark sheds and increased to 10 - 15 lx in laying sheds. The prerequisites for good illumination in poultry sheds are therefore flexible use through different illumination programs, dimmability and warm colour temperature. Poultry are sensitive to flickering light, like that from fluorescent lamps operated with a throttle on 50 Hz alternating current. The animals only stop noticing the flickering when the frequency is clearly above 50 Hz. LED luminaires are operated with direct current and therefore generally free from flickering. For light programs or for daylight controlled lighting systems, however, it has to be ensured that either only current dimming or pulse width modulation with a pulse frequency clearly above 50 Hz are used.

### Keeping

<table>
<thead>
<tr>
<th>Keeping</th>
<th>Illumination level*</th>
<th>Special requirements</th>
<th>Suitable luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor-raising of young hens</td>
<td>20 lx</td>
<td>Day/night rhythm 4/4/4 (two night periods)</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Rearing of meat-producing chickens</td>
<td>60 lx</td>
<td>12 hours illuminated</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Rearing of meat-producing chickens / turkeys / egg-laying chickens in small groups as cage system</td>
<td>Rearing turkeys 80 - 100 lx (from day 4) 30 - 40 lx (from day 8) 20 lx (from day 12)</td>
<td>Day/night rhythm 18/6</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Floor raising</td>
<td>20 lx</td>
<td>From day 21, a dark phase (at least 8 hours) has to be ensured (less than 2 lx). The sheds have to be equipped with light openings of at least 3 % of the shed footprint. Even distribution has to be ensured.</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Dark shed</td>
<td>5 lx</td>
<td>Min. 8 hours of dark phase (less than 0.5 lx) with dusk/dawn phase, 12-14 hours illuminated for good laying performance. Newly erected sheds have to be equipped with light openings of at least 3 % of the shed footprint, ensuring even distribution.</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Duck fattening shed</td>
<td>60 lx</td>
<td>Min. 8 hours of dark phase (less than 0.5 lx) with dusk/dawn phase, 12-14 hours illuminated for good laying performance. Newly erected sheds have to be equipped with light openings of at least 3 % of the shed footprint, ensuring even distribution.</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Egg-laying hens / cages</td>
<td>15 - 20 lx</td>
<td>Day/night rhythm 4/4/4/. 24-hour light program with at least 6 hours uninterrupted dark phase which follows the natural day/night rhythm. An illumination intensity of min. 20 lx at head level of the animals and at least 80 % illumination of the shed have to be ensured during the light hours.</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Meat-producing chickens</td>
<td>20 lx</td>
<td>Until the 14th day hourly dark phases, from the 14th day gradual build-up of an 8 hour dark phase. 16 hours illuminated.</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Turkeys</td>
<td>20 lx</td>
<td></td>
<td>COESFELD PLUS</td>
</tr>
</tbody>
</table>

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Constant illumination during the first 24 to 48 hours after hatching can help the chicks get accustomed to the new environment. The illumination level should be 100 lx from the fourth day at the latest and then about 40 lx from the eighth day.

From the twelfth day, an illumination level of approx. 20 lx is recommended with a day/night rhythm of approx. 12-14 hours illumination and about 8 hours dark phase. Gradual dimming is recommended during the dusk/dawn phases (FadeIn/FadeOut).

Emergency lighting with max. 2 lx can be used during the dark phase to prevent panic reactions.

Source: © 2009 KTBL Kuratorium für Technik und Bauwesen in der Landwirtschaft, article: Anforderungen in der Geflügelhaltung (Requirements for poultry farming)
HORSES / RIDING HALLS / MULTI-PURPOSE HALLS

High requirements apply to lighting when dealing with horses. Different illumination levels are used for best possible presentation of horse and rider, from housing and caring for the horses in the stables to training or competitions in the riding hall.

Riding halls are mostly used during bad weather, in the evening or during the dark, cold time of year. Existing daylight openings often do not provide sufficient light for the riding hall. A daylight-controlled lighting system dims the artificial light in the hall with a high level of energy efficiency, providing a constant illumination level.

Similar to nocturnal animals, horses can see their surroundings much more clearly during dusk/dawn or in moonlight than humans. This means that they become unnerved by sudden changes from dark to bright light. Dimmable illumination can remove this moment of shock by using so-called “fade-in” and “fade-out” functions.

Great differences in illumination density on the ground in combination with dark, reflective surfaces can be interpreted as hazard areas, particularly by young horses.

Homogeneous illumination is therefore recommended for riding halls and riding fields. Sand and dust kicked up by the horses means that luminaires in riding halls become dirty very quickly. They are therefore cleaned with a hosepipe about once per year.

Modern riding halls are equipped with sprinkler systems for watering the sand. Watering creates a high level of moisture in the air of the hall and the finely dispersed water can settle on the luminaires.

Good illumination quality is characterised by the illumination level and by good colour rendering. Particularly during tournaments or horse shows with a lot of photography and filming, good colour rendering from the luminaires supports perfect presentation of the animals.

For other uses of the hall, e.g. for events or exhibitions, different switching groups with different dimming levels can be created to make optimum use of the hall.

### Equestrian sports

<table>
<thead>
<tr>
<th>Outdoor riding field</th>
<th>120 lx, 150 - 250 lx**</th>
<th>Very even illumination</th>
<th>POLARIS, URANUS (version for pole mounting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riding (riding hall)</td>
<td>150 lx</td>
<td>Very even illumination</td>
<td>COESFELD, COESFELD PLUS, CENTAURUS, POLARIS, URANUS</td>
</tr>
<tr>
<td>Jumping (riding hall)</td>
<td>200 lx</td>
<td>Very even illumination</td>
<td>COESFELD, COESFELD PLUS, CENTAURUS, POLARIS, URANUS</td>
</tr>
<tr>
<td>Tournament (riding hall)</td>
<td>400 lx, 600 lx **</td>
<td>Very even illumination</td>
<td>COESFELD, COESFELD PLUS, CENTAURUS, POLARIS, URANUS</td>
</tr>
<tr>
<td>Trick riding (riding hall)</td>
<td>100 lx</td>
<td>Very even illumination</td>
<td>COESFELD, COESFELD PLUS, CENTAURUS, POLARIS, URANUS</td>
</tr>
</tbody>
</table>

### Keeping

| Horse keeping areas           | 80 - 100 lx              | Daylight has to be ensured. The ratio of windows to box footprint has to be at least 1:20. 8 hours illuminated. | COESFELD |
| Retire areas                  | 15 lx                    | Daylight has to be ensured. The ratio of windows to box footprint has to be at least 1:20. 8 hours illuminated. | COESFELD |

### Multi-purpose halls

| Hall                          | 300 lx                   | Dimmable illumination, possibly with different switching groups, consisting of diffuse light sources and floodlights with colour rendering characteristics >90 Ra for brilliant colour rendering | COESFELD, COESFELD PLUS, CENTAURUS, POLARIS, URANUS |

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** Recommendation
PIGS

Pigs are particularly demanding with regard to hygiene and cleanliness. Regular disinfection of sheds, especially of the farrowing areas, is the basic prerequisite for successful rearing of the animals.

The intensive hygiene process includes rough cleaning, e.g. with a pressure washer; several hours of soaking, cleaning from floor to ceiling with plenty of water; followed by rinsing and drying of the sheds and then application of the disinfectants.

Surface cleaning today is carried out manually, mobile or stationary. Stationary systems range from sprinkler systems to high-pressure dispersion systems with fog nozzles up to 100 bar.

The entire process places enormous wear on the materials of all installations in the sheds. Objects such as the luminaires are required for visual checks during cleaning and cannot be dismantled.

Another challenge is the ambient temperature during the cleaning process and e.g. for piglet rearing. Higher ambient temperatures are generally beneficial for the cleaning procedure. The usage concentration of the cleaning agents and disinfectants is optimised between +4 °C and +30 °C. For piglet rearing, a constant ambient temperature of +30 °C supports the health of piglets in the first days of life.

The installation of luminaires in a pig shed therefore requires robust luminaire housings which are resistant to chemicals and lye. Protection rating IP 69K for intensive cleaning processes is required here just as much as permanent ammonia resistance for the sensitive electronic components.

<table>
<thead>
<tr>
<th>Keeping</th>
<th>Illumination level*</th>
<th>Special requirements</th>
<th>Suitable luminaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farrowing area</td>
<td>200 lx</td>
<td>Luminaires suitable for cleaning with pressure washers (IP 69K)</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Covering centre</td>
<td>300 lx</td>
<td>14-16 hours illuminated</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Hygiene sluice</td>
<td>200 lx</td>
<td>Luminaires suitable for cleaning with pressure washers (IP 69K)</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Storage room</td>
<td>100 lx</td>
<td>Motion-controlled, if required</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Feeding shed,</td>
<td>80 lx**</td>
<td>An orientation light is required for the dark phase</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Sows in pig, large groups</td>
<td></td>
<td>Luminaires suitable for cleaning with pressure washers (IP 69K)</td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Sow showers</td>
<td>200 lx</td>
<td></td>
<td>COESFELD PLUS</td>
</tr>
<tr>
<td>Sows in pig, small groups</td>
<td>80 lx**</td>
<td></td>
<td>COESFELD, COESFELD PLUS</td>
</tr>
</tbody>
</table>

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** Recommendation: Agricultural Chamber of North Rhine-Westphalia
## LED LUMINAIRE RANGE – OVERVIEW

### BERLIN LED
- Ceiling and wall surface-mounted luminaire, compact design
- Ambient temperatures between -25 °C and +35 °C
- Replaces TC-SEL 11 W and TC-L / TC-D 18 W

### BERN LED
- Tubular luminaire Ø 60 mm
- Small space requirement for very tight situations
- IP 69K version for intensive cleaning processes, e.g., using pressure washers
- 24 V version with red LEDs available
- Suitable for ambient temperatures between -30 °C and +40 °C

### BERN LED EX
- Tubular luminaire Ø 60 mm
- Explosion protected for zone 2 and zone 22
- IP 69K version for intensive cleaning processes, e.g., using pressure washers
- Suitable for ambient temperatures up to -40 °C

### CENTAURUS
- Floodlight for high ceilings
- Replacement for HQL lamps up to 1000 W
- For integration into DALI controls
- Uniform illumination for large areas
- Different lighting technologies

### COBURG LED
- Single-battery emergency luminaire
- Emergency light operation through electronic integrated emergency lighting unit, including charging, indicator, mains monitoring and protection against total discharge
- Emergency light duration 1 h or 3 h, with self-test function

### COESFELD
- Ammonia-resistant, fume-proof reflector tube luminaire
- Single or twin lamp
- Suitable for ambient temperatures between -25 °C and +40 °C
- IP 65 / IP 67
- Cable gland M20, through wiring on request
- Ammonia-resistant, fixed connecting cable 2 × 1.5 mm²

### COESFELD PLUS
- Ammonia-resistant, fume-proof reflector tube luminaire
- Single lamp
- Suitable for ambient temperatures between -25 °C and +40 °C
- IP 69K
- Cable gland M20, through wiring on request
- For integration into DALI controls
- 4 kV (protection against transient over-voltage)
- Different colour temperatures and high colour rendering capabilities
- Ammonia-resistant, fixed connecting cable 4 × 2.5 mm²

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5 years manufacturer’s warranty
50,000 operating hours
ERFURT LED
- reflector tubes luminaire
- single or twin lamp
- IP 65
- cable membrane M20 and 2 × 1.5 mm² through wiring

FULDA LED
- polymer luminaire resistant to acid, lye and fuel
- installation in wall and ceiling recesses for low ceiling heights
- installation in work pits for indirect lighting

POLARIS
- floodlight for ceiling wall or pole mounting
- replacement for HQL lamps up to 400 W
- elliptical light distribution
- for integration into DALI controls
- different lighting technologies

SCHÖNEFELD LED
- single-battery escape route luminaire with pictogram foils according to DIN EN ISO 7010
- compact design
- emergency light operation through electronic integrated emergency lighting unit, including charging, indicator, mains monitoring and protection against total discharge
- emergency light duration 1 h or 3 h, with self-test function

TALON W
- wall surface-mounted luminaire made of extruded aluminium profiles
- housing, anodised black or silver
- different light technologies for public squares or entryways

TEGEL LED
- centrally supplied escape route luminaire with pictogram foils according to DIN EN ISO 7010
- compact design
- mains and emergency light operation via electronic transformer

URANUS
- floodlight for ceiling wall or pole mounting
- replacement for HQL lamps up to 250 W
- for integration into DALI controls
- different lighting technologies
## PROTECTION RATING TEST

### IP 69K

**INGRESS PROTECTION FOR ACCIDENTAL CONTACT AND FOREIGN BODIES**

<table>
<thead>
<tr>
<th>1st index</th>
<th>Protection Designation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Dust protection</td>
<td>Total protection against contact with live or internal, moving parts. Protection against dust ingress.</td>
</tr>
</tbody>
</table>

**TEST CONDITIONS FIRST INDEX (6)**

- Vacuum test with dust/air mixture
  - Vacuum: ≤ 2 kPa [20 mbar]
  - Test duration: 8 h
  - Test dust: 50 % limestone and 50 % fly ash
  - Grain size distribution: 33 weight fractions ≤ 32 μm / 67 weight fractions ≤ 32 μm, but ≤ 250 μm

**INGRESS PROTECTION AGAINST WATER**

<table>
<thead>
<tr>
<th>2nd index</th>
<th>Protection Designation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>.9K</td>
<td></td>
<td>Hot water [80 °C] impacting from any direction under high pressure [80-100 bar] on the luminaire must not enter.</td>
</tr>
</tbody>
</table>

**TEST CONDITIONS SECOND INDEX (9K)**

- Test device: High-pressure water system / flat nozzle
- Spray angle: 0°- 30°- 60°- 90°
- Distance: 100 - 150 mm on turntable → speed (5 ±1) 1/min
- Water flow rate: 14 - 16 l/min ± 5 %
- Water pressure: 8000 - 10000 kPa (80 - 100 bar)
- Water temperature: 80°C ± 5°C
- Test duration: 30 s per position

![Schematic diagram: protection rating test IP 69K](image-url)
01. IMPACT TEST: In impact tests according to DIN EN 50102, the maximum mechanical stress of the materials is tested using spring hammers and drop hammers.

02. IP RATING TESTS: IP rating tests are carried out according to DIN EN 60529 to test the effects of dust, coarse foreign bodies or water and consequently the tightness of housing, diffusers and gaskets.

- Dust test: Dust tests are carried out to assess the effects of dust and sand both on and in the luminaires.
- Test IP 69K: The IP69K test verifies the protection against hot water during high-pressure or steam-jet cleaning according to DIN EN 40050. The test conditions require a pressure of max. 100 bar at a temperature of 80 °C.
- Spray water test: The spray water test is used to test the resistance against moisture penetration.
- Pressurised water test: During the pressurised water test, a hazardous amount of water ingress must not occur when the luminaire is immersed in water.

03. TEMPERATURE TEST: The temperature test is necessary to guarantee the long-term reliable functioning of the luminaires within a temperature range of -50 °C to 90 °C and to provide definitive statements on their luminous flux characteristics in connection with heat increase.

04. CLIMATIC TEST: The climatic test for potentially explosive zones according to DIN EN 60079 is used to certify climatic resistance under extreme conditions of 80 °C and 90 % relative humidity.

05. VIBRATION TEST: The vibration test is a procedure used to examine the mechanical strength of individual components and to determine the functionality of technical systems when exposed to vibrations.

06. CHEMICAL TEST: This test is used to verify the resistance of materials against chemicals. Material effects such as deformation, embrittlement and cracking can then be avoided.

07. HEATING TEST: When testing the durability and heating, the temperatures of all parts installed in the luminaire are recorded during normal and abnormal operation and then compared to the maximum permissible temperatures.
Lighting for agriculture and animal husbandry

LIGHTING CALCULATION

50 % ENERGY SAVING WITH AN ILLUMINATION LEVEL OF 200 LX

EXAMPLE CALCULATION:
Resting barn L × W: 121 m × 35 m, room height: 10 m, nominal illumination level: 200 lx

LIGHTING CALCULATION RESULT*

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Existing</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>272 units</td>
<td>200 units</td>
</tr>
<tr>
<td>Version</td>
<td>Moisture-proof luminaire, medium beam, low loss ballast, inductive</td>
<td>COESFELD, m1500, PMMA Transopal® (impact strengthened), medium beam</td>
</tr>
<tr>
<td>Article number</td>
<td>-</td>
<td>445 680 35 23 - 5500lm</td>
</tr>
<tr>
<td>Configuration</td>
<td>1 × T8 58 W / 5200 lm</td>
<td>1 × LED 45 W / 5650 lm</td>
</tr>
<tr>
<td>System power</td>
<td>66 W</td>
<td>45 W</td>
</tr>
<tr>
<td>Light output ratio</td>
<td>78.8 %</td>
<td>97.7 %</td>
</tr>
<tr>
<td>Height of reference surface</td>
<td>0.2 m</td>
<td>0.2 m</td>
</tr>
<tr>
<td>Net total luminous flux of all luminaires</td>
<td>1,414,000 lm</td>
<td>1,130,000 lm</td>
</tr>
<tr>
<td>Total power</td>
<td>17,952 W</td>
<td>9,000 W</td>
</tr>
<tr>
<td>Total power per surface (800 m²)</td>
<td>4.24 W/m² (2.18 W/m²/100 lx)</td>
<td>2.12 W/m² (1.04 W/m²/100 lx)</td>
</tr>
<tr>
<td>Average illuminance</td>
<td>202 lx</td>
<td>204 lx</td>
</tr>
<tr>
<td>Minimum illumination level</td>
<td>141 lx</td>
<td>147 lx</td>
</tr>
<tr>
<td>Maximum illumination level</td>
<td>243 lx</td>
<td>249 lx</td>
</tr>
<tr>
<td>Uniformity g1</td>
<td>1:1.43 (0.7)</td>
<td>1:1.38 (0.72)</td>
</tr>
<tr>
<td>Uniformity g2</td>
<td>1:1.72 (0.58)</td>
<td>1:1.67 (0.59)</td>
</tr>
</tbody>
</table>

* The maintenance factor was not taken into consideration for this calculation.

COMPARABLE INVESTMENT COSTS WITH REDUCED NUMBER OF LUMINAIRES
**REPRESENTATIVES / WORLDWIDE**

<table>
<thead>
<tr>
<th>Country</th>
<th>Contact Information</th>
</tr>
</thead>
</table>
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www.lkd.at  
office@lkd.at |
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www.cclight.be  
info@cclight.be |
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www.elektrolicht.cz  
elektrolicht.cz |
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info@industrieicht.nl |
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