

SCHUCH - Technical Supplement

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The technical appendix provides information and notes that are important for the planning, installation and operation of lighting systems with SCHUCH Light Fittings.

1. Explosion-Protected lighting

1.1 Zone Classification (acc. to the standards 1999/92/EG)

Hazardous areas are classified into the following zones in accordance with the probability of the existence of an explosive atmosphere:

Gases, vapours or mists

- Zone 0** An area in which an explosive atmosphere is present either permanently or over long periods of time or frequently as a mixture of air and combustible gases, vapours or mists.
- Zone 1** An area where under normal operating conditions an explosive atmosphere may occasionally be present as a mixture of air and combustible gases, vapours or mists.
- Zone 2** An area where an explosive atmosphere is not likely to be present under normal operation but if it should occur for some reason it would normally only exist for a short period time as a mixture of air and combustible gases, vapours or mists.

Dusts

- Zone 20** An area in which an explosive atmosphere is present either continuously or over a long time or frequently as a cloud of combustible dust in the air.
- Zone 21** An area where under normal operating conditions an explosive atmosphere may occasionally be present as a cloud of combustible dust in the air.
- Zone 22** An area where an explosive atmosphere is not likely to be present under normal operation but if it should occur for some reason it would normally only exist for a short period time as a cloud of combustible dust in the air.

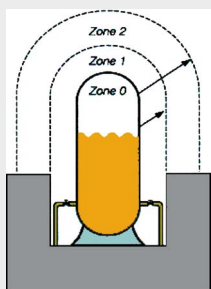


Illustration 1 and Illustration 2 show typical examples for the Zoning for flammable liquids

Illustration 1: Storage of flammable liquids

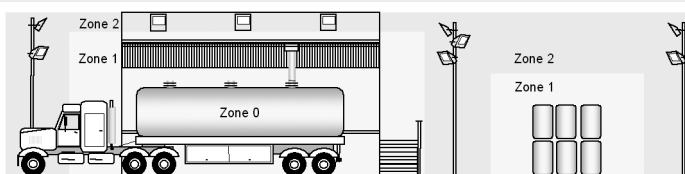


Illustration 2: Filling and storage of flammable liquids

1.2 Categories of appliances

Acc. to the ATEX standards (94/9/EG) the appliances for application in their relative zones are classified into categories. Similar to the different zones there are three different categories for group II of the equipment. Consequently, the explosion protected products can be allocated to the ex-zones existing in the production area.

Category 1 comprises appliances which have been designed in such a way that they may be operated in compliance with the characteristic sizes given by the manufacturer and which ensure a high degree of safety. Appliances of this category may be used in ZONES 0 and 20 as per their certification.

Category 2 comprises appliances which have been designed in such a way that they may be operated in compliance with the characteristic sizes given by the manufacturer and which ensure a high degree of safety. Appliances of this category may be used in ZONES 1 and 21 as per their certification.

Category 3 comprises appliances which have been designed in such a way that they can be operated in compliance with the characteristic sizes given by the manufacturer and which ensure a standard level of safety. Appliances of this category may be used in ZONES 1 and 21 as per their certification.

Appliances of this category may be used in ZONES 2 and 22 as per their certification. DIN EN 61241-14 make a difference between conductive and non-conductive dusts. For conductive dusts of ZONE 22 appliances of category 2 D must be used.

1.3 ATEX Equipment Temperature classes acc. to IEC 60079-0

An important parameter for the subdivision of the gases is the ignition temperature.

The ignition temperature is the lowest surface temperature value which ignites an explosive atmosphere. The maximum surface temperature must always be lower than the ignition temperatures of the gas-air or vapour-air mixture in which the product is applied.

Temperature classification	Maximum permissible surface temperatures of equipment [°C]	Ignition temperatures of inflammable substances [°C]
T1	450	> 450
T2	300	> 300 ≤ 450
T3	200	> 200 ≤ 300
T4	135	> 135 ≤ 200
T5	100	> 100 ≤ 135
T6	85	> 85 ≤ 100

1.4 Classification of Gases and Vapours into Explosion Groups and Temperature Classes

Explosion group	Classification of gases and vapours into temperature classes					
	T1	T2	T3	T4	T5	T6
IIA	Acetone	i-amyl acetate	Gasoline	Acetaldehyde	-	
	Ethane	n-butane	Diesel fuel			
	Ethyl acetate	n-butyl	Aviation fuel			
	Ammonia	alcohol	Heating oils			
	Ethyl chloride	Cyclohexane	n-hexane			
	Benzol	1,2-dichloroethane				
	Acetic acid	Acetic anhydride				
	Carbon monoxide					
	Methanol					
	Methyl chloride					
	Naphtalene					
	Phenol					
	Propane					
	Toluol					
	IIB	Town gas	Ethylene	Hydrogen sulphide		
		Ethyl alcohol				
IIC	Hydrogen	Acetylene			-	Carbon disphide
I	Methane					

1.5 Modes of Protection according to European/IEC Standards

In areas where explosive atmospheres may occur despite the explosion protection measures employed, only explosion protected electrical equipment must be used.

EN 60079-7	- stands for: „Increased safety“	- code: „e“
EN 60079-1	- stands for: „Flameproof enclosure“	- code: „d“
EN 60079-5	- stands for: „Sand filling“	- code: „q“
EN 60079-2	- stands for: „Pressurised apparatus“	- code: „p“
EN 60079-11	- stands for: „Intrinsic safety“	- code: „i“
EN 60079-18	- stands for: „Moulding“	- code: „m“
EN 60079-15	- stands for: „Zone 2“	- code: „n“
EN 60079-28	- stands for: „Limitation of optical radiation“	- code: „op is“
EN 60079-31	- stands for: „Protection by enclosure“	- code: „t“

1.6 Special operating conditions

If there are special conditions of use which place particular stress on the light fitting chemically, mechanically, thermally, electrically or due to vibration or humidity, etc., this must be discussed in advance between the operator and the manufacturer so that additional measures can be taken if necessary. This is indicated both by Directive 99/92/EC and by the standard DIN EN 60079-14 or VDE 0165, which is authoritative for the operator of electrical equipment in potentially explosive atmospheres.

Ex light fittings usually have a high IP degree of protection, which is expressed, for example, by the marking „IP66“. However, this does not mean that the light fitting is hermetically sealed.

The light fittings are classified and tested according to the European standard EN 60529 in various degrees of protection. This standard contains the German translation of the international standard IEC 60529 and is also a VDE regulation, as it has been approved by the VDE and classified under VDE 0470, Part 1.

In the current edition of this standard, a brief description and definition for the degrees of protection represented by the second code digit is given in section 6.

For example, the short description for the second code number 6 is: „Protected against strong water jets.“ The definition given is: „Water splashing against the enclosure from any direction as a strong jet shall have no harmful effects.“

In this standard, the humidity of the air is not considered as a relevant criterion when classifying the degrees of protection.

Humid and cold ambient conditions, combined with low duty cycles, can limit the use of light fittings with electronic ballasts.

Before mounting light fittings, e.g. in rainwater retention basins, in water treatment plants or above clarification basins, etc., the manufacturer should be consulted in order to use special designs if necessary.

2. General remarks

2.1 Permissible ambient temperatures

If no additional specification is available, LED light fittings are built for a maximum permissible ambient temperature of -20°C to +25°C.

Emergency light fittings are excluded from this.

Explosion-proof equipment is generally designed for an ambient temperature of up to +40°C.

Special designs for lower (T..) or higher (H..) temperatures on request.

3. Properties of LED light fittings

3.1 Rated values as specified in data-sheets

All tolerances of rated values of light fitting input power, luminous flux and efficacy are in accordance with IEC 62722-2-1. Light fitting luminous flux is no more than 10% less than rated luminous flux. Light fitting input power is no more than 10% higher than rated input power. If not specified otherwise all rated values refer to an ambient temperature of $T_a = 25^\circ\text{C}$. If LED light fittings are operated at higher temperatures luminous flux decreases by about 1.5% per 10K.

3.2 Lifetime specifications of LED light fittings

Data-sheets provide values of rated life L_x . L_x is the time after which luminous flux has dropped to $x\%$ of initial luminous flux. At rated life L_x luminous flux equals $x\%$ of rated value. Typical values for “ x ” are 70 (L70) or 80 (L80). Life time metrics are based on defined test procedures. Figures given in data-sheets are expected values. Thus, the indicated rated life is not a guaranteed light fitting feature. E.g. L80B10 \geq 50,000h means that, according to statistics, 90% (100-10) of light fittings maintain at least 80% of initial luminous flux after 50,000.

For the average rated life L_x (B_x , value omitted), $B_x = B_{50}$ applies. According to a recommendation of the ZVEI, this value should be specified in the data sheets. Failures of control gear as well as the degree of contamination of the light fitting are not taken into account here.

The failure rate of control gear depends not only on the specification of the components and their quality, but also to a large extent on the operating temperature. The following applies: for t_c max. (maximum permissible device temperature), the failure rate is 2‰ per 1,000 h, i.e. for a service life of 50,000 h, the percentage of failed devices is approx. 10 %.

Example: With 100 ECGs in continuous operation (at the max. permissible device temperature), purely statistically up to 10 devices have failed after 5.7 years. At lower ambient temperatures, the service life is significantly extended.

3.3 Switching cycles

Frequent switching may cause an increased LED-module failure rate. In accordance with IEC rules outdoor light fittings are designed for one cycle per day. While for indoor light fittings up to three cycles per day are assumed. If it is required to switch light fittings more frequent it is recommended to employ corridor mode (DIMC). Corridor mode allows unlimited switching of light fittings.

3.4 Use of LED light fittings in corrosive environments

Corrosive gases and other corrosive substances (e.g. ammonia, sulfuric or chlorine compounds) may damage LED light fittings. Depending on substance, concentration, temperature and exposure time, the damage may result in total failure of light fitting.

Even light fittings with high degree of ingress protection can be affected since corrosive atmospheres can penetrate into all light fittings. Suitability of light fittings for particular purposes can be assessed e.g. by means of a field test.

We recommend the use light fittings out of our product range, which are especially designed for the use in corrosive atmospheres.

- **Version ER:** Increased protection against corrosive atmospheres. Light fittings of type ER are approved e. g. for the use in production and storage areas for tires.
- **Version HR:** High Protection against corrosive atmospheres. Light fittings of type AUS HR are approved e. g. for use in outdoor areas of wastewater treatment plants.
- **Version XR:** Absolutely gas-tight light fitting. The Primo XR light fitting is approved for hazardous gas areas (exception: EX-Zones, swimming pools, exposure to chemicals that attack PMMA or stainless steel).

3.5 Use of LED light fittings in a damp atmosphere

If light fittings are operated in damp and cold ambient conditions in conjunction with low duty cycles, there is a risk of premature failure. Light fittings with a higher protection class are also affected. Critical applications are e.g. rainwater retention basins, water treatment plants and certain applications in the agricultural sector.

After the light fitting is switched off, a negative pressure is created, which leads to the intake of moist outside air. This atmosphere can damage or destroy electronic components in the light fitting.

This problem can be remedied by switching on the lamp regularly and for longer periods of time. Under certain circumstances, an additional air vent may be required. Where this is not possible, only XR or HR lamps should be used (gas-tight or corrosion-resistant). Other suitable special designs on request.

3.6 Mounting of protection class II LED outdoor light fittings to fixing devices with electrical insulation against earth potential.

When mounting protection class II LED light fittings to fixing devices with electrical insulation against earth potential, electrostatic charges could appear (for example, due to weather conditions) which may cause damage of control gear and/or LED modules.

None-Grounded fixing devices are, for example, wooden, concrete or plastic poles, electrically insulated mounted steel poles, wall fixations or rope suspensions. Using protection class I light fittings is recommended in these cases. These allow electric charges to discharge via protective earth (PE) conductor.

If protection class II light fittings are to be installed, special designs equipped with equipotential compensation are available.

3.7 Overvoltage protection of LED outdoor light fittings

LED outdoor light fittings and light fittings with electronic control gear for conventional lamps are much more sensitive to surge voltages than light fittings equipped with magnetic ballasts.

Due to switching events and load changes voltages of up to 6 kV may occur in outdoor power grids.

Lightning strikes in the surroundings of outdoor installations can lead to voltages of up to many times higher than 10 kV depending on distance to light fitting and conductivity of soil.

Lightning that strikes directly into a light fitting will cause such high pulses that no cost-efficient measure can prevent failure of light fitting.

Control gear utilized by SCHUCH is having an enhanced overvoltage protection. By installing an additional overvoltage protection device into a light fitting or into a terminal box protection level can be further increased.

Using protective devices that disconnect light fittings from power supply when they themselves wear out does further enhance overvoltage protection.

Regulative provisions limit higher protection levels of protection class II light fittings. It is not permitted to connect protective earth conductor to protection class II fittings. However a comprehensive overvoltage protection is only feasible if an earth conductor would be available and housing of light fitting and pole are connected via protective earth conductor.

We further recommend to install surge arresters into electrical distribution. Thus absorbing direct and indirect lightning strikes into power grids.

Probability of lightning strikes varies very much locally. Should LED outdoor light fittings or conventional light fittings with electronic control gear be installed in regions with high likelihood for lightning strikes we highly recommend to utilize protection class I light fittings with additional protective measures employed in the light fitting, terminal box and electrical distribution.

3.8 Operating restrictions for LED outdoor light fittings with power reduction

Very rarely, leakage currents may occur between the phases or between phase and neutral conductor. This may cause a false switching behavior of light fittings with power reduction via control phase. Then, the light fittings fail to switch on power reduction.

Leakage currents occur due to old or damaged cables with improper isolation or due to the high capacity coupling.

In these cases, one should install a "shunting-box" between control phase and neutral conductor (available on request). The shunting box may be installed in the terminal box or inside the electrical distribution.

When changing single light fittings in existing installations with elder light fittings or when extending installations, one could face a problem related to power reduction. For these cases, one should mount additional relays at control phase entry in the already installed light fittings. In such cases, it is more cost-effective to add light fittings with stand-alone power reduction (LA => reduction without control phase).

3.9 Inrush currents of LED light fittings – limited capacity of automatic circuit breakers

Contrary to light fittings with magnetic ballasts, LED light fittings start all at the same time (as well as in case of ECGs with conventional lamps).

Inside the storage capacitor of the above ECGs, a high charging current occurs when switching on. The maximum permissible number of light fittings per miniature circuit breaker is not limited by the operating current but by the inrush current. It can be found online on the respective product data sheet of the light fitting.

3.10 Photobiological Safety

Photobiological safety of light fittings is treated in IEC 62471:2006. This standard provides information on safety limits and risk groups for irradiation as well as measurement methods for UV-, visible and IR- spectral range. The protective goal is to prevent human eye and skin from thermal and photochemical hazards.















Almost all light fittings of SCHUCH are within risk groups 0 and 1. Thus they are harmless since they cannot cause any photobiological impairment to human skin or eye. Light fittings that fall under risk group 2 are marked by a pictogram "do not stare at operating light source". In addition mounting instructions provide information on minimum distance required for safe view into light fitting. Due to installation height any hazard can be ruled out for most class 2 technical light fittings since view from short distance is not possible. Doubling distance reduces irradiation to one quarter (inverse-square law). Therefore in most cases caution may only be required during maintenance work.

Risk group 3 light fittings disqualify for approval since they would imply a non neglectable risk.

4. Safety classification for light fittings




The selection of light fittings for specific applications requires the consideration of corresponding protection types and protection classes.

4.1 Table of ingress protection


	1 st CHARACTERISTIC NUMERAL	2 nd CHARACTERISTIC NUMERAL	
RA-TING	PROTECTION AGAINST FOREIGN BODIES	PROTECTION AGAINST HARMFUL ENTRY OF WATER	Symbol
IP 20	solid objects > 12 mm	non-protected	
IP 23	solid objects > 12 mm	protected against spraying water	
IP 40	solid objects > 1 mm	non-protected	
IP 43	solid objects > 1 mm	protected against spraying water	
IP 44	solid objects > 1 mm	protected against splashing water	
IP 54	dust protected	protected against spraying water	 
IP 55	dust protected	protected against water jets	  
IP 65	dust tight	protected against water jets	  
IP 66	dust tight	protected against heavy seas	
IP 67	dust tight	protected against effects of immersion in water between 15cm and 1m for 30 minutes	  
IP 68	dust tight	protected against effects of immersion in water under pressure for long periods	
IPx9k	dust tight	protected against effects of high pressure water jets	

Protection classes according to DIN VDE 0711/EN 60598/IEC 598

4.2 Protection classes

	Meaning	Notes
I	 Light fittings with connection point for protective conductor, to which all touchable metal parts must be connected, which can immediately be on mains voltage level in the event of a fault.	Connection to the mains protective conductor is mandatory. The symbol is attached to the connection point.
II	 In the case of such light fittings, no metal parts may be touched that could immediately be on mains voltage level in the event of a fault (protective insulation or double insulation).	The light fitting must not have a protective earth connection and must not be connected to a protective earth conductor (except for functional earth*).
III	 Light fittings for operation with safety extra-low voltage, i.e. with voltages below 42 V, which are generated with a safety transformer according to VDE 0551 or taken from batteries or accumulators.	

* Functional earth: grounding of a point in a system, which is necessary, for example, to start a lamp or to meet EMC requirements.

This is not part of the electrical protection system. Symbol: 

5. Areas of application and properties of SCHUCH light fittings

It is essential to observe DIN VDE 0100 when selecting the light fittings (see section 4).

5.1 Use of damp-proof light fittings taking into account their degree of protection

Water proof light fittings with a high degree of protection (IP 65) are indoor light fittings for ceiling, pendant and mounting rail installation (horizontal installation). If these light fittings are not used as intended, e.g. if they are mounted outdoors, in a different mounting position and/or in extremely high humidity, condensation may occur. A negative pressure is created in these very tight light fittings during the cooling phase after switching off or in the event of strong temperature fluctuations (e.g. mounting in outdoor installations). This makes it possible for moist air to be drawn into the interior of the light fittings and to condense. Water accumulation in a moisture-proof light fitting is thus by no means due to a leaky light fitting, but rather to a light fitting that is too impervious. (The tighter the light fitting, the greater the risk of condensation).

For outdoor use, special designs with affix ...AUS are available. These lights are suitable for unprotected outdoor use.

When mounting water proof lights on cold surfaces, condensation can also occur. In such cases, it is necessary to mount the light fittings at a distance from the mounting surface. Light fittings with protection class IP65 are „jet water protected“. Direct spraying (e.g. during cleaning work) with high-pressure cleaners/steam jets is not permitted. The forces that occur are many times higher than during a water jet test and can lead to water ingress.

5.2 Use of light fittings in animal husbandry

When used in stables, light fittings are polluted in particular by ammonia from the animals' excrement.

The LED modules mounted in linear light fittings of classic design (e.g. series 161 or 163) and their control gear are damaged by ammonia exposure.

We recommend the use of the „Primo XR LW“ profile tube light fitting. This light fitting is hermetically sealed to prevent aggressive substances from entering the interior of the light fitting.

The linear light fitting „LUXANO 2 LW“, or other light fittings in the „LW“ or „ER“ versions are also suitable for most agricultural applications. Please consult us.

In poultry farming, the „Primo XR LW DIMD“ light fitting should be used. This meets the special requirements regarding flicker as required by the Regulations on Animal Husbandry.

5.3 Yellowing of glasses made of PC

Polycarbonate (PC) is a plastic that turns brown when exposed to UV radiation. When installing the light fittings in outdoor areas the material is exposed to UV-radiation, but also bulbs may emit UV light (eg fluorescent lamps).

To delay the discoloration of the PC we are using so-called UV stabilizers in the respective materials. These stabilizers slow down the process significantly, but do not prevent it. The time course of the discoloration is dependent on the degree of exposure to UV radiation. The discoloration is not a product defect.

6. Plastics in SCHUCH light fittings

6.1 Chemical resistance

The bodies of most SCHUCH light fittings are made of glass fibre reinforced polyester. This material is heat resistant, mechanically stable, electrically insulating, weather-resistant and chemically resistant.

The covers of the light fittings is made of the following materials: silicate glass, polycarbonate(PC) or polymethyl methacrylate (PMMA).

Based on the current state of the art and the information provided by the respective material manufacturers, the following table shows the resistance of PMMA and PC against various chemicals. Experience shows that the temperature of chemical (aggression) substances often plays a significant role.

Parts made of PC are impact resistant and more resistant to heat than parts made of PMMA. PC is not resistant against all chemical agents. For cleaning, we recommend warm water with a mild detergent. Subsequently the material should be thoroughly rinsed with clean water. The PH value must be less than 7.5.

Due to this no soap or similar must be used.

Material	Poly-methylacrylat (PMMA)	Polycarbonat (PC)	Thermoplastic polyester (PBT)
Acetone	–	–	–
Ethylalcohol (to 30 %)	o	o 96% ¹⁾	+
Battery acid	+	+	k.A.
Ammoniac	+	–	+ up to 10% ¹⁾
Boric acid 3 %	+	+	k.A.
Sodium Hypochlorite	+	–	k.A.
Chlorine (moist)	–	–	k.A.
Chromium acid 10 %	o	+	k.A.
Acetic acid concentrated	–	–	–
Acetic acid (up to 10%)	+	+ < 10% ¹⁾	+
Formaldehyde (up to 10%)	o	+	k.A.
Glycerin	+	o	+
Uric acid (up to 20%)	+	k.A.	k.A.
Potassium (20-25°C)	+	–	–
Kerosene (aviation gasoline)	o/–	–	+
Sea water	+	+	+
Methyl alcohol (up to 23°C)	o/–	–	+
Lactic acid < 4%	+	+	k.A.
Sodium chloride	+	+	+ up to 10% ¹⁾
Sodium hydroxide Solution 20-25 °C	+	–	+
Petroleum	o	o	+
Phosphoric acid Concentrated	–	+ 10 up to 30% ¹⁾	+ 25% ¹⁾
Soap liquor (at 23 °c)	+	o	up to 10% OK
Sulfuric acid H2SO4	–	–	–
Sulfuric acid up to 30%	+	+	+ bis 10% ¹⁾
Sulphur dioxide dry (at 23 °C)	–	o	k.A.
Turpentine (at 23 °C)	+/o	–	+
Toluene	–	–	–
Acidity of wine	+ up to 50% ¹⁾	+ up to 10% ¹⁾	k.A.
Citric acid up to 20 %	+	+	+ up to 10% ¹⁾

Legend: + = resistant, O = limited resistant – = volatile (unstably) ¹⁾ = concentration

7. Corrosion resistance of sheet steel light fittings

Our steel sheet light fittings are powder coated with a high quality polyester paint. In addition to the corrosion protection, the coating offers a very good scratch resistance. Depending on the conditions of use at the installation site, however, corrosion may still occur.

Examples are applications with permanent humidity, mounting locations close to the sea, under canopies or areas with aggressive media / chemicals. For such conditions we offer, depending on the requirement, modified versions with KTL coating, aluminum or stainless steel housing.