

DID WE FIND A MIRACLE LIGHT SOURCE ?

NAŠLI SME ZÁZRAČNÝ SVETELNÝ ZDROJ ?

HABEN WIR DIE WUNDERLAMPE GEFUNDEN ?

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The fast evolution of LEDs in the last 5 years suggests they will be the light source of the next future. LED are energy efficient, resistant to damage, safe, easy to control, maintenance free, and have a longer life than previous types of lamps. But even if it is a good light, it is not the "miracle" light that many people hope for and its application should be very sensitive. Effective design, possible simple installation, control, and operation of LED cave lighting equipment (CLE) require a lot of technical knowledge and feeling for the nature.

The newest generation of LED became suitable for use in CLE about 3 years ago. To avoid some of the mistakes that can happen from improper use of this new light source, this study brings some results of our own experiments how to get enough light in the cave without cause quite strange unnatural colors and the feeling of space deformation.

Experimentation of possible LED white light colors and comparison with previous used lamps found that there is necessary to suit the color temperature of used LED (we can now choose between three basic white) with the main color of cave walls, to use only LED of the best quality with efficiency above 50 lm/W and color rendering index better than 80, to avoid any violent experiments with the light effects and to install the properly quantity light into the cave. Only on this way is it possible to guarantee both, the best visual impression for the visitors and the high protection of caves ecosystem.

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LED BENEFITS and LACKS

EFFECTIVITY >>> than incandescent and halogen lamps

COLOURRENDERING Ra good > 80

COLOURTEMPERATURE Tc wide choice between 3000 till 6000 K

LIFE 35000 hours – T70 70% lighth output
(100000 hours – T20 20 % Lo.)

SAFETY voltage 2 till 3,5 V DC (LED),
the floodlight 12, 24 or till 48 V DC or 230 V AC!
no mercury
no IR or UV radiation

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LED BENEFITS and LACKS

MAINTENANCE / RELAMPING minimal

RESISTANT against shock and vibrations,
often switch on and off
low temperature

POINT SOURCE dimmable,
suitable for compact fittings

NO RESISTANT - HEATH (more than 70 °C !!!)

LAMPSFLORA grows like by other light sources !!!
(perhaps a small bit less because
the temperature is lower)

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Tc (colour temperature) and Ra (colour rendition index)

	Ra	Tc [K]	
Natural light sources			
Candle		1800	light to reddish
Moonlight		4000	not enough light
Sunlight	> 90	5000	
Cloudy sky	> 90	6500	
Clear blue sky		10000	light to blueish
Electrical light sources (lamps)			
LI - incandescent (PAR38 80W)	> 80	2800	10
LH - halogen (200W R7s)	> 80	3200	16
FL - linear fluorescent (36W / 8xx)	> 80	2700 - 10000	90
FLC - compact fl. (L 18W / 8xx)	> 80	2700 - 10000	70
HPM - high pressure mercury (HQL 80W)	40-60	4000 - 5000	50
HPH - metal halide (HQL-TS 70W)	> 80	3000 - 6500	80
HPS - high press. sodium (NAV-TS 70W)	20-40	2000 ???	100
LED - light emitting diode - FUTURE !!	> 80	3000 - 6500	50
whiteLED - cheap one, elderly generation	50	6500	10
white PowerLED - new generation	> 80	3000 - 6500	50
All values for the lamps of good quality			
Tc usually used by LED, FL, FLC, HPH			
WW - warm white		3000 (warm coloured surfaces)	limestone caves
NW - neutral white		4200 (white surfaces)	limestone/ice caves
DL - daylight		6500 (white till cold col.sur.)	ice caves

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Tc (Farbtemperatur) und Ra (Farbwiedergabeindex)

ARE THE LEDs REALLY THE MIRACLE LIGHT SOURCE ???

NO, but they are

GOOD LIGHT SOURCE WITH THE FUTURE !

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WHEN IS ONE INSTALLATION GOOD ?

This is a result of our own installed about 15000 meters cave lighting systems and of my investigations in more than 100 show caves all around the world.

SUITABLE and ESTHETIC ROOM and OBJECT LIGHTING, TECHNOLOGICAL EQUIPMENT, FINISHING TOUCH of INSTALLATION.

ENVIROMENT PROTECTION (ECOLOGIE)
during the installation (destruction of cave),
while at work of CLE (light and heat).

SAFETY of persons and objects.



WHEN IS ONE INSTALLATION GOOD ?

Sensitiv **INSTALLATIONS and OPERATING COSTS** :

Technical good, simple LED floodlights with a nice price.

We need very seldom unnecessary expensive units with individual control and dimming ! What do we like to show to the cave visitors – the natural beauty of cave or disco light show ???

We don't need unnecessary lot of LED floodlights with less power than 4 W .
We used in good installations in the past about 1 PAR lamp every 4 meters and today we can see the LED installations with 2 floodlights per meter !!!
There are more floodlights as the stalagmites in some caves !

And we can do it with one 8-15 W LED unit by 4 meters too !!!

Very important is simple installation that can be made by own electricians.



WHEN IS ONE INSTALLATION GOOD ?

Sensitiv **INSTALLATIONS and OPERATING COSTS** :

There is a lot of good and less good LED floodlights more expensive than 200 Euro on the market.
There is a lot of poor cheap LED floodlight too !

A good COMLUX LED floodlight costs less than 120 Euro.
But even this is for a lot of cave owners to much,
because one "old PAR38 light point" was 20 Euro.

If we can use suitable elderly floodlights
(there are many 1000 installed in the caves),
and the "old" copper cable installation is in good condition,
we can use some LEDPAR38 lamps (price less than 75 Euro)
as an equivalent change to PAR38 80W .



WHEN IS ONE INSTALLATION GOOD ?

Easy **CONTROL and MAINTENANCE** :

No unnecessary light effects,
(we need it perhaps in small caves with less speleothemes,
in the big caves there isn't enough time for such a performance,
mostly visitors are tired after 60 minutes visit).

The big caves don't need the light show
around each stalagmite and stalaktite !

Extremely important is possibility of
SIMPLE, QUICK and CHEAP maintenance by own personal !!!



LED **BENEFITS** and **LACKS**

PRICE expensive specially for the caves
with not many visitors

Maximal economical balanced price of LED floodlight
with 8-10 W power (40-60 lm/W) - equivalent to PAR38 80W,
by 10 years installation and 30000 hours LED life .

		Material and running costs compared with the PAR38 80W installation	
Yearly operating time	Daily operating time (300 days in an year)	The same	50% of them (for to save some money for the new installation)
[hours]	[hours]	[Euro]	[Euro]
2000	6.7	< 500	< 230
1000	3.3	< 260	< 120
500	1.7	< 135	< 60
200	0.7	< 60	< 30



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LED cave lighting systems today (autumn 2010) :

We stay on the beginning – perhaps 20 LED installations worldwide

What did COMLUX do ?

Slovakia - 1st experiments in spring and summer 2008

*Germany - 1 – experiment by COMLUX in Jun 2009, owners
reaction was positive, but money are the problem*

*Slovakia - 2 – planed by COMLUX in spring 2009, will be installed
in winter 2010*

Slovakia - 3 – experiment by COMLUX in autumn 2009

Austria – 1 – presentation in Jun 2010



Croatia – 1 – presentation in Jun 2010

LED floodlights COMLUX



KOALA POWER LED

Floodlight in IP65 with the divergence 10 ° / 30 ° / 45 °

KPLED 110

DC 24 V / AC 230 V
3,5 W
2400 cd
WW,NW,DL

KPLED 130

DC 24 V / AC 230 V
3,5 W
500 cd
WW,NW,DL

KPLED 145

DC 24 V / AC 230 V
3,5 W
300 cd
WW,NW,DL

The others colours of LEDs (red, amber, green, blue) and special control units (sequenzer, dimming) possible on request.



LED plastic floodlights COMLUX



CPLLED 220

DC 24 V / AC 230 V
7 W
2000 cd
WW,NW,DL



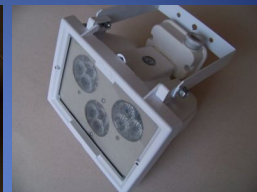
CPLLED 240

DC 24 V / AC 230 V
7 W
800 cd
WW,NW,DL

The others colours of LEDs (red, amber, green, blue) possible on request.
Accessories - antiglare shade.



LED floodlights COMLUX



Floodlights in IP65 with the divergence 10 ° / 30 ° / 45 °

CLED 310

DC 24 V / AC 230 V
10,5 W
7200 cd
WW,NW,DL

CLED 330

DC 24 V / AC 230 V
10,5 W
1500 cd
WW,NW,DL

CLED 345

DC 24 V / AC 230 V
10,5 W
900 cd
WW,NW,DL

The others colours of LEDs (red, amber, green, blue) and special control units (sequenzer, dimming) possible on request.



LED plastic floodlights COMLUX



Floodlights in IP65 with the divergence 8 ° / 26 ° / 38 °

CPLLED 710

DC 24 V / AC 230 V
8,5 W
4800 cd
WW,NW,DL

CPLLED 730

DC 24 V / AC 230 V
8,5 W
1700 cd
WW,NW,DL

CPLLED 745

DC 24 V / AC 230 V
8,5 W
WW,NW,DL

Special control units (dimming) possible on request.



LED floodlights COMLUX



Floodlights in IP65 with the divergence 8 ° / 26 ° / 38 °

CLED 108

DC 24 V / AC 230 V
8,5 W
10500 cd (350 mA)
17000 cd (700 mA)
WW,NW,DL

CLED 126

DC 24 V / AC 230 V
8,5 W
WW,NW,DL

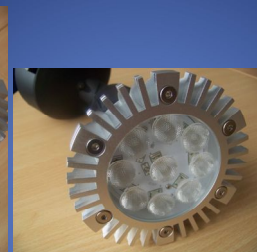
CLED 138

DC 24 V / AC 230 V
8,5 W
WW,NW,DL

Special control units (dimming) possible on request.



DAFNE LEDPAR38



Floodlights in IP65 with the divergence 8° / 16° / 21° / 26° / 41° / 88°

DLP38 xxyy (f.e. DLP38 41WW)

AC 230 V
16 W
About 1000 lm
300 till 25000 cd (depending of divergence and colour)
WW,NW,DL



LED floodlights WMAUS



EnviroMini +
DC 24 V
6 W
300 lm
WW,DL
beam angle 7 °, 14 °, 30 °



LED floodlights WMAUS



RockStar
DC 24 V
1,6 W
80 lm
WW,DL
beam angle 7 °, 14 °, 30 °

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LED paths floodlights WMAUS

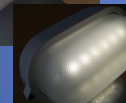


MODEL 16
DC 24 V
1,5 W
40 lm
DL

The others colours of LEDs (red, amber) possible on request.

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LED paths floodlights COMLUX

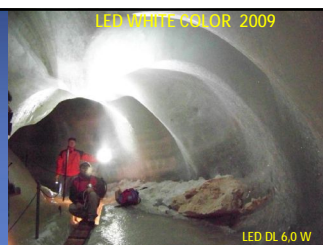


CLED path 2P130
DC 24 V / AC 230 V
6 W
180 lm
WW,NW,DL

CLED path P130
DC 24 V / AC 230 V
3 W
90 lm
WW,NW,DL

The others colour of LED (red, amber, green, blue) possible on request.

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LED WHITE COLOR 2009

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Schellenberger
Eishoehle (D)
April 2009

LED DL 6,0 W



**Thank You
very much
for Your attention !**

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