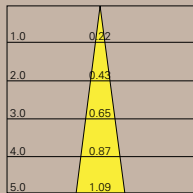
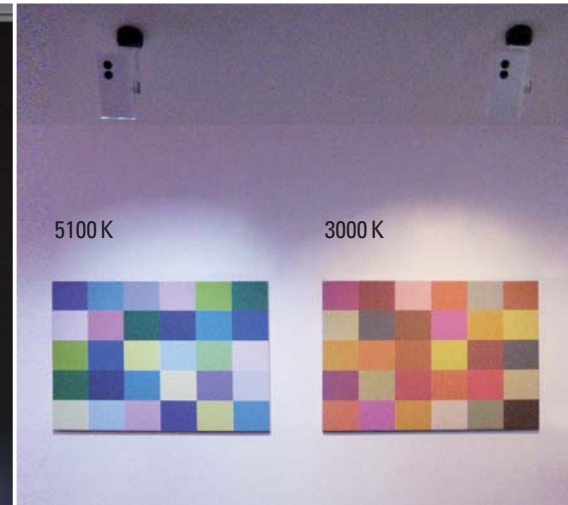




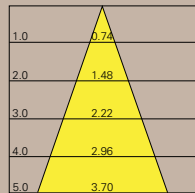
PAL. Perception Adaptive Lightsource.

## PAL Beamer 1.1: The first Regent LED projector with PAL technology

## PAL – The true to life light source



64WS3.0116  
64WS3.0116.R  
SN SuperNarrow 2x8°



64WS3.0114  
64WS3.0114.R  
F Flood 2x20°



Stepless Controls

Intensity (1% – 100%)

Colour Temperature (2700K – 6500K)



PAL Perception Adaptive Lightsource

- LED projector with PAL technology
- Suitable for standard 3-phase track systems
- Aluminium die-cast housing, white thermo painted
- CRI > 90 throughout the entire colour spectrum independent from dimming, colour temperature and service life
- Continuously variable colour temperature (2700K – 6500 K) and intensity (0 – 100%)
- 2 versions: manual adjustment on projector with 2 stepless controls (64WS3.0114.R, 64WS3.0116.R) or manual and radio frequency control via notebook/PC (64WS3.0114, 64WS3.0116), software to be ordered separately
- 2 beam spreads SN SuperNarrow 2x8° or FFlood 2x20°
- Precise aluminium reflectors
- Protective front glass
- Aluminium die-cast arm, self locking or lockable
- Full 360° horizontal adjustment, extended vertical tilt up to: 17°/180°/17°
- Concealed wiring
- Integral electronic control gear and driver unit
- Ceiling canopy for 3-phase adaptor, optional
- UV + IR free light

## PAL – The true to life light source

### The individually correct lighting for each exhibit through one tunable light source with CRI >90

#### Museum lighting today – a very complex challenge

The premium requirement is to conserve valuable pictures and exhibits, i.e. to ensure that a minimum of UV, direct infrared radiation IR, heat and light is directed at them. At the same time, the purpose of a museum is to present works of art optimally, as unaltered as possible, and this demands effective lighting of a very high quality.

#### Minimising deterioration to exhibits

What we see is «reflected» light. What damages sensitive artworks is «absorbed» light. Damage to exhibits can be caused by different parameters such as the energy contained in the light source, the material and the condition of the target surface and the duration of exposure to light. Ultraviolet, visible and infrared light can cause damage. On the other side, visible light is needed to see. Conventional light sources, one of those being daylight, contain UV or infrared or both. Protective filters do not cut the whole quantity of damaging energy, but they can significantly reduce the intensity of the visible light as well. This leads to extra energy consumption and the production of unnecessary heat in the museum which needs to be extracted. The PAL light source emits no UV and no IR, thus reducing deterioration and air-conditioning costs. The colour spectrum of PAL is precisely adapted to the vision of the human eye.



**PAL Project Reference:** Salzburg Museum, Mozartplatz 1, Salzburg. The first Regent PAL technology lighting system for museum illumination is in operation with InMax PAL since June 2007.

#### Light sources

The light source with the highest colour rendering index (CRI) is daylight. Nevertheless, daylight contains major risks for the art works as it contains lots of damaging energy. Fluorescent and discharge lamps contain quite a substantial amount of UV and therefore need additional filters. Under these circumstances their spectrum is not continuous and some colours present in the exhibits risk not being seen. Incandescent and halogen lights contain infrared IR and are biased towards the red spectrum. These light sources produce damaging heat and affect perception as well as the visibility of the exhibits.

Conventional LED light sources with a poor emission spectrum, such as RGB technology, emit no UV or IR but they can't produce «real» white light. RGB uses a combination of 3 LEDs with an almost monochromatic spectrum. Therefore too many colours are missing from the resulting colour spectrum. Many target colours lit with this light will never be seen. Exhibits lit with a «poor» light also look poor and lifeless.

## PAL – The true to life light source

### PAL – Perception Adaptive Lightsource

PAL is a highly efficient and precision true white LED light source with variable colour temperature specified by Regent Lighting, based on the stringent requirements of museum and conservation lighting.

### PAL – The adequate colour rendering for all exhibits, From artworks on paper to oil paintings

Thanks to PAL it is possible to use the advantages of LED technology emitting no UV and no IR and at the same time see all colours naturally and in «true» light. PAL is a state-of-the-art innovative technology for «true and real» white light based on LED. The PAL technology is not based on RGB or conventional white LED concepts. The colour rendering index CRI of PAL is always >90, throughout the entire colour spectrum from 2700K – 6500K. PAL is a true white light source that simulates the quality of daylight. The colour rendering and the colour temperature of PAL remain stable even when dimming (1% – 100%) and during its entire lifetime.

### PAL – The right light spectrum suitable for all artworks

The PAL-LED circuit boards integrated into the Regent luminaire PAL Beamer 1.1 have a very high quality colour rendering and a continuous emission spectrum. The required white nuances for each exhibit as well as the desired room ambience are produced optimally and individually. With the continuously variable colour temperature from 2700K – 6500K (manually on the projector by stepless controls, or with the group control function via notebook/PC), there is flexibility in the lighting of sensitive exhibits as well as in adapting to temporary exhibitions with adjustable colour concepts for the exhibition room background walls. When a warm white temperature is selected, the cool nuance colours will be still recognised but in a lower intensity, unaltered still with a CRI >90.

### PAL – Low energy consumption thanks to high efficiency (up to 70 lm/W)

PAL offers a very long life time (50 000 hours) at a very low energy consumption. The light output always stays between 60 and 70 lumen per Watt, which far exceeds the performance of halogen lamps and reaches the efficacy of fluorescent lamps.

### PAL – Qualities

True colour CRI >90, variable in both colour temperature (2700K – 6500K) and intensity (1% – 100%) plus constant retention of high efficiency 60 – 70 lm/W.

### PAL – True to life, efficient and caring LED lighting for the conservation environment.

**Comparison between daylight spectrum and those of conventional light sources as well as LED RGB and LED PAL. The spectrum of LED PAL is very close to that of daylight.**

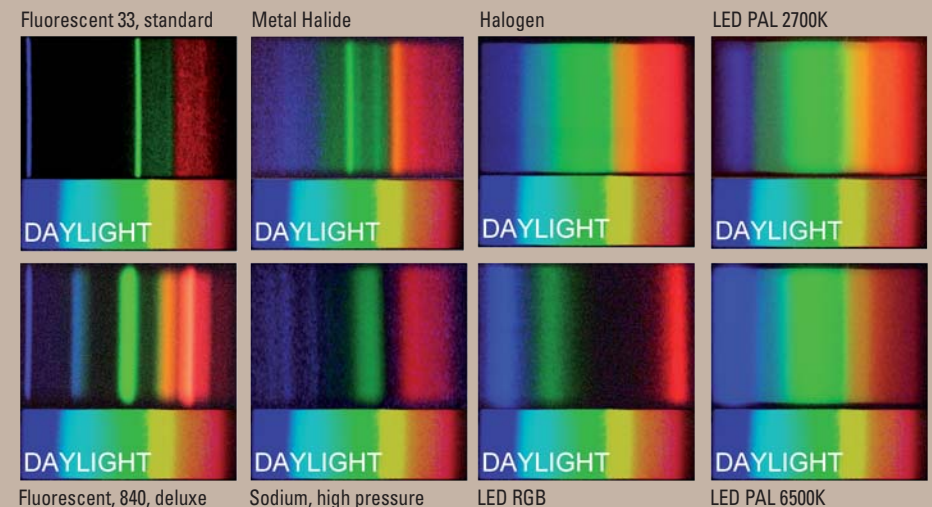




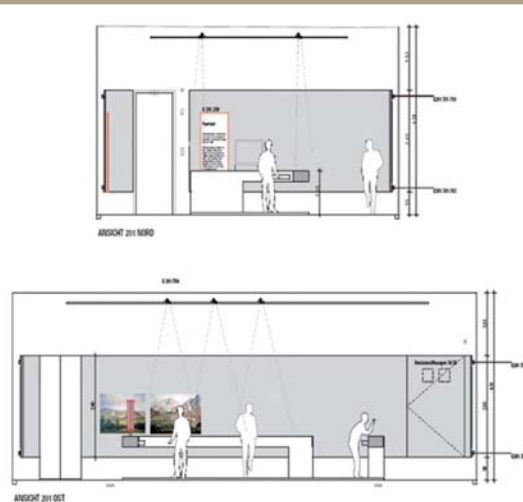
Photo Hechenberger

### **New location with new PAL-LED lighting system by Regent Lighting**

Lighting in museums presents a very complex challenge. This is because it involves fulfilling two requirements that are practically diametrically opposed. One requirement is to conserve valuable pictures and exhibits, i.e. to ensure that a minimum of UV, direct infrared radiation, heat and light is directed at them. Therefore, as little light as possible should be used. On the other hand, the purpose of a museum is to present works of art optimally, as unaltered as possible, and this demands effective lighting of a very high quality. Additionally, the ambience in every room, which is also heavily dependent on the use of lighting, must be appropriate.

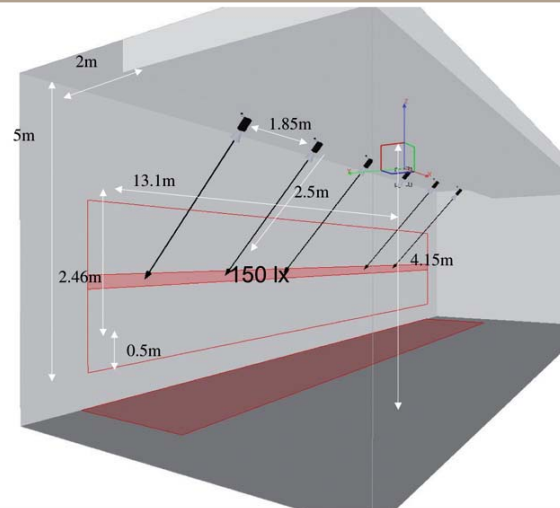
### **Actual case study for the Salzburg Museum**

- Consideration of the heat problem in the museum
- LED projectors for uniform wall illumination
- Light protection – reduction of the damage potential in the case of high quality colour reproduction



- Adjustable luminance
- Variability of the colour temperature
- Use of standard 3-phase track systems

In collaboration with the PÜRCHER ENGINEERING planning office in Schladming, which is responsible for the Salzburg Museum, the Swiss lighting manufacturer Regent Lighting has developed a lighting system that uses InMax PAL 1.1 LED projectors specially manufactured for this system, with which all the specified lighting requirements can be fulfilled. The PAL-LEDs used are currently state-of-the-art with regard to light output and colour rendering CRI quality for white LED light. This extremely efficient new light source, integrated into the projectors specially developed by Regent for this purpose, ensure optimal heat dissipation, even over long periods. This new semi-conductor and luminescence conversion technology enables a CRI colour rendering index of up to Ra 92 and light output of more than 60 lumen per watt. Only through this technological quantum leap can such a demanding lighting task be solved by this very new lighting technology.



The following is a list of the individual lighting tasks set by the Salzburg Museum, which led to the installation of a Regent PAL-LED lighting system:

### **Task 1: Controlled and reduced heat output (Example: room 201)**

We are dealing with an old building, with only a very limited possibility of installing a modern air-conditioning system to keep the thermal influences on the exhibits to a minimum. Therefore, the first and most important requirement for the lighting system that Museum Director Dr. Erich Marx submitted to Regent Lighting was to keep the heat output in the exhibition rooms to a minimum, not exceeding the value of 15 watt per square metre.

The total output of the spotlights used (incl. the power loss of the operating devices) amounts to 240 watt. This corresponds to a saving of 144 watt over traditional spotlighting methods, and this with only 8 Regent InMax PAL 1.1 LED projectors being used. The illumination is UV-free and without direct infrared radiation, thus preserving the valuable exhibits.

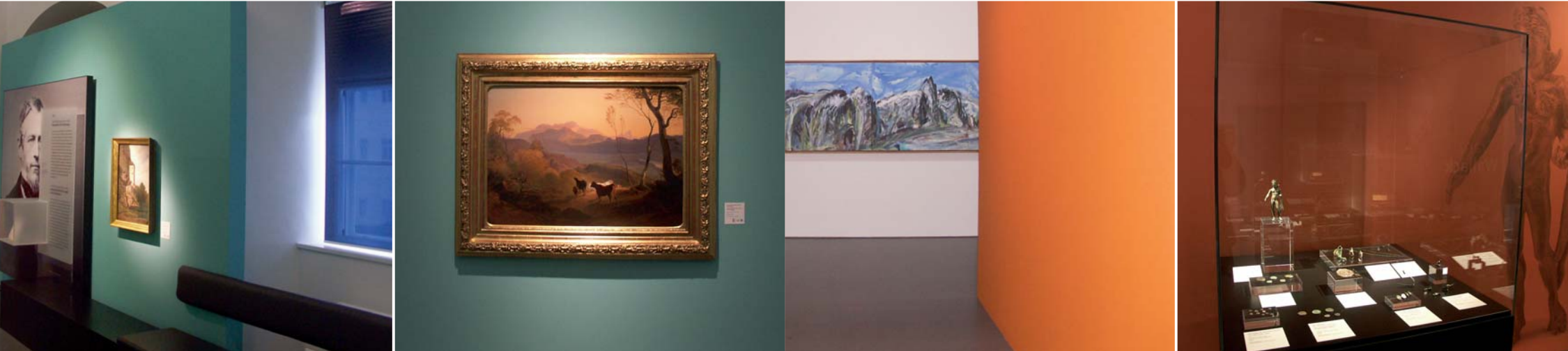
### **Task 2: Variability and uniformity of the illumination levels**

Exhibits with varying degrees of sensitivity require different and generally very low lighting strength values. In the Salzburg Museum, these values vary between 50 and 150 lux. The Regent InMax PAL 1.1 projectors produce 150 lux, which can be reduced using the dimmer installed directly in the spotlight or the group control function via a laptop, while maintaining a uniform illuminance.

An additional requirement was for all the exhibition walls, which have a different colour design in every room, to be illuminated with perfect uniformity. The Regent PAL projectors produce very harmonious, soft illumination on vertical surfaces and exhibits, without the interference of lighter/darker zones. The impression given is that the walls are self-illuminating.

### **Task 3: Adjustable colour temperature and high quality colour reproduction**

«Natural colour reproduction for the exhibits and the creation of a comfortable, warm room ambience by means of a light, not excessively glistening white light» (with conventional lighting, there is either a very marked red weighting, e.g. 830



for CDM-Tm [which leads to colour distortion in blue and green tones], or an excessively unnatural glistening white light).

The PAL-LEDs integrated into the Regent projectors have a very high quality colour rendering. Each luminaire uses two light colours, with which the required colour nuances for each exhibit can be produced optimally and individually, in combination with the desired room ambience.

With the freely adjustable colour temperature (manually on the spotlight, or with the group control function via a laptop), there is flexibility in the protective illumination of sensitive exhibits and also in adapting to temporary exhibitions with adjustable colour concepts for the exhibition room walls.

#### **Task 4: Light protection – optimal reduction of the damage potential**

The exhibits are subjected – even discounting the light – to a high degree of heat exposure.

It has therefore been necessary to keep any additional damage potential to an absolute minimum (UV and direct infrared radiation). With the new Regent PAL-LED

lighting system, oil paint on canvas and watercolours on paper, for example, can be illuminated for 45% longer in comparison to systems using halogen light sources, without any increased risk to the exhibits (CIE 157: 2004).

#### **Task 5: Maintenance and service**

The life span of the PAL-LED's used is approx. 50 000 operating hours at a room temperature of 25°C. This results in an enormous saving, even when one considers the cost of changing the lighting. The long life span of the Regent PAL projectors is due to the latest chip-on-board technology. Additionally, all the PAL-LED circuit boards for the projectors employ the most up-to-date plugging technology, so that the spotlight need not be replaced should one of them malfunction.

#### **Task 6: Use of standard 3-phase conductor rails**

The development of the new Regent PAL-LED projector was based on the specification that it could be installed without the use of any tools on an existing

## Project Report: Salzburg Museum since June 2007

standard 3-phase track. It was also an important consideration for the Museum Director, the Curator and the Technical Manager that the work involved in the installation be kept to a minimum.

On June 1st, 2007, the Salzburg Museum presented itself in an entirely new light in its magnificent new residence at Mozartplatz. Valuable works of art, aesthetic presentation, challenging ideas and multimedia installations combine to form a harmonious overall experience. Salzburg Museum proves that a modern museum can inform and entertain at the same time.

Lighting challenges such as the Salzburg Museum are predestined to make use of innovative technology, because here you can see the advantages when compared to conventional lighting and lighting technology, advantages which will undoubtedly scale unimaginable heights in the future.

### **PAL Perception Adaptive Lightsource**

The individually correct lighting for each exhibit – with only one light source  
Precision-LED with variable colour temperature 2700K – 6500K  
Constant colour rendering quality CRI >90 throughout the entire spectrum

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PAL Beamer 1.1

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