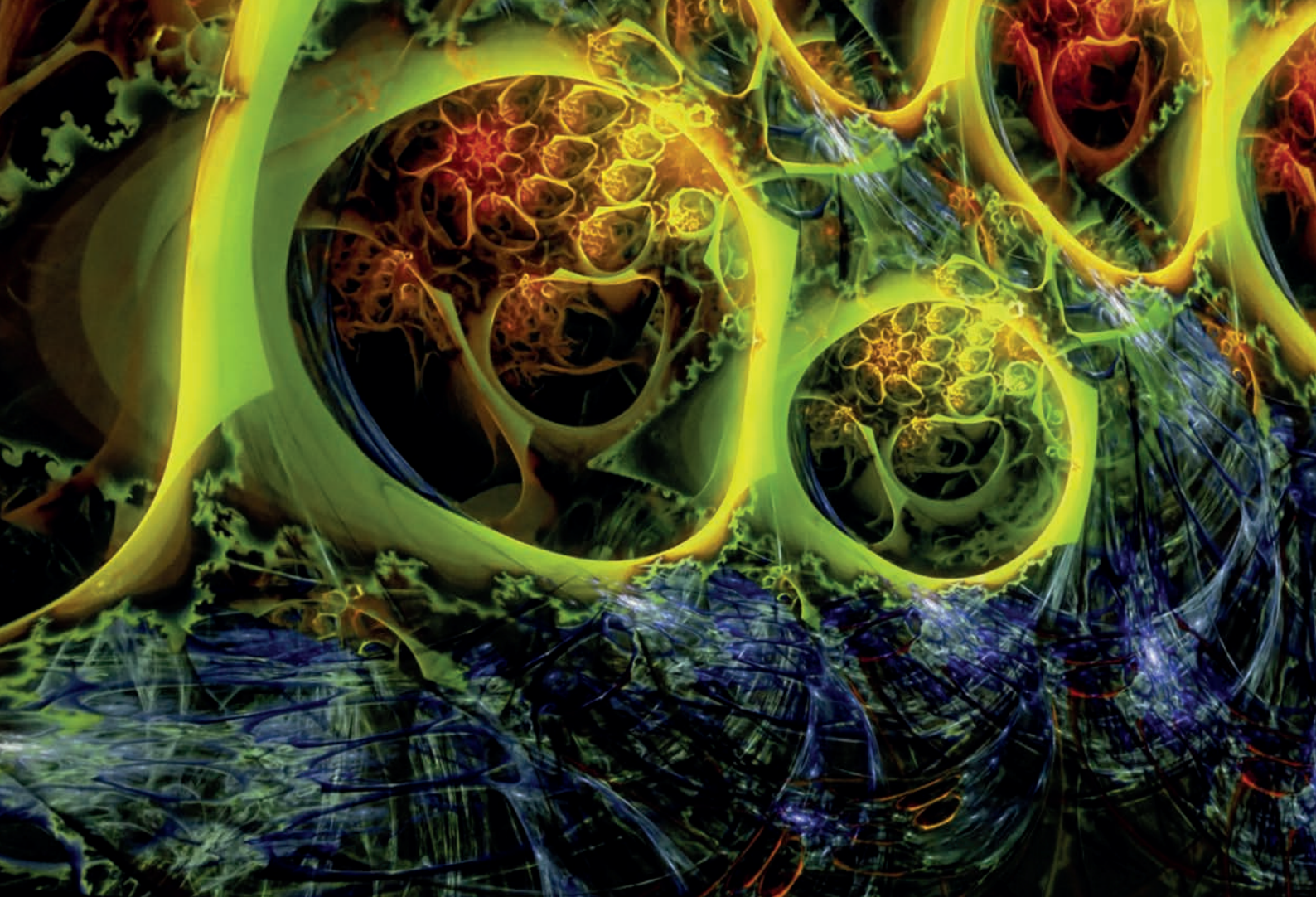


Full dome Projection



ZEISS VELVET LED
Premium Digital Projector for Planetariums





Top Sharpness and Contrast, Brilliant Colors

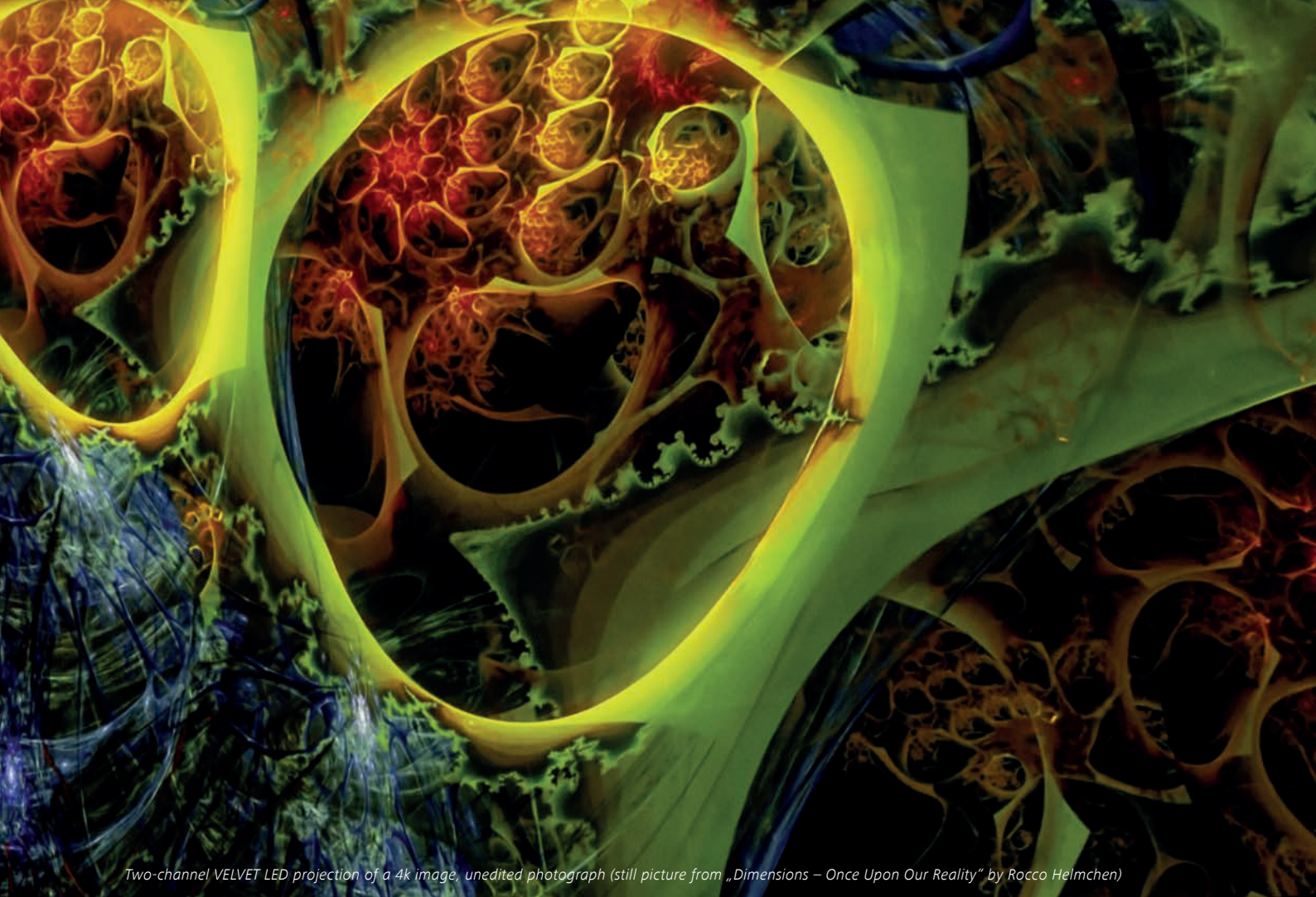
The VELVET LED projector developed and made by ZEISS is the only projector worldwide created in every respect for astronomical presentations in planetariums. Combining cutting-edge sharpness with unequalled contrast and strong colors, this projector delivers the most exquisite video projection possible in the planetarium.

VELVET LED provides an absolutely black background to the imagery projected, with not the least bit of gray brightening the jet black night sky behind the brilliant stars and other celestial objects. In hybrid operation, typical planetarium presentations such as constellation figures, grids, planets, moons, nebulae and galaxies are superimposed on the night sky produced by your star projector without any trouble.

Transitions between image channels are made invisible by software. The new semiconductor light sources extend the color space. They have a rated life of 20,000 hours, and are ready to operate immediately upon being switched on. For most planetariums this allows operation for ten or more years, and lets you save about 1,100 Euro per year per projector, compared to the lamp-based VELVET models. This also means lower total operating costs compared with many other projection systems.

The essential point is the quality of the image on the dome. It is not alone the number of pixels that makes a good image. In the end, the sharpness and pictorial impression of the image are determined by the imaging quality of the equipment involved. The VELVET

LED features ZEISS optics of the highest grade, which guarantee impressive images. That is why a 6k dome picture projected with VELVET LED may well look crisper than many an 8k image produced by other systems. Making you forget blurs, visible edge blends, and brightness and color deviations between channels, VELVET LED projectors offer a projection quality for astronomical and related contents that no standard projector can deliver. The patented »True Black Projection Technology« developed by ZEISS is based on imagers made by Texas Instruments. The DLP® technology makes for image homogeneity, while the LED technology provides constant color saturation – two properties that are maintained throughout the operating life.



Two-channel VELVET LED projection of a 4k image, unedited photograph (still picture from „Dimensions – Once Upon Our Reality“ by Rocco Helmchen)

Designed Specifically for Planetariums

- DLP technology and ZEISS optics for pin-sharp pixels and excellent pixel contrast
- Absolutely black image background, entailing higher color brilliance
- high resolution for images particularly rich in detail: true pixels, no pixel shift
- Colors of higher saturation; pure white thanks to LED lighting
- Extended color space, adapted to the DCI (Digital Cinema Initiative) standard
- Result: Color rendition fidelity visibly improved compared to previous models
- Impressive brightness for all planetarium applications
- 30-bit color depth for stepless color gradients without banding
- Invisible transitions between image channels (edge blends)
- Edge blend computation without gray level losses
- No mechanical masks, for best possible edge blending quality
- Reduced overlap zone between channels, resulting in better pixel utilization
- Color stability and homogeneity virtually throughout the operating life
- Higher brightness compared to incandescent-lamp projectors
- Specially corrected ZEISS objectives, which take the curvature of the projection screen into account
- Optimized image quality thanks to optics of extremely high transmission and color purity
- Virtually non-vignetted projection
- Transfer of the imager matrix with minimum modulation losses, resulting in homogeneous, pixel-precise imaging without distortions and chromatic aberrations

Das Schönste was wir erleben können,
ist das Geheimnisvolle.
Albert Einstein

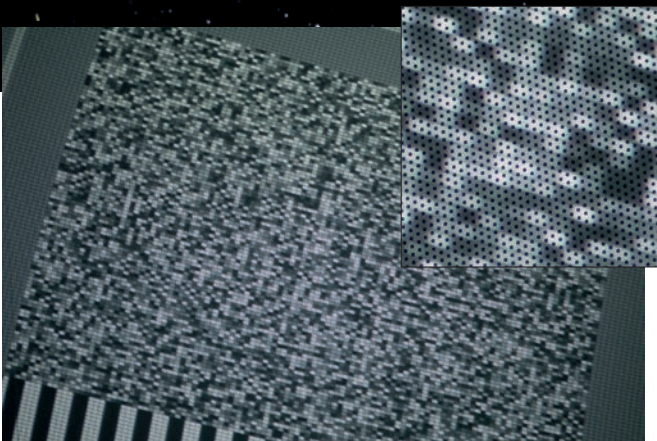
The most beautiful thing we can experience is the mysterious.
Albert Einstein

- Enclosed light engine for long service-free operation
- No stray light in the projector, nor in the objective
- Lightproof – no light exiting between housing components
- Improved cooling permits noise-reduced operation
- Robust mounting frames
- Easy adjustment, lower failure rate compared to projectors with color wheel
- Availability extended by about 40% thanks to LED light source (no warm-up, can be switched on or off any time)
- Extremely long rated life of ten and or more years
- Fast, cost-effective remote maintenance
- Service guaranteed for at least ten years
- Matched projector and software configuration from a single source
- Manifold configurations possible, also for off-center projection
- Suitable for stereo projection (active 3D – 120 Hz)
- Full-scale calibration facilities (geometry, brightness, colors)
- Markedly reduced overall operating costs
- Safe investment – with the world's most experienced and steadiest planetarium supplier



*Guarantees best imaging quality:
VELVET objective ZEISS DIGIGON*

*Two-channel VELVET LED projection of a 4k image, unedited photograph
(still picture from „Dimensions – Once upon Our Reality“ by Rocco Helmchen)*



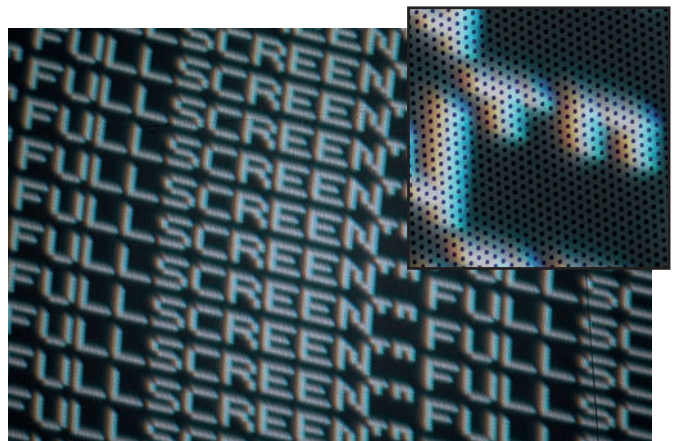
*Segment of projected image, VELVET/DIGIGON 108 2.4/11.4 (test image)
Definition: excellent – distinct pixel separation; exposure data: Canon EOS 5D
Mk II, ZEISS Macro-Planar 2/100, ISO 800, f/2, 1/4s.*



*Segment of projected image, F35/NAVITAR HM117/11.7 – (test image)
Definition: mediocre – pixels blurred; exposure data: Canon EOS 5D Mk II, ZEISS
Macro-Planar 2/100, ISO 800, f/2, 1/8s.*



*Segment of projected image, VELVET/DIGIGON 108 2.4/11.4 (test image)
Lateral color: negligible – less than 1/4 pixel width; exposure data: Canon
EOS 5D Mk II, ZEISS Macro-Planar 2/100, ISO 800, f/2, 0.4s.*



*Segment of projected image, F35/NAVITAR HM117/11.7 – (test image)
Lateral color: clearly visible – 2 to 3 pixel widths; exposure data: Canon EOS 5D
Mk II, ZEISS Macro-Planar 2/100, ISO 800, f/2, 1/13s.*



System configurations as required

Only two VELVET LED projectors, placed near the dome center together with a star projector, e.g., a SKYMASTER ZKP 4, produce a splendid dome image in domes with diameters up to about 12 m. Alternatively, installed in mutually

opposite positions at the dome periphery, they create full-dome projection. VELVET LED configurations with five or more projectors offer highly resolved full-dome images with 4k to 8k resolution*. VELVET LED also allows configurations with a central star projector; they

will project their images past the sides of the star projector without casting shadows.

* Systems with effectively 6k or higher resolution are usually called „8k systems“.

Recommendable configurations*

Dome diameter	Planetarium projector at the center**	VELVET LED configuration	Resolution approx.	Pixel size approx.
23 m to 30 m	no	11 channels, periphery	7 k	1.7 arcmin
20 m to 25 m	yes	10 channels, periphery	6.5 k	1.8 arcmin
20 m to 25 m	no	9 channels, periphery	5.7 k	1.9 arcmin
18 m to 23 m	yes	8 channels, periphery	5 k	2.1 arcmin
18 m to 23 m	no	7 channels, periphery	5 k	2.1 arcmin
12 m to 18 m	yes	6 channels, periphery	4.7 k	2.2 arcmin
12 m to 18 m	no	5 channels, periphery	4.5 k	2.3 arcmin
8 m to 12 m	yes	2 channels, center	2.6 k	3.9 arcmin
4.5 m to 12 m	no	2 channels, periphery	2.6 k	3.9 arcmin

* Other configurations by consultation.

** If there is a star projector at the dome center, an additional channel is required as a rule.



Two-channel VELVET LED projection of a 4k image, unedited photograph (still picture from „The Life of Trees“ by Softmachine)

Design and manufacturing from a single source

Although it is not manufactured in large lots, the VELVET LED projector is not an odd sort. It represents already the third VELVET generation since the first one was launched in 2010. Its merits are appreciated by planetarians, but also by pilots. Several hundreds of VELVET projectors do continuous service in flight and driving simulators and in many planetariums.

As developers and manufacturers of these projectors, we can ensure servicing until well into the distant future, thus protecting your investment for a long time to come. For obvious reasons this does not apply to projectors supplied by subcontractors.

Digital Compagnon

An artificial night sky with really brilliant stars that inspires and enchants the

audience can only be implemented with an optical-mechanical planetarium projector from ZEISS. ZEISS offers a no-compromise hybrid solution combining full-dome and analog star projection. “No-compromise” means that digital projection with VELVET LED will not

interfere with the brilliance of the star-studded sky, and because the digital and analog projections will always be in correct alignment and synchronism. Various models of star projectors are available depending on your planetarium’s dome size.



SKYMASTER VELVET in the Laupheim Planetarium (10-m dome).

Technical Data

VELVET LED projector

Image format / Resolution	WQXGA / 2 560 x 1 600, native (up to 120 Hz)
Display technology	LVDS DMD™ with DarkChip3™ ZEISS True Black Projection Technology
Brightness	corresponds to the visual impression of a projector with 2 600 lm
Contrast ratio (on-off, static)	2 500 000 : 1
Color rendition	30 bit RGB (3x 10 bit)
Width x height x depth	approx. 674 mm x 729 mm x 500 mm, incl. lens and mount
Lamps	LED-based RGB solid-state lighting (rated life 20,000 h)
Inputs	DisplayPort digital RGB (no internal scaler), RJ45 TCP/IP network
Electrical requirements	220 V – 240 V / 110 V – 127 V, 50 Hz – 60 Hz 1000 VA (operation), 30 VA (stand-by)
Weight	about 70 kg

VELVET LED fulldome system

Projection field	360° x 180° (± approx.15°)
Dome diameter	4.5 m to 30 m (diverse configurations)
Dome tilt	0° to 30°
Dome reflectivity	35 % to 65 % recommended (project specific)
Edge blends between channels	electronic, no masks before or inside the objective
Dome configurations	2 to 10+ channels
Temperature (operation)	+15°C to +30°C
Temperature variation	max. 5°/h
Rel. atmospheric humidity	30 % to 70 %, not condensing
Permissible change of humidity	max. 5 %/h
Remote maintenance	optional (Internet connection required)

VELVET LED hybrid systems

SKYMASTER VELVET	for dome diameters from 8 m to 14 m diameter: two VELVET LED projectors at the dome center (up to 12 m) or six VELVET LED projectors at the dome periphery
STARMASTER VELVET	for dome diameters from 15 m to 18 m diameter: six or more VELVET LED projectors at the dome periphery
UNIVERSARIUM VELVET	for dome diameters from 20 m to 30 m diameter: eight or more VELVET LED projectors at the dome periphery

Carl Zeiss Jena GmbH
Planetariums
07740 JENA, GERMANY

Phone: +49 3641 642406
Fax: +49 3641 643023
E-mail: planetarium@zeiss.com
www.zeiss.com/planetariums