

ZEISS VELVET SIM LED
ZEISS VELVET SIM LED VISIR

Delivering exceptional projection quality for
OTW and direct night vision goggles stimulation



The perfect projection technique for simulation and training applications

In the past, the contrast performance for display simulations did not meet the needs of high-performance simulator trainings. The black level was much too high, and adequate image content details were missing. Now, the best solution is the patented ZEISS VELVET SIM LED projector.



The ZEISS VELVET SIM LED projector delivers an absolutely black image background. This unique property makes the ZEISS VELVET SIM LED system the perfect projection solution for high-quality simulation and training applications for both out-of-the-window (OTW) and direct night vision goggles stimulation (VISIR technology). Night scenes, dark scenes and dawn content appear very realistic. They are not impaired by a gray background. At the same time, the high native contrast creates sharp and distinct pixels on the screen. This causes the projected content to look significantly crisper as compared with other projectors. Furthermore, the brightness can be graduated and displayed down to the lowest gray levels with the greatest possible accuracy. The brightness

resolution displayable on the screen is 10 bits for each color. This also allows for a perfect transition from one channel to the other in the blending zones of a multichannel projection system without the need for mechanical or optical blending masks.

The ZEISS VELVET SIM LED projector is capable of displaying video signals with a 120 Hz frame rate. This new technology allows for artifact-free, fast moving image content. Smearing reduction mode is no longer necessary, meaning there is no brightness loss. The ZEISS VELVET optical system demonstrates the full range of ZEISS innovation.

Design, manufacture and installation from a single supplier

ZEISS sells and installs projection solutions with ZEISS VELVET SIM LED projectors. Its merits are appreciated by pilots trained in flight simulators, but also by virtual reality and event audiences. ZEISS continues to evolve ZEISS VELVET technology.

As the manufacturers of the ZEISS VELVET SIM LED system, we can guarantee after-sales service until far into the future, providing long-term protection for your investment.

Enjoy unparalleled realism with the VELVET SIM LED projector thanks to its unique properties – no matter the weather conditions or time of day.





ZEISS VELVET SIM LED VISIR benefits

Due to an on/off contrast of 2,500,000 : 1, a pilot has the feeling of full immersion in night flight scenes.

- Featuring a native contrast of 2.5 million : 1 – the highest in the world – as well as the aberration and distortion-free ZEISS DIGIGON projection lenses, ZEISS VELVET SIM LED projectors offer the greatest possible definition, clearly defined pixels and optimum image resolution. This enables the system to replicate reality perfectly.
- An additional special feature is the 10-bit color resolution for every color on the screen. This ensures the best-possible transition between the channels, preventing artifacts.

The displayed grayscale is perfect from flawless white to smooth black. Four times as many shades of gray are available compared with standard 8-bit video signal processing. The blending areas between the projection channels are therefore completely artifact-free, ensuring total immersion in the projection.

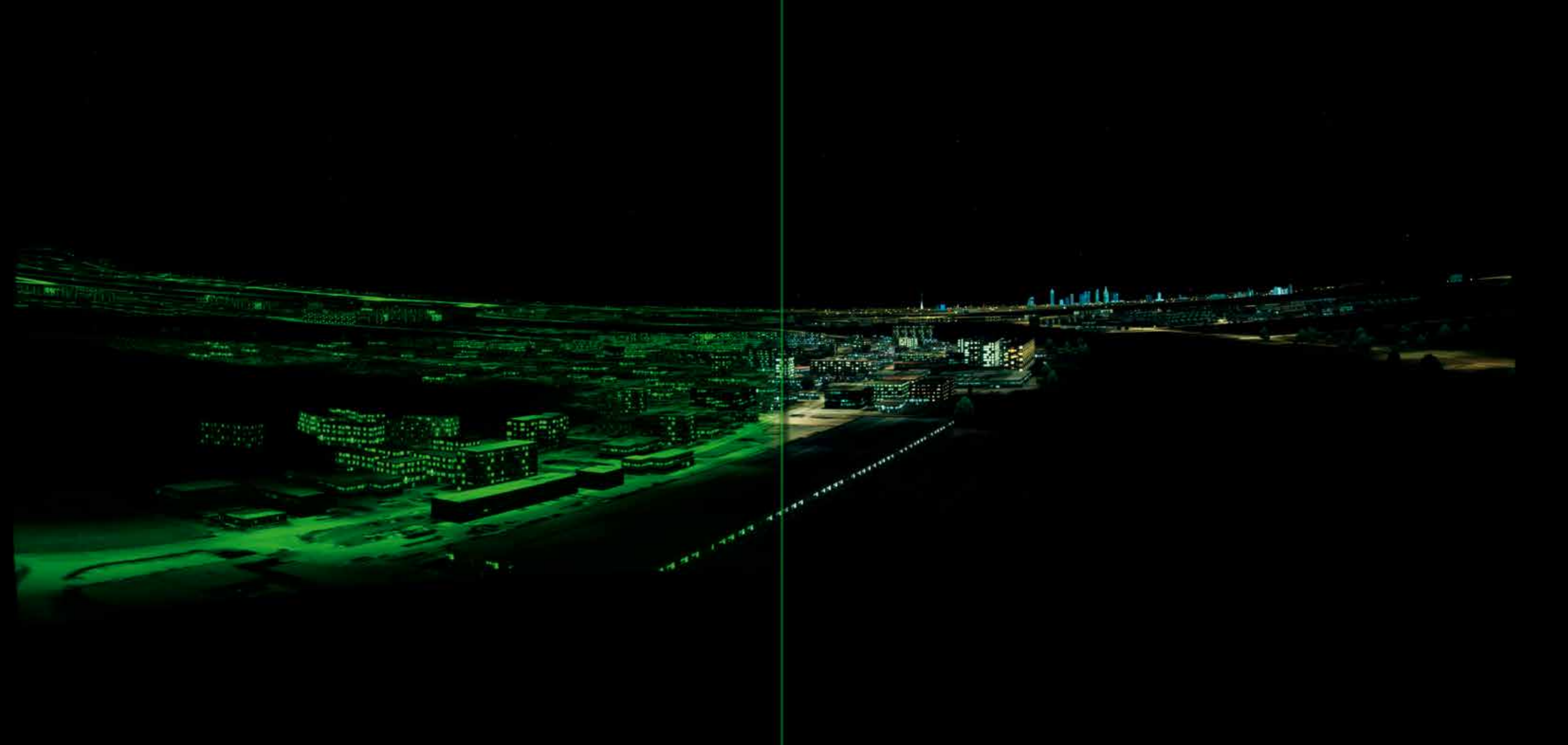
■ The ZEISS VELVET SIM LED system also makes it possible to display minimum grayscale with maximum precision.

- No color-breakup effect occurs.
- More saturated colors than with lamp projectors.
- Free image rotation possible between landscape and portrait formats for an optimum dome projection design.
- 120 Hz signal input capability. Also 2x 60Hz inputs (interleaved) possible.
- Direct stimulation of night vision goggles with near infrared light.

- As the VELVET projector emits no residual light in the VIS wavelength region, there is no black level disturbing the IR-frame. Night vision goggles (Gen2 and Gen3) are stimulated exactly just like in real night time operating conditions.
- Pure night vision training without any VIS signal is possible thanks to the extremely high contrast!
- Maintenance-free illumination due to LED technology. No need to replace light bulbs.

- Modular setup: The ZEISS VELVET SIM LED can be upgraded to infrared projection (VISIR) by adding a module.
- Compatibility with a motion system: ZEISS VELVET SIM LED projectors can be used on a motion platform.
- Motion Mode feature (if using 60Hz signal input): can be adjusted by the user, ensuring even shaper definition with very fastmoving images (“Smearing Reduction”).

- Color stability and homogeneity for many years.
- No vignetting at the edges of the projection.
- Low noise thanks to efficient ventilation.
- Guaranteed maintenance for at least 15 years.
- No mechanical blend mask necessary for edge-blending between several channels because of an extremely low black level.



High image definition and stability thanks to DLP chip technology

Our sensory perception is largely affected by what our eyes actually see. With VELVET projectors, ZEISS offers its customers projection quality that is visibly superior to that of commercial projectors. Simulation applications with ZEISS VELVET SIM LED projectors meet the users' expectations for modern and realistic virtual reality.



The proprietary "True Black Projection Technology" developed by ZEISS is based on DMD™ imagers from Texas Instruments. DLP® technology offers decisive advantages over other video technologies. One of the greatest benefits is that the image remains stable for many years. ZEISS VELVET SIM LED retains the high image quality for the entire lifetime of the projectors. Thanks to many technical and structural

solutions, our projectors are designed to have a service life of 15 years or longer, with operating expenses that are comparatively much lower than with competitors' systems.

With the ZEISS VELVET SIM LED VISIR projector, both visual and night vision scenes appear as real as possible.

A lens for a perfect image



ZEISS DIGIGON VELVET zoom optical lens

The lens you need to complete the picture

The best chip and projection technology will not create an excellent image on the dome unless it comes with an outstanding projection lens.

ZEISS VELVET SIM LED projectors come with high-performance lenses from the ZEISS DIGIGON series.

Their ray tracing has been specially designed for dome projection, and these products impress with their higher-than-average imaging quality.

They ensure that every single pixel contributes to the razor-sharp picture on the dome. Neither chromatic aberration nor optical distortions spoil the image quality.

ZEISS VELVET with its DIGIGON lens shows off its strengths in the projected image, as compared to a commercial projector for fulldome projection.



Segment of projected image, VELVET/DIGIGON (test image)
Lateral color: negligible – less than 1/4 pixel width
Exposure data: Canon EOS 5D Mk II, ZEISS Macro-Planar



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

Modular structure of the ZEISS VELVET SIM LED projector



ZEISS VELVET SIM LED projectors can easily be upgraded after installation.

The ZEISS VELVET SIM LED shows off its strengths during operation because of its very low failure rate. The reason for the low failure rate is the use of tried-and-tested components by the highly experienced ZEISS development staff.

If you have purchased ZEISS VELVET SIM LED projectors but later decide to use infrared projection, you do not need to get rid of your ZEISS VELVET SIM LED projectors! ZEISS VELVET systems can be refitted with infrared projection. A lot of ZEISS VELVET systems have been retrofitted. The modular design makes this possible.

References

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| German Air Force | Eurofighter Typhoon Simulators Tornado fighter/bomber Simulators Transall C-160 military transport aircraft Simulator |
| US Navy | Landing Signal Officer Trainer |
| Daimler AG | Driving Simulator for Light Simulation |
| Fraunhofer Institute | Overlay projection system for panorama projection |

Technical Data and Specifications

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|------------------------------|--|
| Display technology (chip): | DLP DMD with DarkChip3™ |
| Display technology (design): | ZEISS True Black Projection Technology |

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|---------------------------|---|
| Imaging Properties | |
| Image resolution: | WQXGA (2560 x 1600 pix ²) |
| Color depth: | 30 bit RGB (10 bit per color channel) |
| Aspect ratio: | 16 : 10 |
| Smearing reduction: | Motion Mode (50% darktime) in case of 60Hz input signal |
| Signal input | 60/ 120Hz possible |

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| Correlated color temperature: | 7300 K |
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| Optical Properties | |
| Contrast ratio: | 2,500,000 : 1 (static, on/off) |
| Luminous flux: | up to 2000 lm |
| Infrared output power: | typ. min. 4mW (within 700 – 800 nm) |
| LED: | LED- based solide state illumination for red, green and blue |
| LED lifetime | typ. 20.000h |

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|-------------------|---|
| Interfaces | |
| Video input: | DisplayPort v1.2 |
| Connectivity: | RJ45 TCP/IP network port (control) Controlled by »VELVET Master« control software on external PC |

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| Input power: | 100 – 240 V 50 – 60 Hz |
| Power consumption: | 1000 VA (full operation), corresponds to 3410 Btu/h 35 VA (stand-by) |

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| Degree of protection: | IP 20 |
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Weight & Dimensions

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| Dimensions: | 617 mm x 569 mm x 509 mm (W x H x D) 24.3 in x 22.4 in x 20.0 in (W x H x D) incl. projection lens ca. 63 kg (incl. projection lens) max. 58 dB |
| Weight: | |
| Noise level: | |

Environmental Conditions

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| Storing & shipping temperature: | +0° C – +55° C (VELVET within shipping box) max. 3000 m above sea level |
| Altitude: | |

Projection Lenses

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| Wavelength range: | 405 – 800 nm |
| MTF: | min. 40% (46 LP/mm) |
| Transverse chromatic aberration: | max. 1/3 pix (450 – 800 nm, for concave on-axis projection surface) |
| Distortion: | max. 5% |
| Projection full angle: (image diagonal) | 28° – 53° for ZEISS Digigon 28 – 53 IR VARIO 50° – 72° for ZEISS Digigon 50 – 72.5 IR VARIO |

Conformity with standards

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|----------------|-----|
| CE conformity: | Yes |
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Carl Zeiss Jena GmbH
Simulation Projection Solution
Carl-Zeiss-Promenade 10
07745 Jena
Germany

Telephone: +49 (0) 3641/ 64-3015
Fax: +49 (0) 3641/ 64-1989
Email: sven.ziebart@zeiss.com
www.zeiss.de/simulation-projection-solutions