

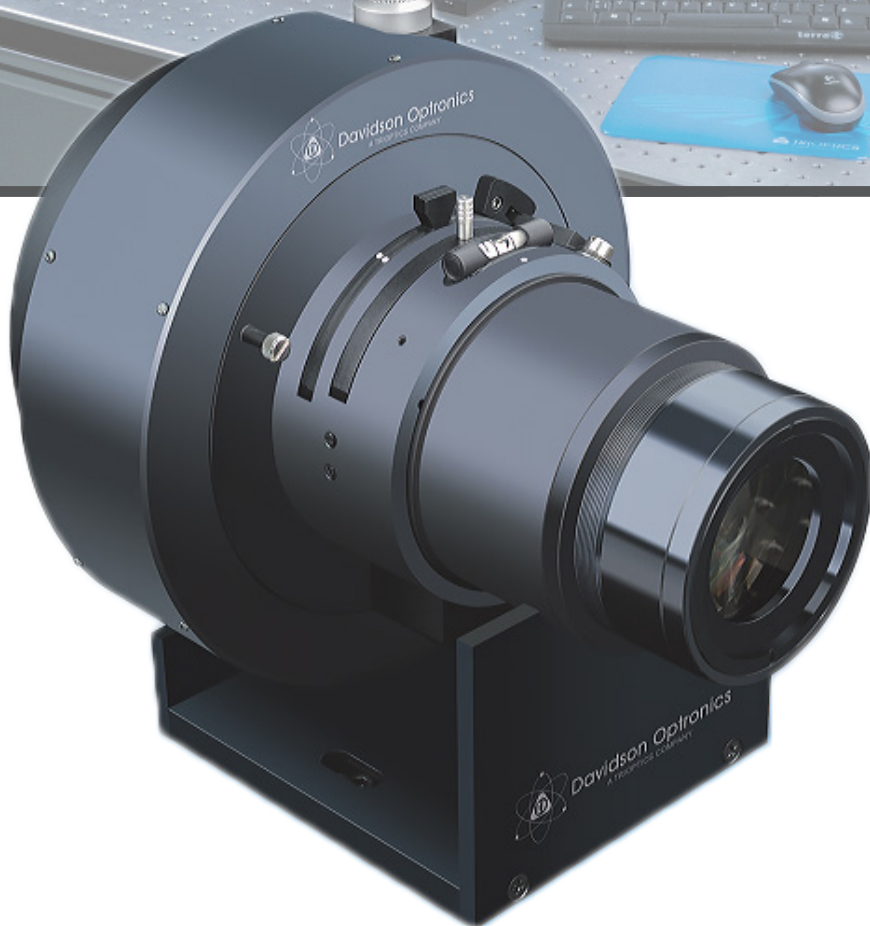
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Putting Your Future in Focus

Optoliner® NV

Calibration Standard for Sighting & Imaging Devices



2223 West San Bernardino Road
West Covina, California 91790

Phone: (626) 962-5181

Fax: (626) 962-5188

www.davidsonoptronics.com
sales@davidsonoptronics.com

The Calibration Tool for Sighting & Imaging Devices

The Optoliner® NV is a compact, factory calibrated optical test chart projector, specifically designed for testing afocal sighting devices with an eyepiece such as:

- binoculars
- night vision (NVIS) goggles
- riflescopes
- other telescopes

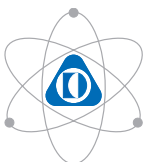
It's also an efficient tool for testing infinite conjugate camera modules with up to 40° angular field of view.

The Optoliner® NV has a wide Variety of Tested Parameters such as:

- Magnification
 - Distortion
 - Resolution / MTF
 - Camera sensitivity
 - Camera linearity
-

Key Features:

- Operates in bright daylight & eliminates the need for wall charts.
- Suitable for eyepieces up to 40° angular field of view.
- Homogeneous incandescent VIS and NIR illumination by tungsten filament halogen lamp.
- Large variety of test patterns available – replaceable within seconds.
- Large variety of filters available – color glass, cut-off, interference, neutral density.
- Optical attenuation enables testing at extremely low light levels.
- Large working distance to eyepiece entrance pupil.
- Modular and easily customized to your application.



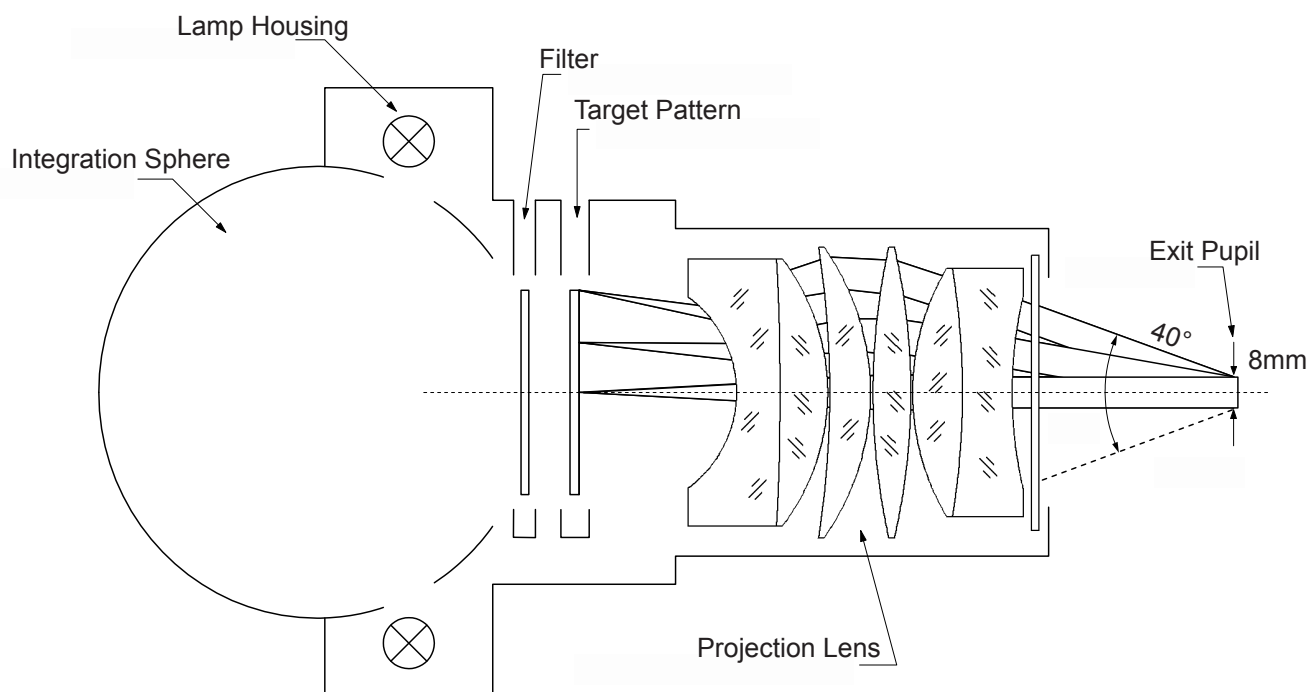
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Setup of Optoliner® NV

Modular System for Sighting Device & Camera Testing



The modular system of Optoliner® NV consists of an incandescent light source, a test pattern projector and the electronic light control and measurement unit.

The heart of the system is the test pattern projector with a collimating projection lens imaging the test pattern virtually to infinity. It provides a large angular field of projection with a convenient working distance to the entrance pupil of the sample. The precision lens projects a sharp distortion-free image of the selected test pattern into the entrance pupil of the sighting device under test. The incandescent illumination system utilizes an integrating sphere for uniform lighting within the full field of view. It is detachable and can easily be interchanged with near infrared LED, or other illumination systems upon request.

The Optoliner® system is supplied with one test target slide inserted into the projector housing. Test targets can be easily exchanged within seconds. A large variety of test patterns is available; special reticle designs are manufactured upon request.

A full line of spectral and neutral density filters allows the testing at different spectral ranges and extremely low light levels. The filters can be easily exchanged the same way as the test targets. Two filters can be inserted simultaneously in one slot.

The Digital Multi-Purpose Meter powers the illumination system while also monitoring its color temperature, voltage and image plane luminance. An internal probe measures the parameters while the Optoliner® projector is in operation. The readings are selectively displayed on the instrument's front panel.

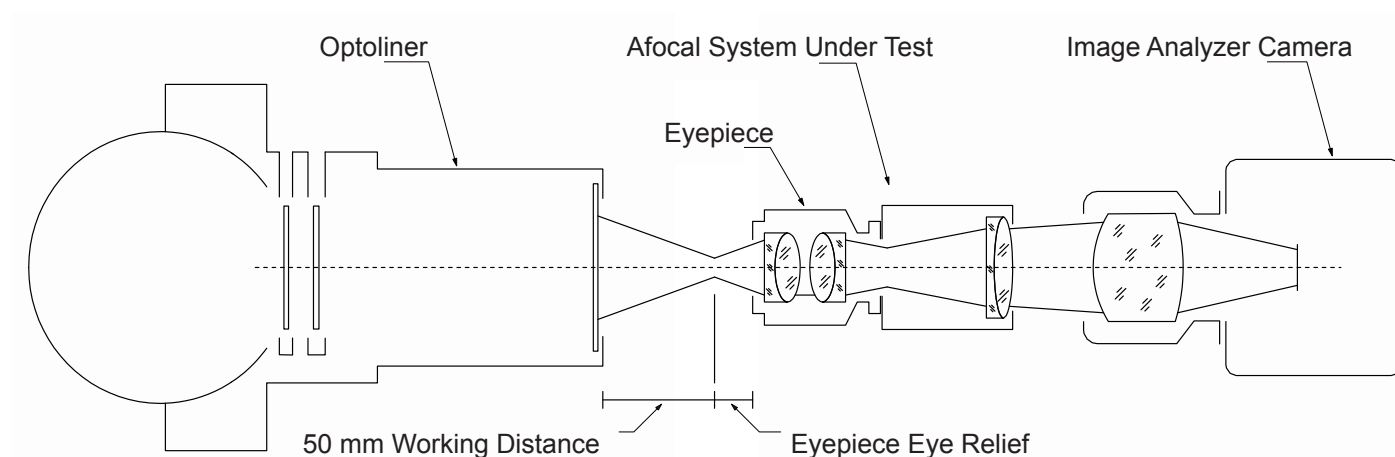


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Applications

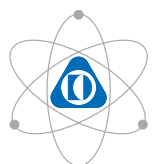


I. Measuring afocal sighting devices: night vision goggles, binoculars, telescopes

The Optoliner® NV collimator lens projects the test chart image into the eyepiece pupil of the device under test. The 50 mm working distance allows for a convenient distance between the Optoliner® and the test subject. An image analyzer camera picks up the image from the test subject for software assisted image analysis. The Optoliner® collimator lens is able to illuminate an 8 mm entrance pupil within 50 mm working distance up to the full angular field of view of 40°. The image analyzer has to be adapted to the optical properties of the device under test (focal length, magnification) by selecting a specific sensor size and lens focal length. Davidson Optronics offers the standard image analysis software Imatest Master with Optoliner, but also custom-tailored software modules. Please contact Davidson Optronics for a recommendation.

II. Measuring complete camera modules

The Optoliner® NV collimator lens projects the test chart image directly into the entrance pupil of the camera under test. The collimator is suited for camera lenses with a total angular field of view up to 40°. Hence, the collimator is not applicable for more extreme wide angle lenses like fish eye lenses. The focal length of the camera lens should always be shorter than the Optoliner® collimator focal length. The Optoliner® collimator is designed with its exit pupil outside in front of the lens body so that the collimator beam can fill the entrance pupil of the test subject. In many cases, the camera lens has to be positioned very closely to the collimator such that the projector exit pupil falls inside of the camera lens to avoid vignetting. However, the 50 mm working distance of the Optoliner® collimator gives enough space for most camera systems under test.

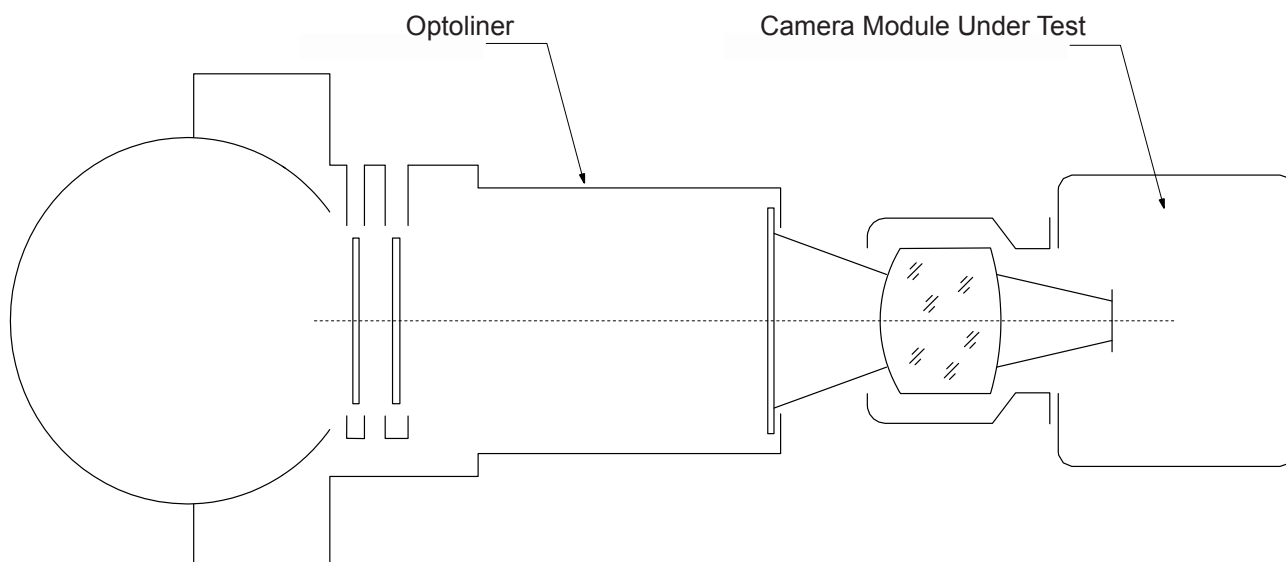


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System Components

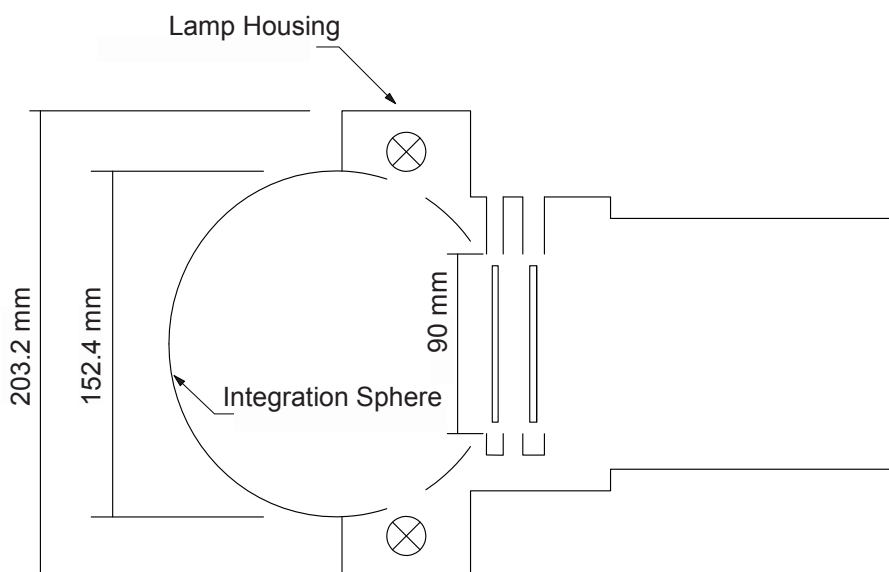


Integration Sphere and Illumination System

The Optoliner® NV is supplied with an incandescent illumination system which contains three tungsten filament halogen lamps placed in a lamp housing attached to an integrating sphere for a high degree of output uniformity. The tungsten filament light bulbs are specifically manufactured for the Optoliner® to exacting tolerances to yield the desired color temperature at design voltage. Lamp replacement is easily accomplished by removing the rear sphere with three captive thumb screws.

The integration sphere has a 152.4 mm (6 in) diameter with a 90 mm aperture. The inner surface is covered with a white diffusive paint which is spectrally flat for the visible and NIR spectral range. An opto-mechanical lamp adjustment mechanism features a continuous light reduction capability at constant color temperature and lamp voltage.

Other illumination systems employing LED light sources can be custom designed upon request.



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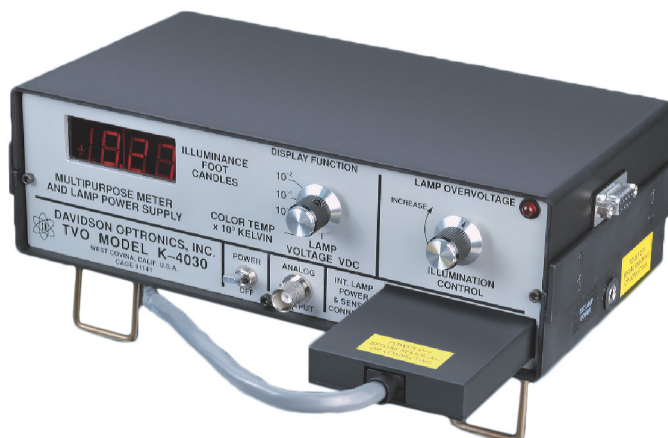
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System Components

Lamp Power Supply and Digital Meter

This unit consists of three major functional building blocks; the power supply, the LED panel meter, and the luminance sensors. All controls are housed together, while the sensors are part of the Optoliner® projector.

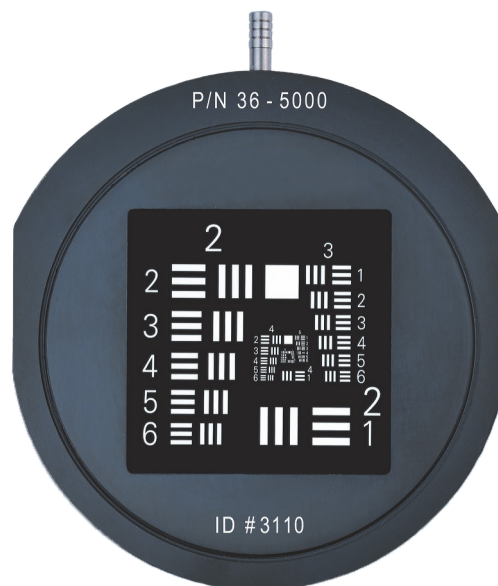
The unit provides the necessary regulated power to the incandescent illumination system, and is also capable of measuring lamp color temperature, image plane luminance, and lamp voltage. The various modes are selected from a rotary switch on the front panel and the corresponding measured values are displayed on the LED panel meter.



Target Reticles

Every Optoliner® is supplied with at least one test pattern slide in a suitable frame for the quick insertion into, and removal from the projector housing. The standard test slide supplied with Optoliner® is the USAF 1951 resolving power test chart (MIL-STD-150A).

A variety of alternate test patterns is available. Each pattern serves a specific purpose to provide the test engineer with information on the condition of the device under test. Typically, the target design depends heavily on the optical characteristics of the test subject; therefore Davidson Optronics provides a design service for custom specific test patterns.

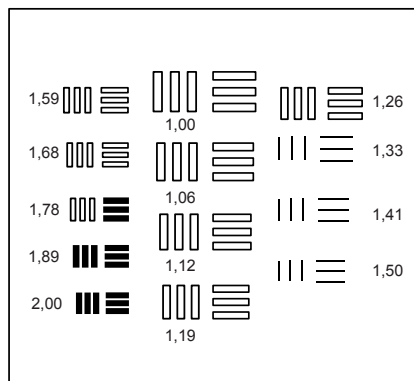


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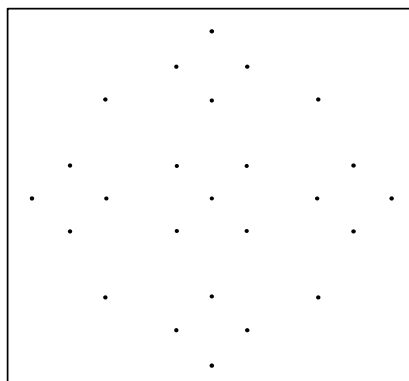
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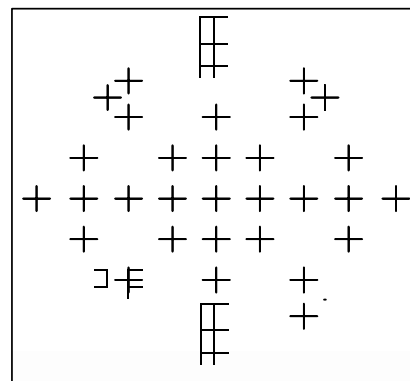
The following list provides some examples of standard test patterns.



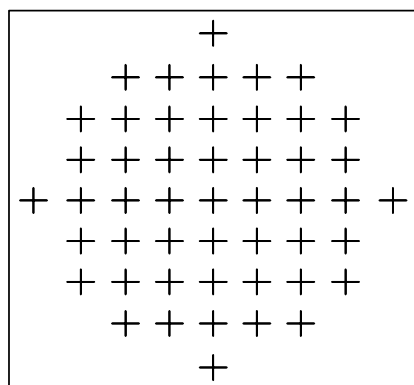
USAF Type Resolution Test



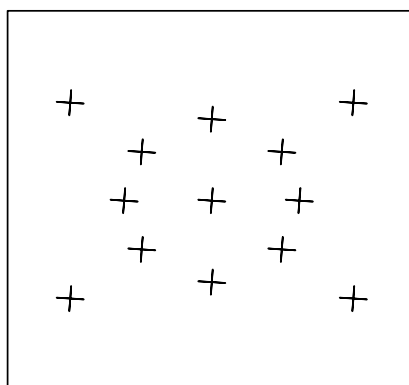
Pinhole Distortion Test



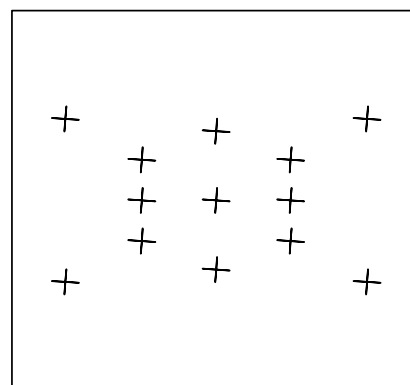
Crosshair Distortion Test



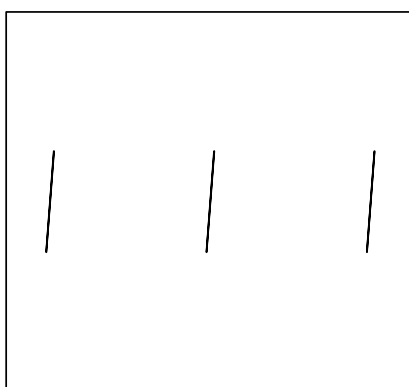
Crosshair Distortion Test



Crosshair MTF Test Chart 4:3



Crosshair MTF Test Chart 16:9



Slanted slit MTF test chart



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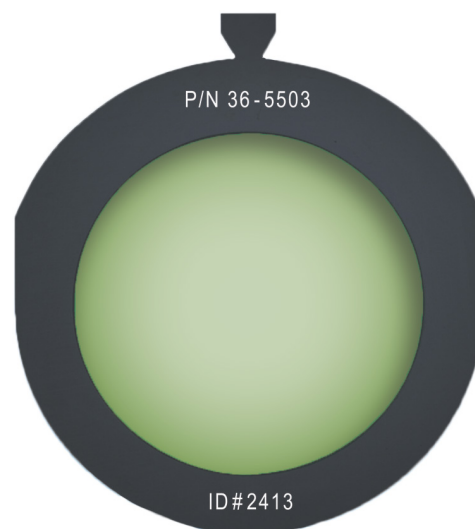
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System Components

Filters

A variety of filters for different applications are available:

1. Color glass filters for adjusting the spectral emission characteristics of the Optoliner® projector.
2. Narrow bandpass (BW=10 nm) interference filters (e.g. 546 nm, 644 nm, etc).
3. Long-pass cut-off filters (e.g. at 645 nm).
4. Neutral density filters for adjusting the luminance level over a wide range. Filter densities are available from 0.1 to 7.0.



All filters are mounted in identical metal frames with filter type and ID number engraved on the holders. Two filters can be positioned into the Optoliner® at the same time for combining their characteristics. A neutral density filter with optical density OD 1 (1:10) is supplied with every Optoliner® Individual spectral response curves are available upon request.

Specifications		
Collimator Focal Length		73.5 mm
F-Number		F/9
Angular Field of Projection		40°
Collimation		Focus distance > 80 m
Max. Working Distance		50 mm
Exit Pupil Size		8 mm diameter
Geometric Distortion		< 1%
Resolution		> 60 cycles/degree
Uniformity of Illumination		> 85% (over full field of view)
Image Plane Luminance (max.)		500 cd/m ² (green color filter) 2800 cd/m ² (white light)
Optical Luminance Adjustment Range		1:10
Electrical Luminance Adjustment Range		1:50
Black Body Color Temperature		2300-3200 K (without filter)
Required Line Power		105-125 VAC and 210-230 VAC
Line Frequency		47- 67 Hz
Illumination System Power		21 VDC Nominal (adjustable from 11 to 24 V)
System Weight		10 kg
Dimensions		203 mm × 406 mm × 470 mm

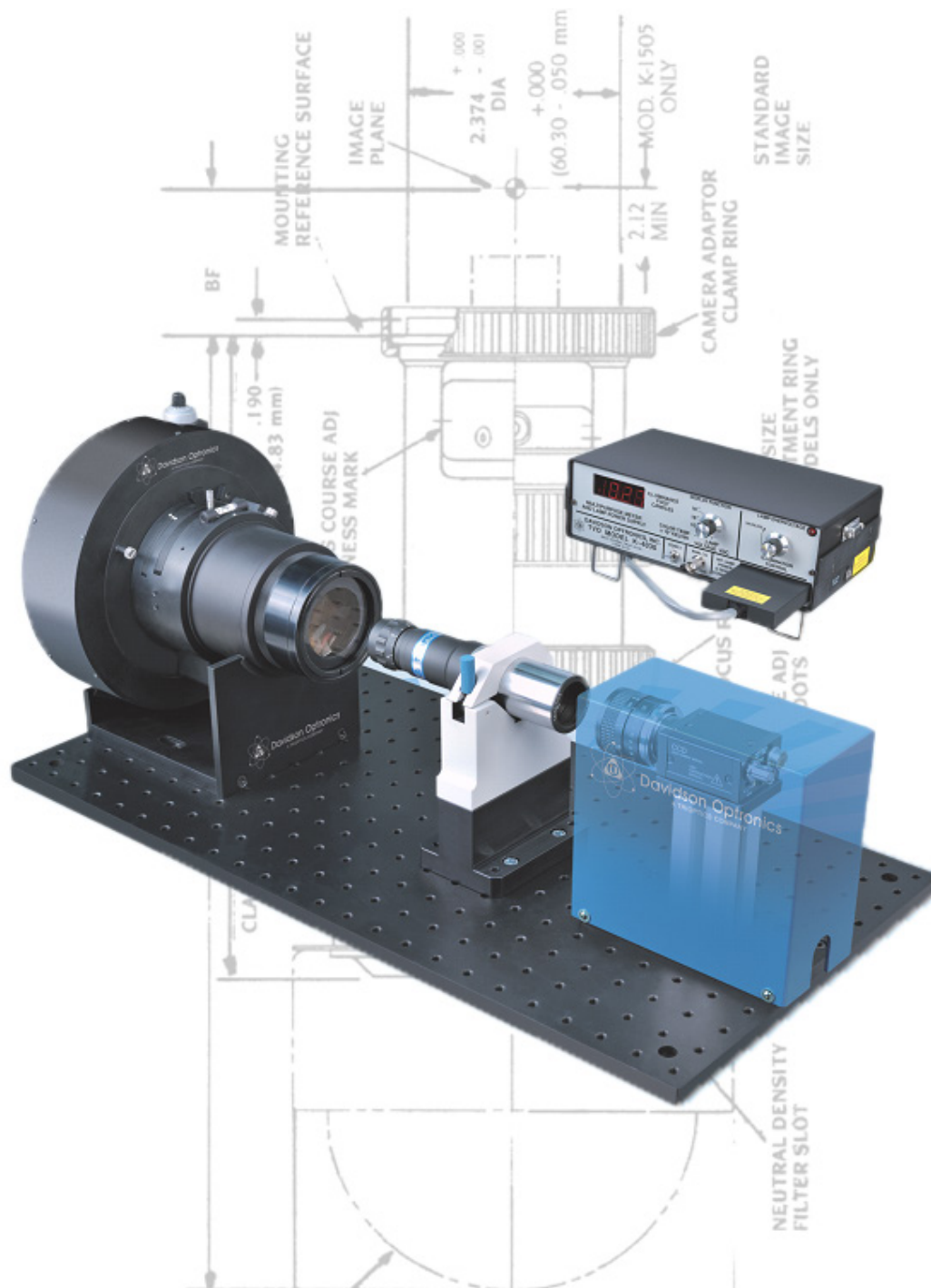


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Davidson Optronics is aware of the increasing variety of sighting devices and electro-optic sensors on the market, and is prepared to customize any of the standard models for special applications. This may result in adding filters for specific spectral bands, in customizing the test pattern or projection lens, providing special image analysis software, or in supplying a larger integrating sphere yielding an even better uniformity of illumination.



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