



DVT Spectral Camera quick start Guide

DVT Corporation
Applied Engineering
August 2003



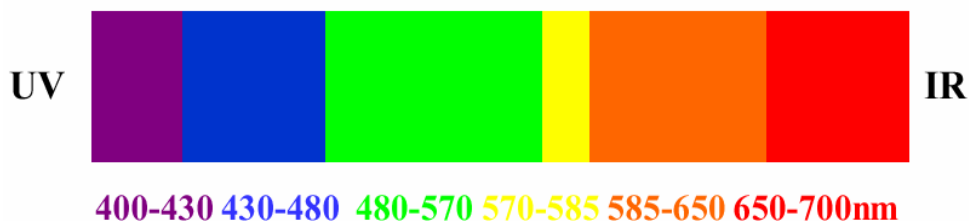
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DVT Spectral Camera

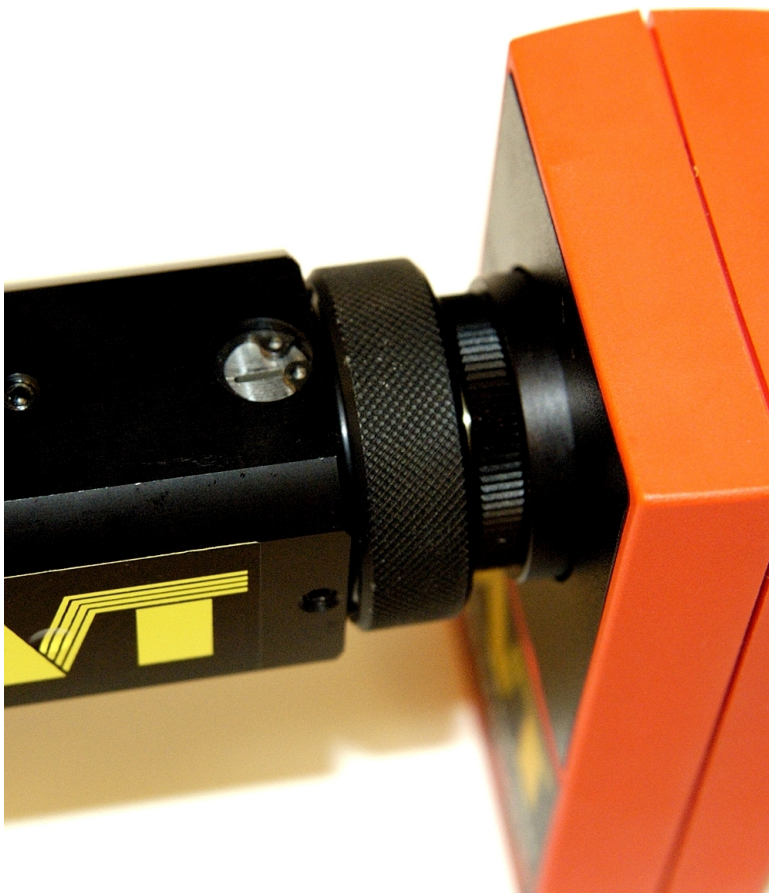
Congratulations! You have just acquired one of the most powerful tools for color analysis: the DVT Spectral Camera. This guide will walk you through the setup process so you can have the DVT Spectral Camera up and running quickly and efficiently.

General Setup

Your DVT Spectral Camera has been configured with factory settings to be properly oriented. This orientation will ensure that when you analyze images (or spectra) the lower wavelengths which correspond to shades of blue, are located on the left and the higher wavelengths which correspond to shades of red are located on the right side of the screen. This will not only ensure that the Spectrograph SoftSensor works properly, but also it will make the outputs of it more intuitive, for they will follow the standard representation of a spectrum as shown below.



A practical check that can be used to verify that the DVT Spectral Camera components are properly oriented is to verify the position of the silver seal in the lens adapter with respect to the red enclosure. The image to the right shows the correct position of it. Looking in the direction and orientation that the DVT Spectral Camera looks, this seal should be on the top side. It should face the side of the DVT Spectral Camera opposite to the Ethernet and Power connectors. Do not move the position of any of the parts for it would require recalibration.



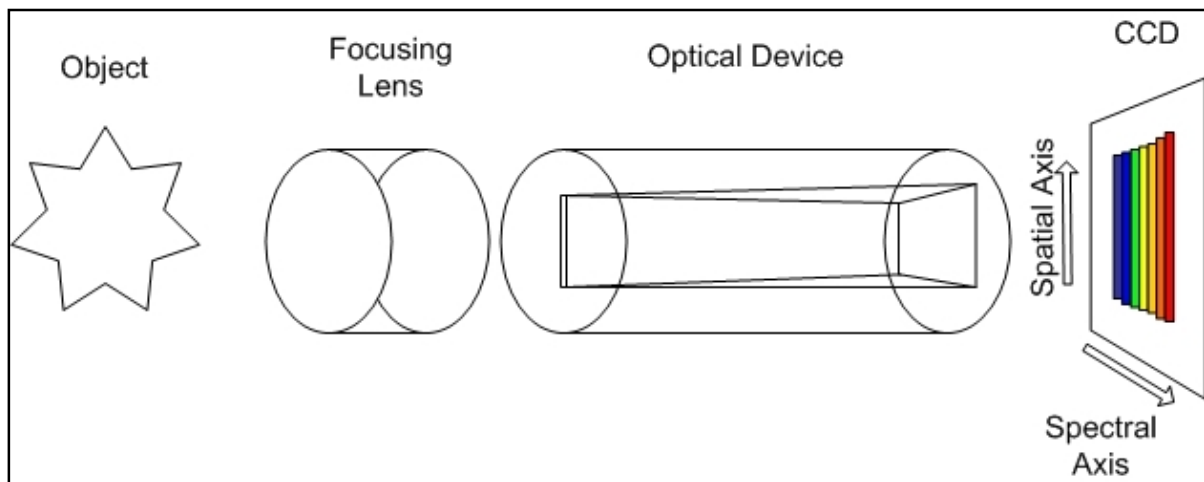


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By default, the f-stop setting (aperture level) is set to 3. You should not change this parameter for it represents the level at which the lens adapter spreads the light into its spectral components more efficiently. The lens is set to focus on a part 0.3 m (about 12 inches) away from it. If your working distance (distance from the lens to the part being inspected) is different from this, simply change the position of the focus to reflect your working distance. The lens shows the distance in meters and it is marked at 0.25m, 0.3m, 0.5m, 1m, 2m, and infinity, but you can set it to any value in between any two of those.

Finding the FOV (field of view)

By now, the DVT Spectral Camera should be properly oriented and fairly well focused depending on the working distance. The next step is to fine-tune the focus setting and find the FOV. If we were working with a regular SmartImage Sensor, the FOV would be very easy to find by determining what is in the image and what is not. For the DVT Spectral Camera it is slightly different, because it does not analyze an entire image but simply the spectral contents of a line. The figure below illustrates this concept. Only a thin band of the part is analyzed, not an entire image.



We can determine the size of this band, which is our FOV, by using the following formulas:

$$L = \frac{L_s \times WD}{f}; W = \frac{W_s \times WD}{f}$$

The parameters needed for the formulas are:

L = Length of the field of view

L_s = Length of the physical opening in the optical device (3.6 mm)

W = Width of the field of view

W_s = Width of the physical opening in the optical device (50 μ m)

WD = Working Distance (distance from the lens to the part being inspected)



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f = Focal length of the lens being used

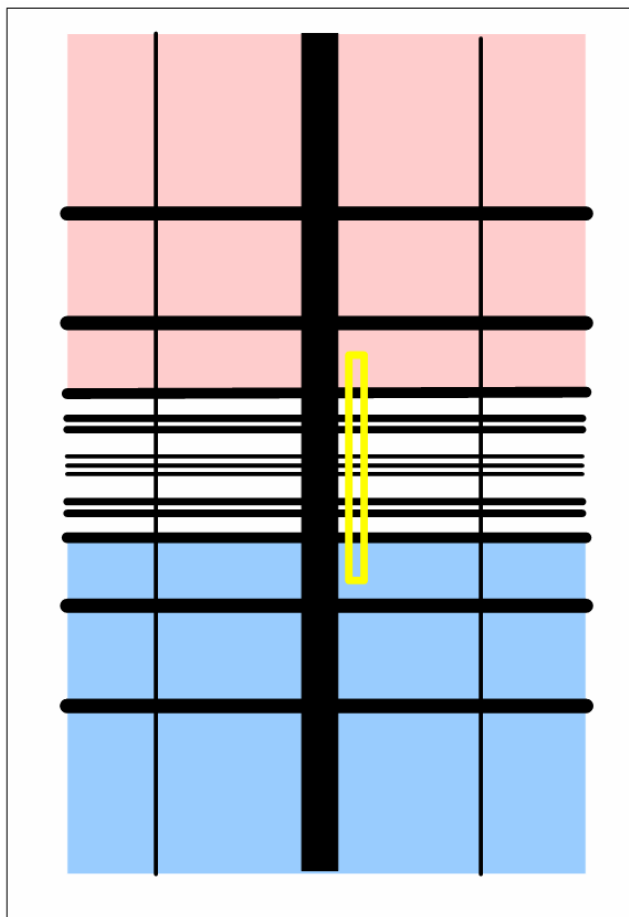
For instance, for factory settings (WD = 0.3m, f = 25 mm) the field of view would have the following size:

$$Length = \frac{3.6mm \times 300mm}{25mm} = 43.2mm$$

$$Width = \frac{0.05mm \times 300mm}{25mm} = 0.6mm$$

So for factory settings, the field of view would be of approximately 24 mil in width by 1.7 inches in height. In order to help you find the area being inspected, we provide you with calibration targets, included in the last page of this document.

Once we know the distance at which the lens should be focused, we can place a calibration target in front of the system and try to identify the band being analyzed by the DVT Spectral Camera. The objective is to make the DVT Spectral Camera point to a specific region of the target as shown below.



In order to locate this region, users can take advantage of the specific design of the target. The area shaded in red should produce higher intensity where higher wavelengths are, whereas the one shaded in blue should produce higher intensity where the lower wavelengths are. This should be used to verify the correct orientation of the DVT



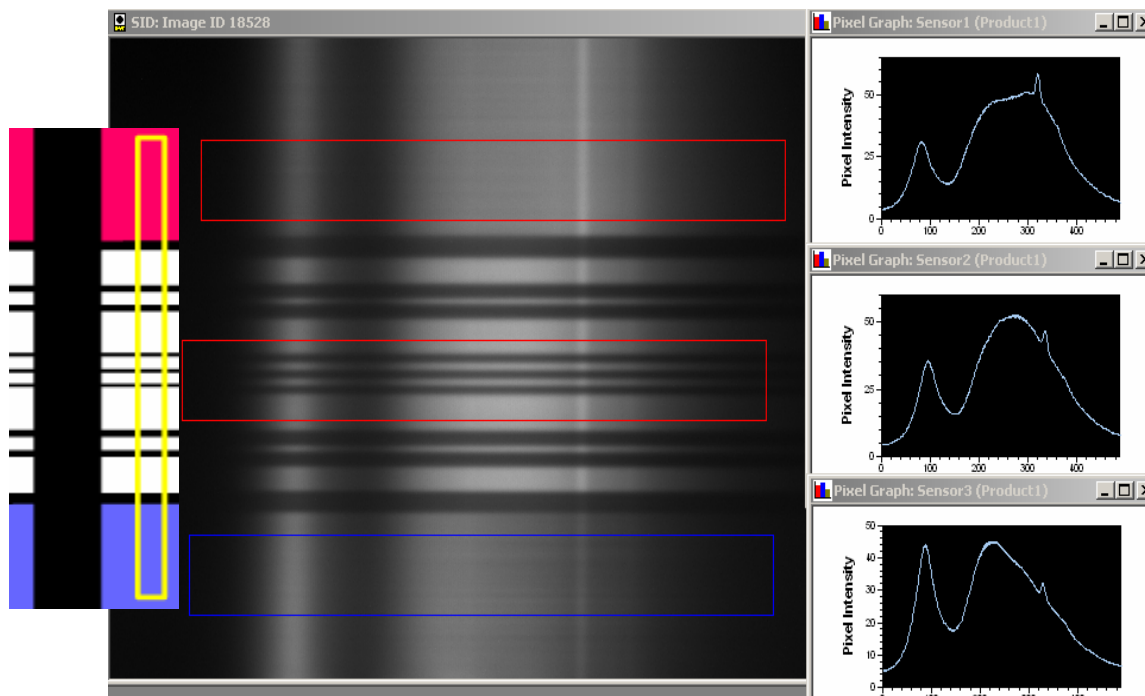
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Spectral Camera. The dark bands have different thickness so it is easy to identify different regions of the target.



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The figure below illustrates how the image should look like in FrameWork and includes SoftSensor graphs to illustrate the color differences.

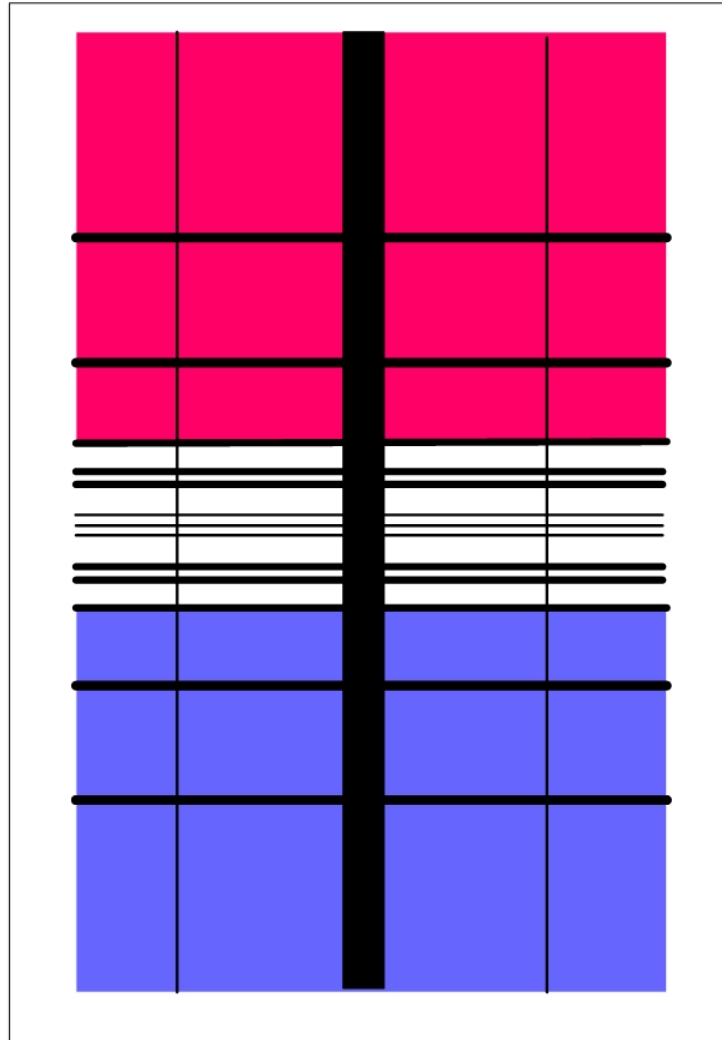
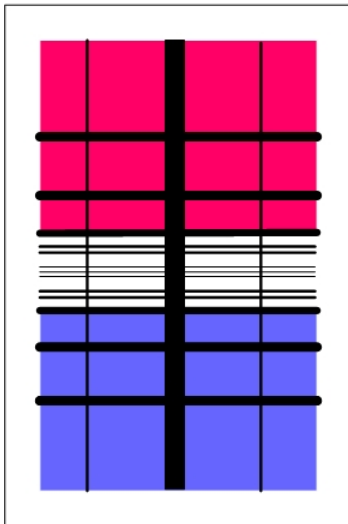


The three rectangles represent SpectroGraph SoftSensors analyzing the different regions of the image. The pixel graphs of those SoftSensors reveal the slight difference in colors. The middle one corresponds to white, or the spectrum of the light being used. The upper one, with more concentration on the higher wavelengths, illustrates the spectrum of red under the light being used. The one on the bottom illustrates the same concept but for blue (higher contents of lower wavelengths). This is the image we must obtain to ensure that the DVT Spectral Camera is well focused (the dark bands are not fuzzy) and correctly oriented (blue colors with more intensity on the left side of the image and red colors producing high intensity on the right side of the image). At this point the DVT Spectral Camera is ready to start learning spectrum and inspecting parts as needed.



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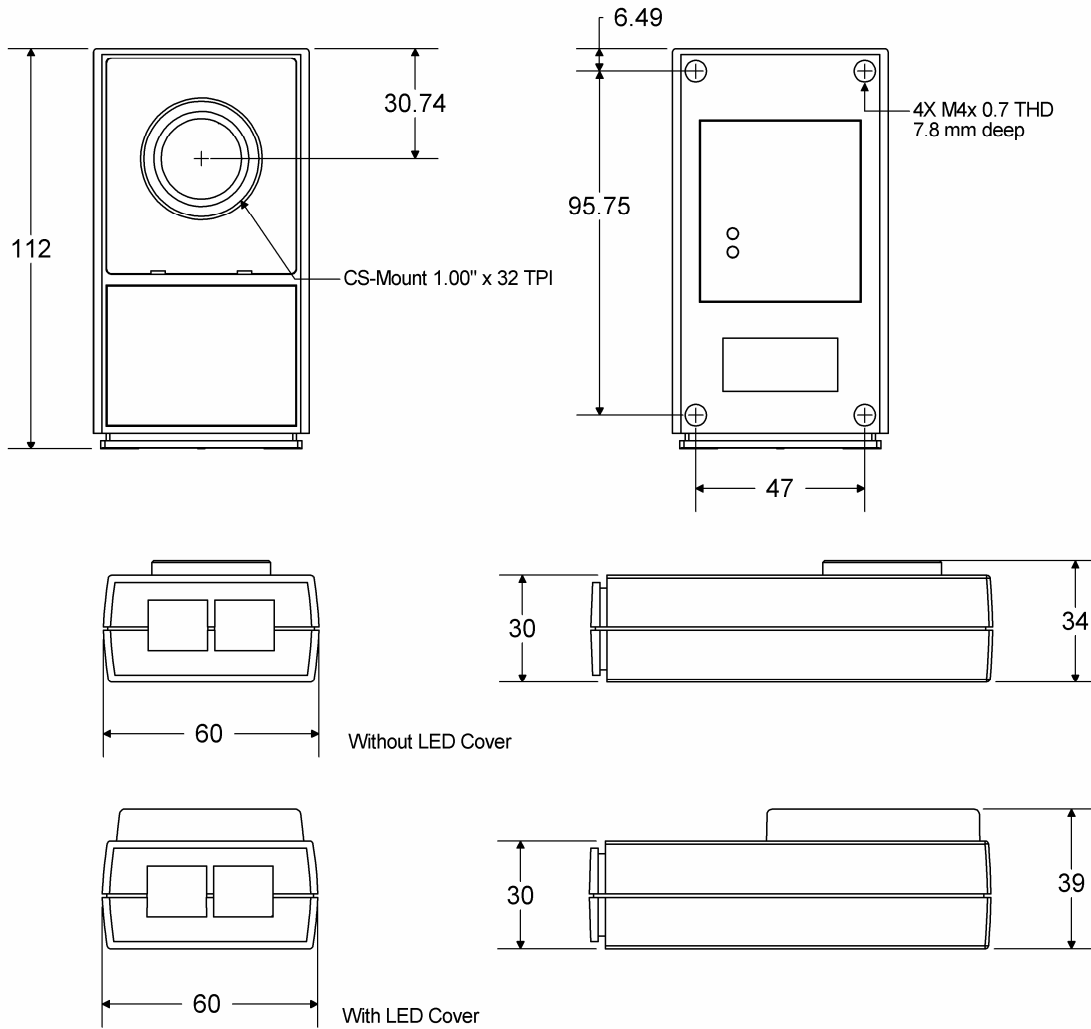
Sample calibration targets





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DVT Spectral Camera SmartImage Sensor Spec Sheet

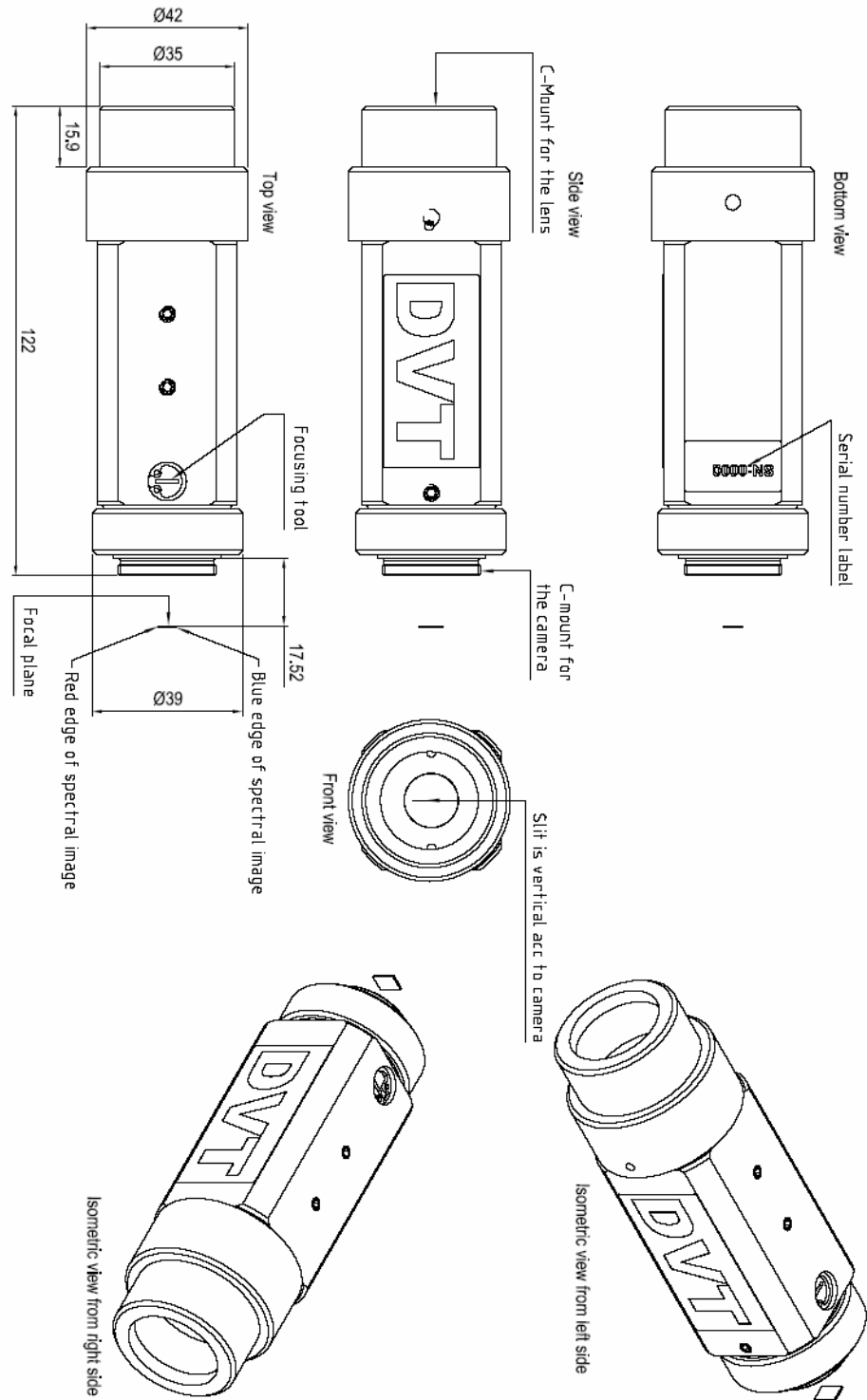


Note: All Units in mm.



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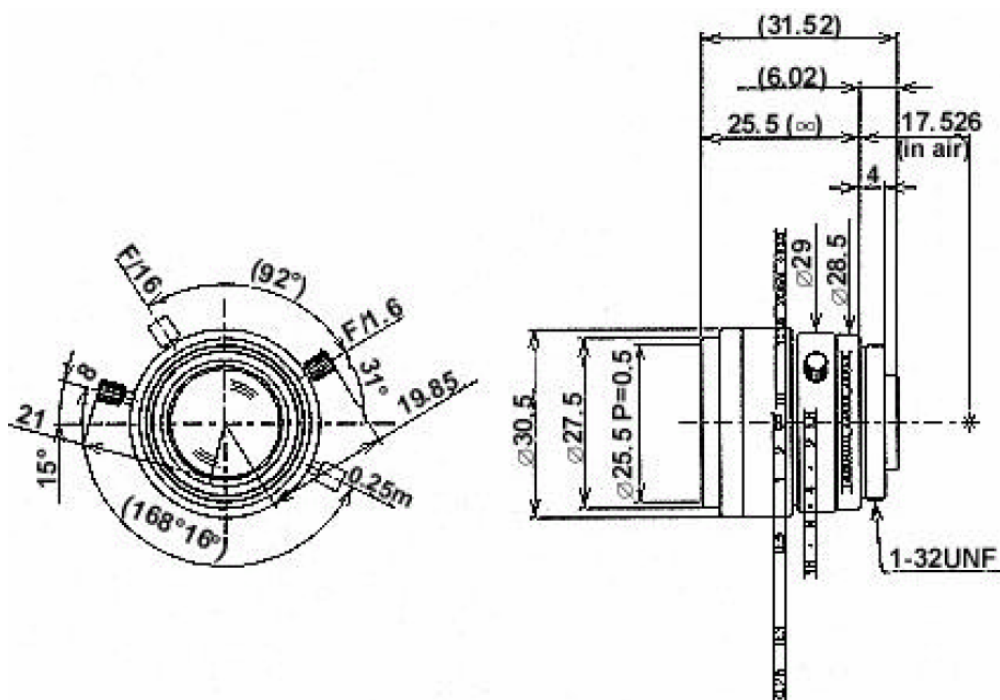
DVT Spectral Camera lens adapter Spec Sheet





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DVT Spectral Camera lens Spec Sheet



Specifications

Focal Length	25mm
Iris Range	F/1.6 to 16
Iris Operation	Manual w/lock
Focus Operation	Manual w/lock
1/3" Angle of View	11.0° x 8.2°
1/2" Angle of View	14.5° x 10.9°
2/3" Angle of View	19.6° x 15.0°
Effective Diameter (Front/Rear Lens)	Ø16.0mm/Ø10.8mm
Minimum Object Distance	9.8 in. (0.25m)
Back Focus	11.60mm (in air)
Filter Size	M25.5 P=0.5
Maximum Diameter	ø1.2 in. (ø30.5mm)
Overall Length	1.0 in. (25.5mm)
Weight	1.4 oz. (40 grams)