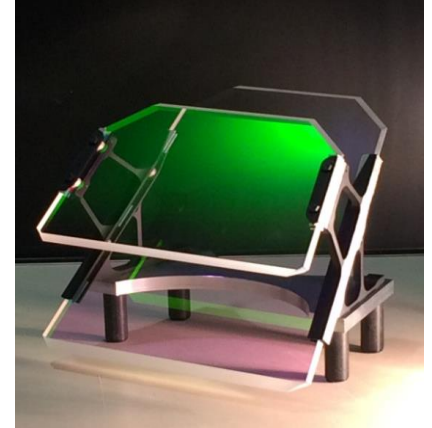


## DATA SHEET

### Variable rugate coatings for dual graded combiners

A Head up Display (HUD) provides the ability to be able to project information onto a transparent glass screen in a way that it almost appears to be floating in space behind the screen as a virtual image. With suitable optics, the virtual image is combined with the view of the real world seen through the screen (or combiner) so that both images appear to be at the same distance. HUD's were originally developed for aircraft cockpits, so that flight information can be seen by the pilot without him having to refocus his eyes and look down at flight instruments.



Dual combiner HUD's are used to extend the vertical field of view (FOV) in aircraft cockpits where space is limited. This is achieved by sharing the display image between two combiners parallel to each other but vertically displaced. To maintain a uniform display, the combiners overlap each other, and in the overlap region, the reflection of each combiner plate is progressively reduced (or feathered) to make the transition of the image between each combiner smooth, and the combiner edges almost invisible. The overlap region in the dual combiner assembly is called the 'grade'.

Orion Photonics has perfected techniques for manufacture of graded rugate combiners where the green reflecting rugate coating progressively reduces in reflectivity through the overlap region (grade) until it becomes an antireflection coating. The technique enables the wavelength of the reflecting notch to remain constant as level of reflection decreases. This results in no visible coating bands or colour change minimising the perception of artificial horizon. The processes for the upper and lower combiners are matched so that the performance as an assembly takes into account the angle of incidence variations, and the transfer of image from lower to upper combiner exhibits no bands or discontinuities. An additional feature of these combiners is that, thanks to the narrow width of the reflective rugate notch, unwanted solar reflections are greatly minimised.

Orion Photonics have manufactured production quantities of colour selective dual graded rugate combiners for a number of aircraft programmes, and have provided prototype graded combiners for a major transport aircraft programme.

