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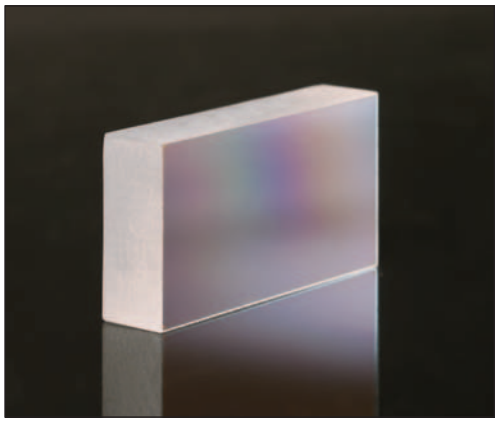
Echelle Gratings

High Resolution Echelle Gratings, which have increased groove spacings, are designed for use in the high orders. They are generally used with a second grating or prism to separate overlapping diffracted orders. Supplied on precision glass substrates, Echelles have a resolution of 80-90% of the theoretical value.

- Ideal for High Resolution Spectroscopy
- Used in Higher Orders



Specifications

- **Dimensional Tolerances:** ±0.5mm
- **Thickness Tolerances:** ±0.5mm
- **Damage Threshold:**
  350mJ/cm² @ 200ns (Pulsed); 40W/cm² (CW)

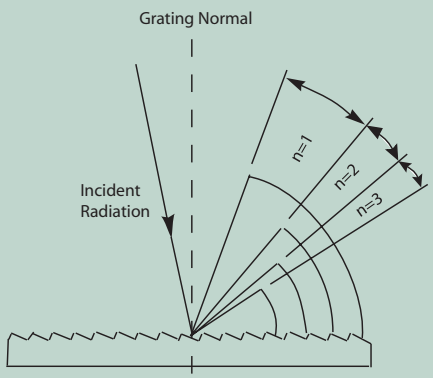
Special Considerations with Echelle Gratings

The Grating Equation:

The general grating equation may be written as

$$n\lambda = d(\sin\theta + \sin\theta')$$

where n is the order of diffraction, λ is the diffracted wavelength, d is the grating constant (the distance between grooves), θ is the angle of incidence measured from the grating normal, and θ′ is the angle of diffraction measured from the grating normal.



Higher Orders and Free Spectral Range

Free Spectral Range:

Free spectral range is the maximum spectral bandwidth that can be obtained in a specified order without spectral interference (overlap) from adjacent orders. As the grating spacing decreases, the free spectral range increases. However, the free spectral range decreases as the order increases. If λ_1 and λ_2 are the lower and upper limits, respectively, of the band of interest, then

$$\text{Free Spectral Range} = \lambda_2 - \lambda_1 = \lambda_1/n.$$

Using an Echelle Grating:

The extremely high blaze angle of the Echelle grating concentrates the energy in the higher orders. In the simplest case where light is incident on the grating at an angle of 0°, the grating equation simplifies to $n\lambda = d \sin\theta'$. If solved for $\sin\theta'$, it becomes

$$\sin\theta' = n\lambda / d,$$

which shows that for higher orders, the angular separation between two wavelengths becomes greater. Imagine two lines, one at 600nm and the other at 605nm, which are incident on a grating with 31.6 lines/mm. From the equation above, at n=1 the angular separation is 0.009°, but at n=40 the angular separation 0.6°. The disadvantage is the reduced free spectral range, which decreases from 630nm (630nm/1) to 15.8nm (630nm/40). Often a dispersing prism is used in combination with an Echelle grating for order sorting.

ITEM#	GROOVES (lines/mm)	BLAZE ANGLE	BLAZE λ	DISPERSION (nm/mrad)	SIZE	$	£	€	RMB
GE1325-0363	31.6	63°	UV - 57µm	14.37	12.5 x 25 x 9.5mm	$ 112.30	£ 70.70	€ 104,40	¥ 1,072.50
GE1350-0363	31.6	63°	UV - 57µm	14.37	12.5 x 50 x 9.5mm	$ 135.00	£ 85.10	€ 125,60	¥ 1,289.30
GE2550-0363	31.6	63°	UV - 57µm	14.37	25 x 50 x 9.5mm	$ 199.70	£ 125.80	€ 185,70	¥ 1,907.10
GE1325-0863	79	63°	UV - 23µm	5.75	12.5 x 25 x 9.5mm	$ 112.30	£ 70.70	€ 104,40	¥ 1,072.50
GE1350-0863	79	63°	UV - 23µm	5.75	12.5 x 50 x 9.5mm	$ 135.00	£ 85.10	€ 125,60	¥ 1,289.30
GE2550-0863	79	63°	UV - 23µm	5.75	25 x 50 x 9.5mm	$ 199.70	£ 125.80	€ 185,70	¥ 1,907.10
GE1325-0875	79	75°	UV - 25µm	3.28	12.5 x 25 x 9.5mm	$ 112.30	£ 70.70	€ 104,40	¥ 1,072.50
GE1350-0875	79	75°	UV - 25µm	3.28	12.5 x 50 x 9.5mm	$ 135.00	£ 85.10	€ 125,60	¥ 1,289.30
GE2550-0875	79	75°	UV - 25µm	3.28	25 x 50 x 9.5mm	$ 199.70	£ 125.80	€ 185,70	¥ 1,907.10
GE1325-3263	316	63°	UV - 57µm	1.44	12.5 x 25 x 9.5mm	$ 112.30	£ 70.70	€ 104,40	¥ 1,072.50
GE1350-3263	316	63°	UV - 57µm	1.44	12.5 x 50 x 9.5mm	$ 135.00	£ 85.10	€ 125,60	¥ 1,289.30
GE2550-3263	316	63°	UV - 57µm	1.44	25 x 50 x 9.5mm	$ 199.70	£ 125.80	€ 185,70	¥ 1,907.10