ILLUMINATION

Diffractive Gratings

GRATINGS, BEAM SPLITTERS, PATTERN GENERATORS FOR STRUCTURED LIGHT PATTERNS

StockerYale offers a wide selection of standard and custom diffractive optical elements (DOEs). These DOEs transform a single laser beam into various simple or complex structured light patterns, as illustrated below. In "dot" patterns, each of the several outgoing beams carries the same power. In "line" patterns, the lines are of uniform intensity.

Our DOEs can be fabricated in photoresist (for use with lower power lasers). Alternately, they can be etched in fused silica (for use with high-power or UV applications). Whether you are looking for an off-the-shelf solution or a custom OEM design, let StockerYale's 15 years of experience with diffraction optics help you meet your needs.

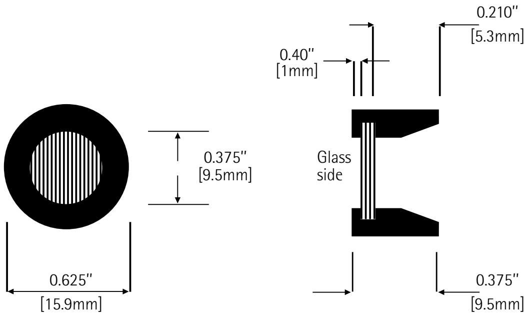
FEATURES

- Standard or custom
- Sinusoidal, binary, or other grating profiles
- Photoresist on silica, or etched silica
- Other substrate materials available
- High diffraction efficiency
- Uniform interbeam intensity
- Operating wavelengths 250 nm to 1550 nm

APPLICATIONS

- General or high-precision beamsplitting
- Machine vision systems
- Multiple imaging
- Spectrometry
- Beam sampling
- Metrology

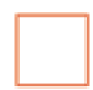
TYPICAL DIMENSIONS



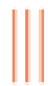
SOME AVAILABLE PATTERNS

Multiple Dots

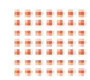
Single Square



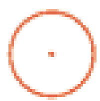
Multiple Lines



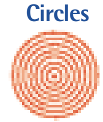
7x7 Dot Matrix



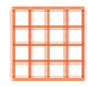
Single Circle



7 Concentric Circles



4 x 4 Grid



More patterns available

StockerYale

Multiple Dot Patterns

Number of dots	DOE Period (µm)	*Interbeam angle (°)	*Spreading angle (°)
5	25	1.54	6.14
	169	0.23	0.91
	170.6	0.23	0.90
9	338.2	0.11	0.91
	532	0.07	0.58
11	25.7	1.49	14.94
15	16.4	2.34	32.78
19	33	1.16	20.94
	50.4	0.76	13.71
33	100	0.38	12.28
	426.1	0.09	2.88
99	260	0.15	14.47

* At 670 nm

Multiple line patterns are also available with similar specifications. Please call for information on other patterns.

Custom DOEs

Custom elements are also available to satisfy a wide range of wavelengths, interbeam angles, number of beams, and structured light patterns. Wavelengths can be between 250 nm and 1550 nm. Interbeam angles vary between 0.05° and 20° (in some case, up to 30°). Contact us for more information.

Diffraction Equation

The following equation is used to calculate the diffraction angle of the pattern (lines or dots).

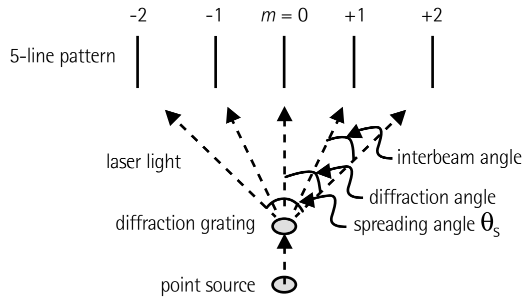
$$d(\sin\theta_m) = m\lambda \text{ or } \theta_m = \arcsin\left(\frac{m\lambda}{d}\right)$$

where d = DOE period (µm)
θ_m = diffraction angle of the m^{th} beam (°)
λ = wavelength (µm)

Note that θ_m is the diffraction angle measured from the normal to the m^{th} beam (assuming the incident laser beam is normal to the DOE plane). It is different from the interbeam angle, which is the angle between two neighboring beams (you can calculate the interbeam angle by letting $m = 1$). The beams (or orders) are numbered starting from the central beam (order 0) with the positive orders on one side (+1, +2, +3...) and the negative orders on the other side (-1, -2, -3...). The spreading angle θ_s between the two outmost beams (or lines, when a line generating lens is added) is twice the angle of the higher order beam.

For example, for a 5-line pattern at 670 nm with a period d = 25 µm, the spreading angle θ_s is twice the diffraction angle of the second order beam.

$$\theta_s = 2\theta_m = 2\theta_2 = 2\arcsin\left(\frac{2 \times 0.670\mu m}{25\mu m}\right) \qquad \theta_s = 6.14°$$



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StockerYale
Simply brilliant ideas™

Corporate Headquarters
32 Hampshire Road
Salem, New Hampshire 03079 USA
Tel.: 603-893-8778 Fax: 603-893-5604
www.stockeryale.com

For sales information:
1-800-814-9552
StockerYale Canada Inc.
275 Kesmark
Montreal, Quebec
Canada H9B 3J1
Tel.: (514) 685-1005 Fax: (514) 685-3307
www.stockeryale.com/lasers
lasers@stockeryale.com

Adept Electronic Solutions
195 Banks Street
East Victoria Park WA 6101
Perth
Australia
T: 61-8-9470 3180
F: 61-8-9470 3041

Lynx Ltd.
Rua Cayowaá 2241 cs 02
01258-011 - São Paulo - SP
Brazil
T: (55) 11 3862-2099
F: (55) 11 3862-1747
www.lynxpage.com.br

Unit One Electronics
Sandholmgaardsvej 38
Birkeroed DK-3460
Denmark
T: (45) 48 14 1670
F: (45) 48 14 1680

Oy Optoparameter AB
Tekniikantie 4 D
02150 Espoo
Finland
T: (358) 9 43 555 00
F: (358) 9 43 555 011
www.parameter.se

Laser 2000 S.A.
Parc d'Affaires
3, rue de la Plaine
78860 St-Nom-de-la-Bretêche
France
T: (33) 1 30 80 00 60
F: (33) 1 30 80 00 40

Laser 2000 GmbH
Argelsrieder Feld 14
D-82234 Wessling
Germany
T: (49) 81 53 405-21
F: (49) 81 53 405-33

Scientific Solutions
JF-38, Lower Ground Floor
Khirki Extn., Malviya Nagar
New Delhi - 110017
India
T: (91) 11 667 5703

Lahat Technologies Ltd.
Teradion Industrial Zone
Misgav 20179
Israel
T: (972) 0 4 999 0151
F: (972) 0 4 999 0826
www.lahat.co.il

Microsystems S.R.L.
Via Oldofredi 41
20124 Milano
Italy
T: (39) 2 6900 9555
F: (39) 2 6900 0606

Moritex Corp
1-4-3 Azamino, Aoba-ku
Yokohama City
Kanagawa Pref. 225
Japan
T: (81) 45 909 4710
F: (81) 45 909 4707

WKP Machines Corporation
#1925 19th Floor
Hyundai Dream Tower Building
923-14 Mok 1-Dong
Yangchon-Gu, Seoul
Korea
T: (82) 2 653 6801
F: (82) 2 653 6803

Iris Vision BV
Schoonhout 46
4872 ME Etten-Leur
The Netherlands
T: (31) 0 76 503 6646
F: (31) 0 76 501 9715

Infaimon S.L.
C/Vergos 55
Barcelona 08017
Spain and Portugal
T: (34) 93 252 5757
F: (34) 93 252 5758

Parameter AB
Sehlstedsgatan 9
PO Box 27186
SE-102 52 Stockholm
Sweden and Norway
T: (46) 8 555 110 00
F: (46) 8 555 110 01
www.parameter.se

Firstsight Vision Ltd.
The Old Barn, Grange Court,
Tongham, Surrey GU10 1DW
U.K.
T: (44) 1252 780 000
F: (44) 1252 780 001
www.firstsightvision.co.uk