GRATICULES OPTICS

Microscope Eyepiece Reticles

EYEPIECE RETICLES / GRATICULES

Definition

An eyepiece reticle is a glass disc with a pattern on it that fits at the optical plane inside a microscope eyepiece. It is used to provide alignment, measurement, size or shape comparison, or area counting of specimens by having the reticle pattern superimposed over the specimen image. The terms reticle, graticule and reticule are all used to describe these items.

Standard Patterns

The following pages show the wide range of patterns that we have available. These include:

- Lines and cross-lines for alignment
- Scales and gauges for measurement
- Grids for counting and referencing
- Particle sizing to determine shape, size and quantity of materials or vapours
- Protractors for measuring angles
- Stereology for extracting quantitative information from 3D images
- Many specialist patterns designed by Scientists for specific applications

All Graticules Optics eyepiece reticles are produced on 1.5mm thick optical glass. The image, which is created using a vacuum evaporated chrome process, is correct reading through the glass. All eyepiece reticles are available in a variety of standard diameters to suit most microscopes in the marketplace. Other sizes are available to special order.

Custom Patterns

If you need something different from the patterns in this catalogue there is no problem, we have a very cost-effective custom reticle facility that is able to make the exact pattern you require.

Selecting your Reticle

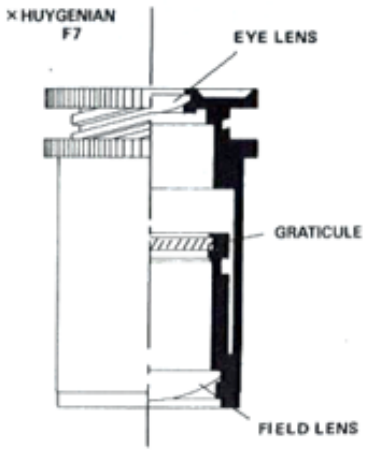
There are two things that need to be defined when selecting your reticle:

1. The pattern that is suitable for your application
2. The diameter required to fit your eyepiece

The application or method that you are working to will normally determine the reticle pattern that will be required. For instance, if you are doing straightforward length measurements you may require a simple horizontal scale, if you are performing asbestos analysis you are most likely to need a Walton & Beckett reticle.

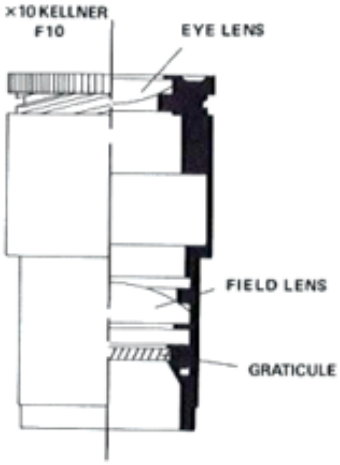
One very common mistake that is made when selecting the reticle is with the size of the pattern. If you have a 10mm length scale (such as our NE1) in the eyepiece this does not mean that it will be measure 10mm at the specimen stage. You have to take into account the objective magnification. Thus if you are using a 10x objective lens then the 10mm scale will represent 1mm at the specimen stage (10mm/10x = 1mm). In practical use, if you have a specimen of typically 50 micron (0.050mm) length and you are using a 40x objective then you will need to select a reticle pattern that has a scale range capable of measuring a size of 2mm (0.050mm x 40x = 2mm).

The reticle is fitted inside the eyepiece at the optical plane. The optical plane being the position where both the formed images of the specimen and the reticle are in focus. The reticle diameter needs to be a fraction smaller than the inside diameter of the eyepiece at the point of the optical plane. Most modern eyepieces have a reticle holder or threaded bush to secure the reticle in the correct position. If there is no fixing device in the eyepiece then Graticules Optics offer a measuring and fitting service.



Measuring and Fitting Service

When fitting reticles it is essential this is done in clean areas, any speck of dust on the reticle will be visible when installed in the microscope. The locating and securing of the reticle can also cause problems. Due to these difficulties and the uncertainty that many people have about sizing a reticle, Graticules Optics offer a measuring and fitting service.



Customers send us their eyepiece and we carry out the following actions:

1. Check to see if fitting a reticle is feasible and then measure the internal dimensions to determine the diameter required.
2. Provide a quotation for the supply and fitting of the reticle.
3. Once order/payment has been received Graticules Optics will make and fit the reticle then despatch it back to you.

Lines and Crosses

Single Lines

NE50

For measurement of large objects in conjunction with graduated mechanical stage, and for alignment. Image covers entire field of view

Pattern	Description	Diameter	Order Code
NE50	Single line, nominal width 0.02mm.	16mm	**01B16238**
		19mm	**01B19238**
		20.4mm	**01B20.4238**
		21mm	**01B21238**
		23mm	**01B23238**
		24mm	**01B24238**
		24.5mm	**01B24.5238**
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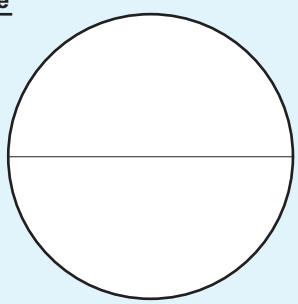
		26mm	**01B26238**
		27mm	**01B27238**
		Special	**01BSP238**

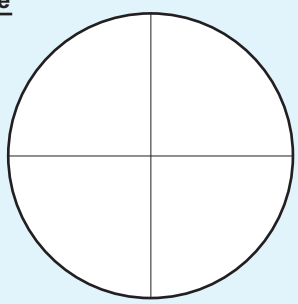


Crosslines

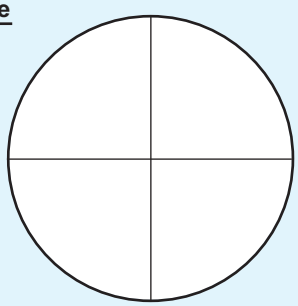
NE8, NE81, NE82

Used as for NE50 but for measurements in two directions and for sighting and alignment. Image covers entire field of view

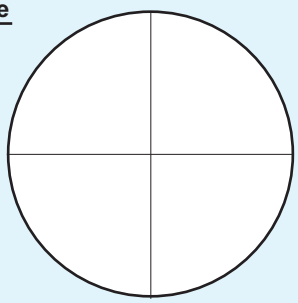
Pattern	Description	Diameter	Order Code
NE8	Crosslines, nominal line width 0.02mm.	16mm	**01B16206**
		19mm	**01B19206**
		20.4mm	**01B20.4206**
		21mm	**01B21206**
		23mm	**01B23206**
		24mm	**01B24206**
		24.5mm	**01B24.5206**
		25mm	**01B25206**
		26mm	**01B26206**
		27mm	**01B27206**
		Special	**01BSP206**



Pattern	Description	Diameter	Order Code
NE81	Crosslines, nominal line width 0.04mm	16mm	**01B16234**
		19mm	**01B19234**
		20.4mm	**01B20.4234**
		21mm	**01B21234**
		23mm	**01B23234**
		24mm	**01B24234**
		24.5mm	**01B24.5234**
		25mm	**01B25234**
		26mm	**01B26234**
		27mm	**01B27234**
		Special	**01BSP234**



Pattern	Description	Diameter	Order Code
NE82	Crosslines, nominal line width 0.005mm	16 mm	**01B16235**
		19mm	**01B19235**
		20.4mm	**01B20.4235**
		21mm	**01B21235**
		23mm	**01B23235**
		24mm	**01B24235**
		24.5mm	**01B24.5235**
		25mm	**01B25235**
		26mm	**01B26235**
		27mm	**01B27235**
		Special	**01BSP235**

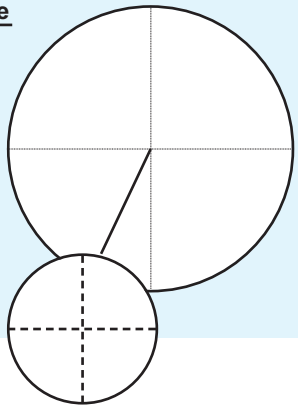


Broken Crosslines

NE56

Use as crossed lines. Broken lines enable fine detail to be seen at the breaks. A thin boundry would be lost behind a continuous line. Image covers entire field of view.

Pattern	Description	Diameter	Order Code
NE56	Broken crossline.	16mm	**01B16231**
		19mm	**01B19231**
		20.4mm	**01B20.4231**
		21mm	**01B21231**
		23mm	**01B23231**
		24mm	**01B24231**
		24.5mm	**01B24.5231**
		25mm	**01B25231**
		26mm	**01B26231**
		27mm	**01B27231**
		Special	**01BSP231**



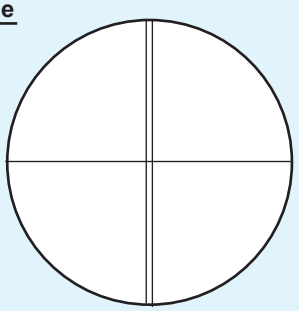
Drawings not to scale

Crossed Gauge Lines

NE53, NE54

Use as crossed lines, but for measuring distances between lines. Greater accuracy can be obtained by locating the specimen detail between the reticle gauge pair. Image covers entire field of view.

Pattern	Description	Diameter	Order Code
NE53	Two vertical lines 0.1mm apart with horizontal line.	16mm	**01B16230**
		19mm	**01B19230**
		20.4mm	**01B20.4230**
		21mm	**01B21230**
		23mm	**01B23230**
		24mm	**01B24230**
		24.5mm	**01B24.5230**
		25mm	**01B25230**
		26mm	**01B26230**
		27mm	**01B27230**
		Special	**01BSP230**



Pattern	Description	Diameter	Order Code
NE54	Two vertical lines 0.2mm apart.	16mm	**01B16239**
		19mm	**01B19239**
		20.4mm	**01B20.4239**
		21mm	**01B21239**
		23mm	**01B23239**
		24mm	**01B24239**
		24.5mm	**01B24.5239**
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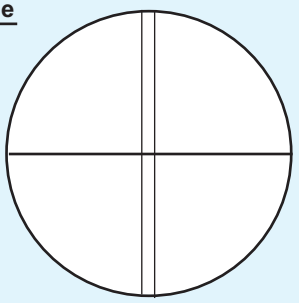
		26mm	**01B26239**
		27mm	**01B27239**
		Special	**01BSP239**



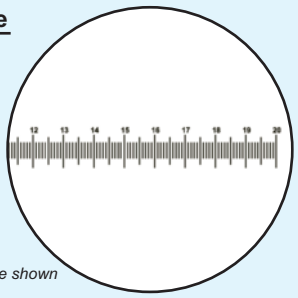
Eyepiece Scales

Horizontal & Vertical Scales

NE1, NE2, NE5, NE20 NE28, NE31, NE41, NE120

Used for measuring lengths of specimen or distances between points on a variety of different shaped objects.

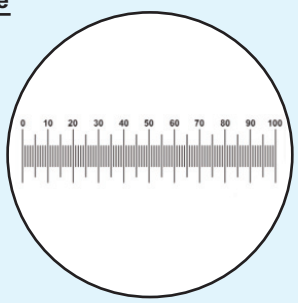
Pattern	Description	Diameter	Order Code
NE120	Horizontal micrometer 20mm long with 200 divisions of 0.1mm.	23mm	**01B23320**
		24mm	**01B24320**
		24.5mm	**01B24.5320**
		25mm	**01B25320**
		26mm	**01B26320**
		27mm	**01B27320**
		Special	**01BSP320**



Part scale shown

NE1 Scale: This eyepiece reticle has an overall length of 10.00mm with 100 subdivisions of 0.1mm. When used with a x10 objective each division will represent 10 microns on the specimen. By dividing the division of the chosen reticle by the magnification of the objective one obtains an approximate value that each division will represent on the stage.

Pattern	Description	Diameter	Order Code
NE1	Horizontal micrometer 10mm long with 100 divisions of 0.1mm.	16mm	**01B16201**
		19mm	**01B19201**
		20mm	**01B20201**
		20.4mm	**01B20.4201**
		21mm	**01B21201**
		23mm	**01B23201**
		24mm	**01B24201**
		24.5mm	**01B24.5201**
		25mm	**01B25201**
		26mm	**01B26201**
		27mm	**01B27201**
		Special	**01BSP201**



Pattern	Description	Diameter	Order Code
NE2	Vertical micrometer 10mm long with 100 divisions of 0.1mm.	16mm	**01B16202**
		19mm	**01B19202**
		20mm	**01B20202**
		20.4mm	**01B20.4202**
		21mm	**01B21202**
		23mm	**01B23202**
		24mm	**01B24202**
		24.5mm	**01B24.5202**
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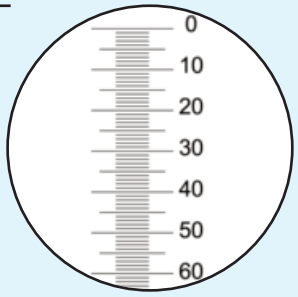
		26mm	**01B26202**
		27mm	**01B27202**
		Special	**01BSP202**



Part scale shown

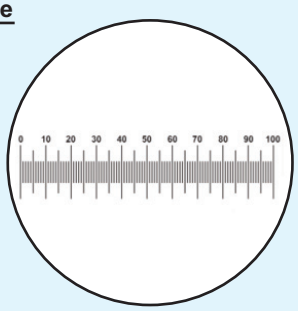
Drawings not to scale

Eyepiece Scales

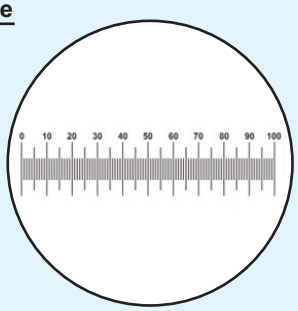
Horizontal & Vertical Scales

Used for measuring lengths of specimen or distances between points on a variety of different shaped objects.

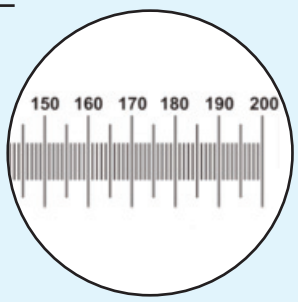
Pattern	Description	Diameter	Order Code
NE5	Horizontal micrometer 5mm long with 100 divisions of 0.05mm.	16mm	**01B16203**
		19mm	**01B19203**
		20.4mm	**01B20.4203**
		21mm	**01B21203**
		23mm	**01B23203**
		24mm	**01B24203**
		24.5mm	**01B24.5203**
		25mm	**01B25203**
		26mm	**01B26203**
		27mm	**01B27203**
		Special	**01BSP203**



Pattern	Description	Diameter	Order Code
NE28	Horizontal scale 1mm long, with 100 divisions of 0.01mm.	16mm	**01B16217**
		19mm	**01B19217**
		20.4mm	**01B20.4217**
		21mm	**01B21217**
		23mm	**01B23217**
		24mm	**01B24217**
		24.5mm	**01B24.5217**
		25mm	**01B25217**
		26mm	**01B26217**
		27mm	**01B27217**
		Special	**01BSP217**

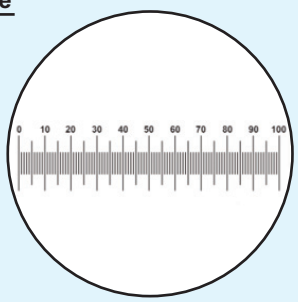


Pattern	Description	Diameter	Order Code
NE41	Horizontal scale 10mm long with 200 divisions of 0.05mm.	16mm	**01B16223**
		19mm	**01B19223**
		20.4mm	**01B20.4223**
		21mm	**01B21223**
		23mm	**01B23223**
		24mm	**01B24223**
		24.5mm	**01B24.5223**
		25mm	**01B25223**
		26mm	**01B26223**
		27mm	**01B27223**
		Special	**01BSP223**



Part scale shown

Pattern	Description	Diameter	Order Code
NE20	Horizontal scale 0.1” long with 100 divisions of 0.001”.	16mm	**01B16214**
		19mm	**01B19214**
		20.4mm	**01B20.4214**
		21mm	**01B21214**
		23mm	**01B23214**
		24mm	**01B24214**
		24.5mm	**01B24.5214**
		25mm	**01B25214**
		26mm	**01B26214**
		27mm	**01B27214**
		Special	**01BSP214**



Pattern	Description	Diameter	Order Code
NE31	Horizontal scale 0.5” long with 100 divisions of 0.005”.	16mm	**01B16219**
		19mm	**01B19219**
		20.4mm	**01B20.4219**
		21mm	**01B21219**
		23mm	**01B23219**
		24mm	**01B24219**
		24.5mm	**01B24.5219**
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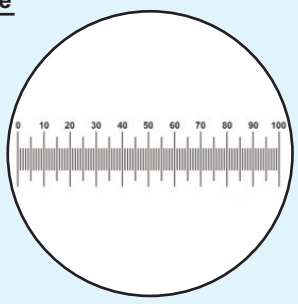
		26mm	**01B26219**
		27mm	**01B27219**
		Special	**01BSP219**



Drawings not to scale

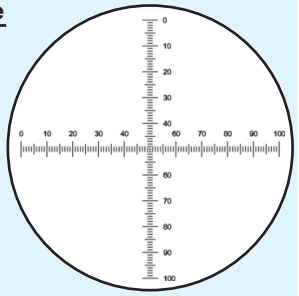
Eyepiece Scales

Crossed Scales

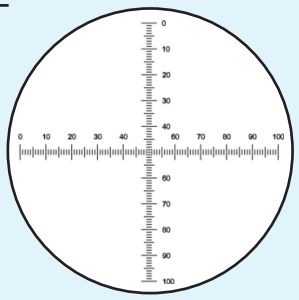
NE17, NE18

Used as horizontal and vertical scales, and especially useful when interested in measurements in different axis

Pattern	Description	Diameter	Order Code
NE17	Crossed micrometer scales. Each 10mm long with 100 divisions of 0.1mm.	16mm	**01B16212**
		19mm	**01B19212**
		20.4mm	**01B20.4212**
		21mm	**01B21212**
		23mm	**01B23212**
		24mm	**01B24212**
		24.5mm	**01B24.5212**
		25mm	**01B25212**
		26mm	**01B26212**
		27mm	**01B27212**
		Special	**01BSP212**

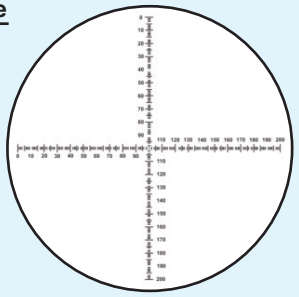


Pattern	Description	Diameter	Order Code
NE18	Crossed micrometer scales. Each 5mm long with 100 divisions of 0.05mm.	16mm	**01B16213**
		19mm	**01B19213**
		20.4mm	**01B20.4213**
		21mm	**01B21213**
		23mm	**01B23213**
		24mm	**01B24213**
		24.5mm	**01B24.5213**
		25mm	**01B25213**
		26mm	**01B26213**
		27mm	**01B27213**
		Special	**01BSP213**



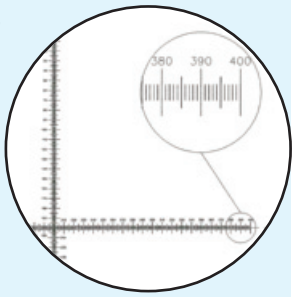
NE72 NEW

Pattern	Description	Diameter	Order Code
NE72	Crossed micrometer scales. Each 20mm long with 200 divisions of 0.1mm.	23mm	**01B23303**
		24mm	**01B24303**
		24.5mm	**01B24.5303**
		25mm	**01B25303**
		26mm	**01B26303**
		27mm	**01B27303**
		Special	**01BSP303**



NE70 NEW

Pattern	Description	Diameter	Order Code
NE70	Crossed micrometer scales. (imperial). Each 0.8” long with 400 divisions of 0.002”.	21mm	**01B21301**
		23mm	**01B23301**
		24mm	**01B24301**
		24.5mm	**01B24.5301**
		25mm	**01B25301**
		26mm	**01B26301**
		27mm	**01B27301**
		Special	**01BSP301**



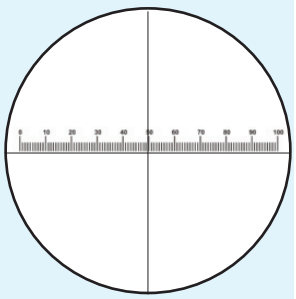
Part scale shown

Scales with Crosslines

NE7

The inclusion of a crossline assists in ensuring alignment of the reticle with edges, etc, in the specimen.

Pattern	Description	Diameter	Order Code
NE7	Horizontal micrometer scale 10mm long, with 100 divisions of 0.1mm and crosslines	16mm	**01B16204**
		19mm	**01B19204**
		20.4mm	**01B20.4204**
		21mm	**01B21204**
		23mm	**01B23204**
		24mm	**01B24204**
		24.5mm	**01B24.5204**
		25mm	**01B25204**
		26mm	**01B26204**
		27mm	**01B27204**
		Special	**01BSP204**

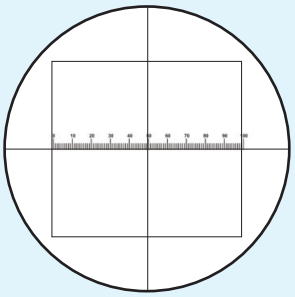


Drawings not to scale

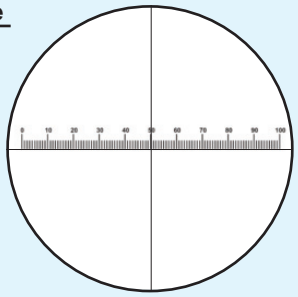
Scales with Crosslines

NE7N, NE77, NE777
The inclusion of a crossline assists in ensuring alignment of the reticle with edges, etc, in the specimen.

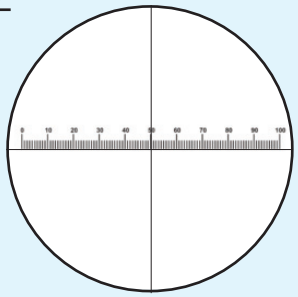
Pattern	Description	Diameter	Order Code
NE7N	Horizontal micrometer scale 10mm long with 100 divisions of 0.1mm, includes crosslines and additional 10mm square.	16 mm	**01B16205**
		19mm	**01B19205**
		20.4mm	**01B20.4205**
		21mm	**01B21205**
		23mm	**01B23205**
		24mm	**01B24205**
		24.5mm	**01B24.5205**
		25mm	**01B25205**
		26mm	**01B26205**
		27mm	**01B27205**
		Special	**01BSP205**



Pattern	Description	Diameter	Order Code
NE77	Horizontal micrometer scale 5mm long with 100 divisions of 0.05mm and crosslines.	16mm	**01B16233**
		19mm	**01B19233**
		20.4mm	**01B20.4233**
		21mm	**01B21233**
		23mm	**01B23233**
		24mm	**01B24233**
		24.5mm	**01B24.5233**
		25mm	**01B25233**
		26mm	**01B26233**
		27mm	**01B27233**
		Special	**01BSP233**



Pattern	Description	Diameter	Order Code
NE777	Horizontal micrometer scale 0.5" long with divisions of 0.005" and crosslines.	16mm	**01B16237**
		19mm	**01B19237**
		20.4mm	**01B20.4237**
		21mm	**01B21237**
		23mm	**01B23237**
		24mm	**01B24237**
		24.5mm	**01B24.5237**
		25mm	**01B25237**
		26mm	**01B26237**
		27mm	**01B27237**
		Special	**01BSP237**



Squares and Grids

Note: These may need to be calibrated, according to intended use. There are a number of uses for the grids and squares listed and they will largely depend on the individual user's application.

Sectoring
A squared reticle might be used for the systematic examination of a specimen. Some of the squared patterns are numbered to aid the identification of areas of interest. Sectoring is particularly useful for making drawings of specimens onto graph paper. The chessboard type of pattern helps the user to distinguish the position being examined: the darker squares are translucent, while the lighter ones are transparent, avoiding eyestrain in prolonged counting as may be necessary in haematology. These patterns provide the same advantages when used with image analysis and capture devices.

Counting
A squared reticle can be used for counting. Here the basic principle is that a small area of the specimen is analysed in order to obtain information about the total area. This minimises sometimes wasteful work enabling simple analysis of a particular area. An example of this would be the comparison of large to small particles in a specimen. By using the Miller reticle (NE57) only the smaller particles in the small square are counted, the result being multiplied by ten for comparison with the number of larger particles in the large square.

Squared Grids
Squared grids can be used in particle size analysis as simple technical aids where sophisticated image analysis systems are not required. The areas of the particles to be measured can be estimated by simply counting the number of squares occupied by those particles. It is necessary to estimate fractions of a square or make a rule (e.g. count as a square all partly covered squares at the right and bottom sides of the grid, and ignore partly covered squares at the left and upper sides of the square). This method would only be useful for a fairly crude estimation of a large diameter. For more detailed optical analysis it is advisable to use a specialised reticle such as those in the Particle Size Analysis section on page 11

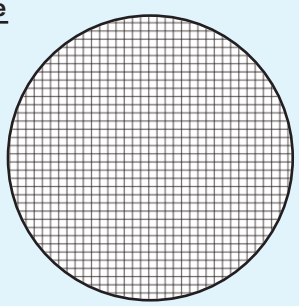
Drawings not to scale

Squared Grids

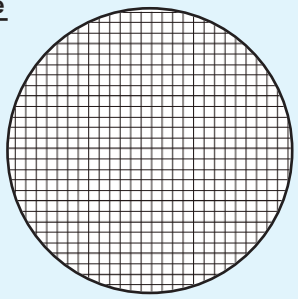
NE10, NE11,NE34

Simple grids are convenient for making sketches of the observed specimen. They are also useful for particle counting.

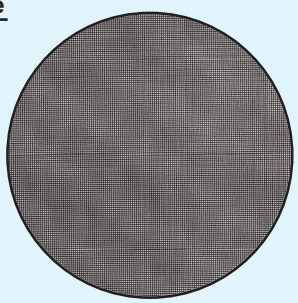
Pattern	Description	Diameter	Order Code
NE10	Grid (net) 0.5mm pitch.	16mm	**01B16207**
		19mm	**01B19207**
		20.4mm	**01B20.4207**
		21mm	**01B21207**
		23mm	**01B23207**
		24mm	**01B24207**
		24.5mm	**01B24.5207**
		25mm	**01B25207**
		26mm	**01B26207**
		27mm	**01B27207**
		Special	**01BSP207**



Pattern	Description	Diameter	Order Code
NE11	Grid (net) 1.0mm pitch.	16mm	**01B16209**
		19mm	**01B19209**
		20.4mm	**01B20.4209**
		21mm	**01B21209**
		23mm	**01B23209**
		24mm	**01B24209**
		24.5mm	**01B24.5209**
		25mm	**01B25209**
		26mm	**01B26209**
		27mm	**01B27209**
		Special	**01BSP209**



Pattern	Description	Diameter	Order Code
NE34	Grid (net) 0.1mm squares	16mm	**01B16300**
		19mm	**01B19300**
		20.4mm	**01B20.4300**
		21mm	**01B21300**
		23mm	**01B23300**
		24mm	**01B24300**
		24.5mm	**01B24.5300**
		25mm	**01B25300**
		26mm	**01B26300**
		27mm	**01B27300**
		Special	**01BSP300**

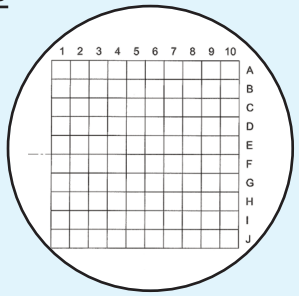


Indexed Grids

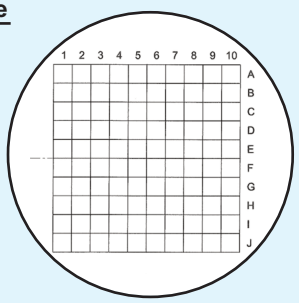
NE10A, NE11A

Useful for particle counting, particularly where reference is needed between workers. Also useful for area of specimen determinations.

Pattern	Description	Diameter	Order Code
NE10A	Numbered grid 5mm x 5mm. 0.5mm pitch. Marked 1–10 and A-J.	16mm	**01B16208**
		19mm	**01B19208**
		20.4mm	**01B20.4208**
		21mm	**01B21208**
		23mm	**01B23208**
		24mm	**01B24208**
		24.5mm	**01B24.5208**
		25mm	**01B25208**
		26mm	**01B26208**
		27mm	**01B27208**
		Special	**01BSP208**



Pattern	Description	Diameter	Order Code
NE11A	Numbered grid 10mm x 10mm. 1.0mm pitch. Marked 1-10 and A-J.	16mm	**01B16210**
		19mm	**01B19210**
		20.4mm	**01B20.4210**
		21mm	**01B21210**
		23mm	**01B23210**
		24mm	**01B24210**
		24.5mm	**01B24.5210**
		25mm	**01B25210**
		26mm	**01B26210**
		27mm	**01B27210**
		Special	**01BSP210**

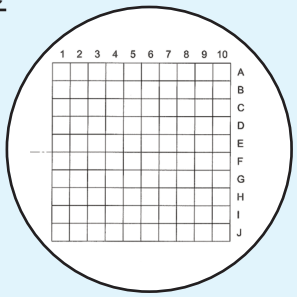


Drawings not to scale

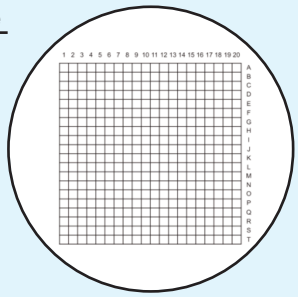
Indexed Grids

NE34A, NE71

Pattern	Description	Diameter	Order Code
NE34A	Numbered grid 1mm x 1mm. 0.1mm pitch. Marked 1-10 and A-J.	16mm	**01B16220**
		19mm	**01B19220**
		20.4mm	**01B20.4220**
		21mm	**01B21220**
		23mm	**01B23220**
		24mm	**01B24220**
		24.5mm	**01B24.5220**
		25mm	**01B25220**
		26mm	**01B26220**
		27mm	**01B27220**
		Special	**01BSP220**



Pattern	Description	Diameter	Order Code
NE71	Index pattern	21 mm	**01B21302**
NEW	20 x 20 grid of 0.5mm squares	23mm	**01B23302**
		24mm	**01B24302**
		24.5mm	**01B24.5302**
		25mm	**01B25302**
		26mm	**01B26302**
		27mm	**01B27302**
		Special	**01BSP302**



NE35
Useful for particle counting, particularly where reference is needed between workers, especially rectangular shapes, also for particle counting.
Numbered 0 to 99.

Pattern	Description	Diameter	Order Code
NE35	Numbered grid 10mm x 10mm. 1mm indexed squares.	16mm	**01B16221**
		19mm	**01B19221**
		20.4mm	**01B20.4221**
		21mm	**01B21221**
		23mm	**01B23221**
		24mm	**01B24221**
		24.5mm	**01B24.5221**
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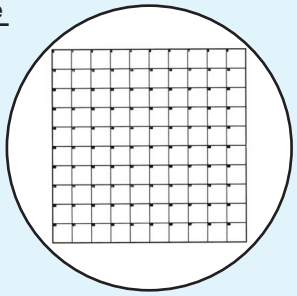
		26mm	**01B26221**
		27mm	**01B27221**
		Special	**01BSP221**



Chessboard Squares

NE15
The dark squares are translucent. Used as an alternative to simple grids for area of specimen determination and particle counting. Alternate light and dark squares help to reduce eyestrain. Semi coating gives approximately 50% light transmission.

Pattern	Description	Diameter	Order Code
NE15	Chessboard (net) 2.0mm squares.	16mm	**01B16211**
		19mm	**01B19211**
		20.4mm	**01B20.4211**
		21mm	**01B21211**
		23mm	**01B23211**
		24mm	**01B24211**
		24.5mm	**01B24.5211**
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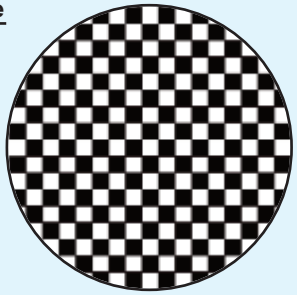
		26mm	**01B26211**
		27mm	**01B27211**
		Special	**01BSP211**



Squares and Grids

NE38
Combines three areas in one for convenience, giving area ratios A:B of 1:3 and B:C of 1:2.

Pattern	Description	Diameter	Order Code
NE38	Squares 10mm, 7mm & 4mm.	16mm	**01B16222**
		19mm	**01B19222**
		20.4mm	**01B20.4222**
		21mm	**01B21222**
		23mm	**01B23222**
		24mm	**01B24222**
		24.5mm	**01B24.5222**
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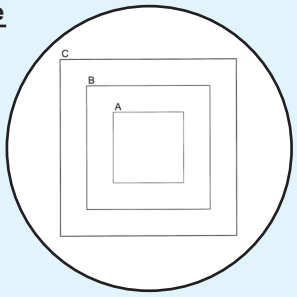
		26mm	**01B26222**
		27mm	**01B27222**
		Special	**01BSP222**



Drawings not to scale

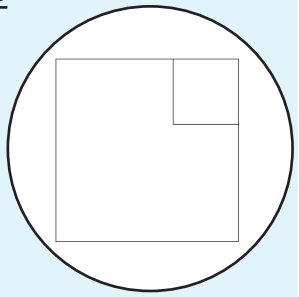
Miller Squares

NE57
The ratio of large to small square is 9:1. Originally designed for haematology, they can be utilised for rapid counting of any evenly spread field of particles.

References: American Journal of Clinical Pathology Vol. 20, 1950, page 1079. “Time Saving Device For Counting Reticulocyte.” G.Brescher and Schneiderman.

Practical Haematology-J.D.Dacy. Published by J.A.Churchill. 2nd Edition 1956

Pattern	Description	Diameter	Order Code
NE57	Miller 7 x 7 mm grid.	16mm	**01B16232**
		19mm	**01B19232**
		20.4mm	**01B20.4232**
		21mm	**01B21232**
		23mm	**01B23232**
		24mm	**01B24232**
		24.5mm	**01B24.5232**
		25mm	**01B25232**
		26mm	**01B26232**
		27mm	**01B27232**
		Special	**01BSP232**

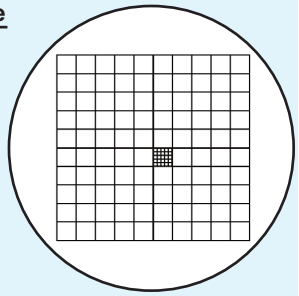


Whipple Grid

NE29
Originally designed for water particle analysis, but may be used for other aspects of particle counting. Grid shown: Ratio of full square to smallest is 50:1. Area is 2500:1
Reference: Microscopy of Drinking Water.

Please note the NE29 is also available with a 10mm x 10mm grid to special order.

Pattern	Description	Diameter	Order Code
NE29	Whipple grid 100 squares in 7mm. area.	16mm	**01B16218**
		19mm	**01B19218**
		20.4mm	**01B20.4218**
		21mm	**01B21218**
		23mm	**01B23218**
		24mm	**01B24218**
		24.5mm	**01B24.5218**
		25mm	**01B25218**
		26mm	**01B26218**
		27mm	**01B27218**
		Special	**01BSP218**

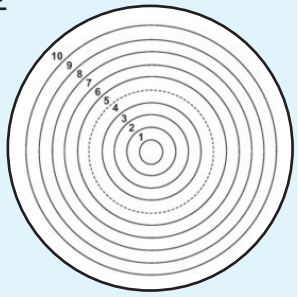


Circle Gauges and Protractors

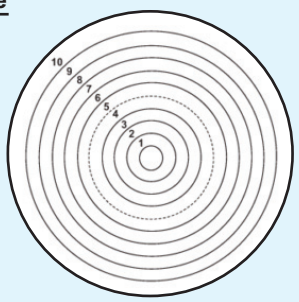
Concentric Circles

NE42, NE43, NE44, NE47
Can be used for two-way measurement when calibrated as a micrometer.

Pattern	Description	Diameter	Order Code
NE42	Concentric circles 0.25mm – 2.5mm diameter. 10 circles.	16mm	**01B16224**
		19mm	**01B19224**
		20.4mm	**01B20.4224**
		21mm	**01B21224**
		23mm	**01B23224**
		24mm	**01B24224**
		24.5mm	**01B24.5224**
		25mm	**01B25224**
		26mm	**01B26224**
		27mm	**01B27224**
		Special	**01BSP224**



Pattern	Description	Diameter	Order Code
NE43	Concentric circles 0.5mm – 5mm diameter. 10 circles.	16mm	**01B16225**
		19mm	**01B19225**
		20.4mm	**01B20.4225**
		21mm	**01B21225**
		23mm	**01B23225**
		24mm	**01B24225**
		24.5mm	**01B24.5225**
		25mm	**01B25225**
		26mm	**01B26225**
		27mm	**01B27225**
		Special	**01BSP225**

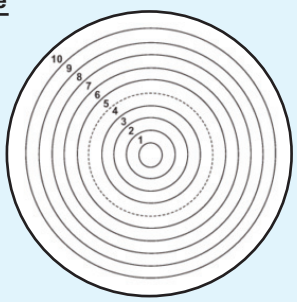


Drawings not to scale

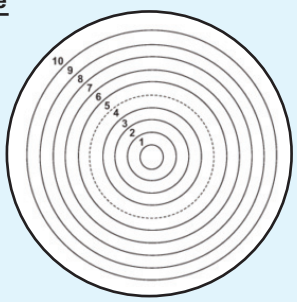
Concentric Circles + Cross Scales

NE44, NE47, NE48
Similar to concentric circles, but with graduated cross hairs.

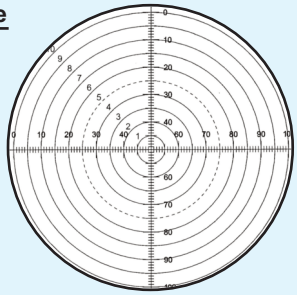
Pattern	Description	Diameter	Order Code
NE44	Concentric circles 1mm – 10mm diameter. 10 circles.	16mm	**01B16226**
		19mm	**01B19226**
		20.4mm	**01B20.4226**
		21mm	**01B21226**
		23mm	**01B23226**
		24mm	**01B24226**
		24.5mm	**01B24.5226**
		25mm	**01B25226**
		26mm	**01B26226**
		27mm	**01B27226**
		Special	**01BSP226**



Pattern	Description	Diameter	Order Code
NE47	Concentric circles 2mm – 20mm diameter. 10 circles.	21mm	**01B21228**
		23mm	**01B23228**
		24mm	**01B24228**
		24.5mm	**01B24.5228**
		25mm	**01B25228**
		26mm	**01B26228**
		27mm	**01B27228**
		Special	**01BSP228**



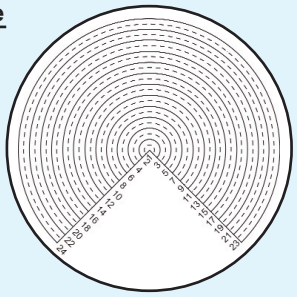
Pattern	Description	Diameter	Order Code
NE48	Concentric circles, 10 circles 1mm-10mm, with graduated cross hairs	16mm	**01B16242**
		19mm	**01B19242**
		20.4mm	**01B20.4242**
		21mm	**01B21242**
		23mm	**01B23242**
		24mm	**01B24242**
		24.5mm	**01B24.5242**
		25mm	**01B25242**
		26mm	**01B26242**
		27mm	**01B27242**
		Special	**01BSP242**



Concentric Circles

NE22
This design leaves the circles clear of obstruction. In addition the intermediate lines are broken to improve ease of reading.

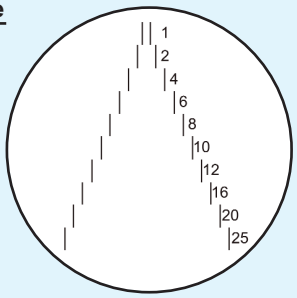
Pattern	Description	Diameter	Order Code
NE22	Concentric circles 0.5mm - 12mm diameter, 24 circles.	16mm	**01B16215**
		19mm	**01B19215**
		20.4mm	**01B20.4215**
		21mm	**01B21215**
		23mm	**01B23215**
		24mm	**01B24215**
		24.5mm	**01B24.5215**
		25mm	**01B25215**
		26mm	**01B26215**
		27mm	**01B27215**
		Special	**01BSP215**



Gauge Pairs

NE19
Gauge pairs occupying a field of view of 10mm. Each gauge is proportional to its adjacent number. Approximate size of smallest pair = 0.1mm.

Pattern	Description	Diameter	Order Code
NE19	Gauge pairs	16mm	**01B16241**
		19mm	**01B19241**
		20.4mm	**01B20.4241**
		21mm	**01B21241**
		23mm	**01B23241**
		24mm	**01B24241**
		24.5mm	**01B24.5241**
		25mm	**01B25241**
		26mm	**01B26241**
		27mm	**01B27241**
		Special	**01BSP241**



Drawings not to scale

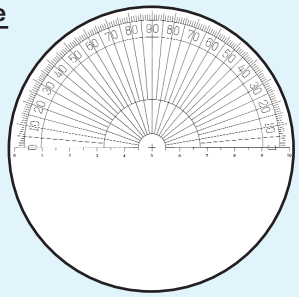
Protractors

Placed in the eyepiece, these are used in the same manner as ordinary protractors.

Half Protractor

NE25

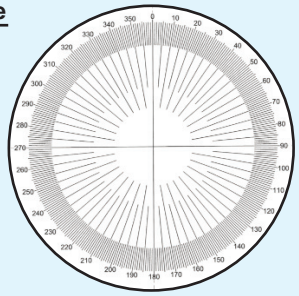
Pattern	Description	Diameter	Order Code
NE25	Half protractor scale 10mm diameter divided in degrees.	16mm	**01B16216**
		19mm	**01B19216**
		20.4mm	**01B20.4216**
		21mm	**01B21216**
		23mm	**01B23216**
		24mm	**01B24216**
		24.5mm	**01B24.5216**
		25mm	**01B25216**
		26mm	**01B26216**
		27mm	**01B27216**
		Special	**01BSP216**



Full Protractor

NE45

Pattern	Description	Diameter	Order Code
NE45	Full protractor scale 10mm diameter divided in degrees.	16mm	**01B16227**
		19mm	**01B19227**
		20.4mm	**01B20.4227**
		21mm	**01B21227**
		23mm	**01B23227**
		24mm	**01B24227**
		24.5mm	**01B24.5227**
		25mm	**01B25227**
		26mm	**01B26227**
		27mm	**01B27227**
		Special	**01BSP227**



Particle Sizing and Distribution

The use of the eyepiece reticles shown in this section make it possible to analyse specimens containing particles as an alternative, or in addition to, sieving. Reticles for particle size analysis are particularly popular when there are only limited quantities of particles or where particles are smaller than 50 micron diameter. Typical substances analysed are sand grains, soil particles, plant seeds, fertilizers, abrasives, liquid droplets, pigments, pulverised coal, silica, fibres and fine dust.

The basic principle employed is to compare particles to the globes and circles of varying sizes that appear on the reticle – dark particles being compared to solid globes, and light or transparent ones to the circles. Naturally the procedure varies with the reticle concerned, more information about which is given alongside each reticle description.

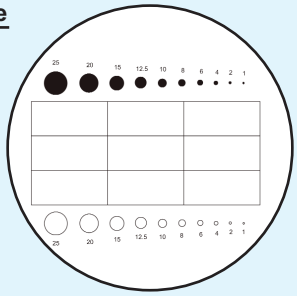
Please note that for calibration the circles and globes will represent particles smaller in diameter by the magnification of the objective.

Patterson Globes and Circles

NG1

The reticle consists of a central rectangle, sub-divided into nine smaller rectangles with a number of increasing circles outside the top and bottom horizontal edges. The marked figures are the diameters of the circles in units. 250 units represent the horizontal length of the large rectangle. Rectangle size is 4.5mm x 2.025mm. Circle sizes in microns are nominally 450, 360, 270, 225, 180, 145, 110, 74, 37 and 18.

Pattern	Description	Diameter	Order Code
NG1	Patterson globes/circles.	16mm	**01B16250**
		19mm	**01B19250**
		20.4mm	**01B20.4250**
		21mm	**01B21250**
		23mm	**01B23250**
		24mm	**01B24250**
		24.5mm	**01B24.5250**
		25mm	**01B25250**
		26mm	**01B26250**
		27mm	**01B27250**
		Special	**01BSP250**



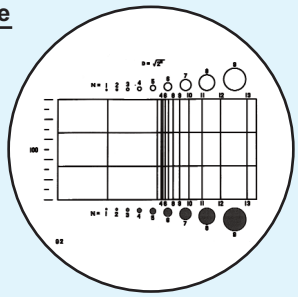
Reference: H.S.Patterson and W.Cawood.Transactions of the Faraday Society, Vol. 32 Feb 1936.
“The Determination of Size Distribution in Smokes.” Pp. 1084-1088.

Drawings not to scale

Porton

NG2
The circle areas of the Porton reticles increase with Root 2 progression as do the divisions on the right hand side of the rectangle. These divisions are numbered for convenience. Rectangle size is 4.5mm x 2.025mm. The specimen is racked on the mechanical stage of the microscope and traverses are taken right across the deposit sizing all the particles encountered.

Pattern	Description	Diameter	Order Code
NG2	Original Porton globes/circle	16mm	**01B16251**
		19mm	**01B19251**
		20.4mm	**01B20.4251**
		21mm	**01B21251**
		23mm	**01B23251**
		24mm	**01B24251**
		24.5mm	**01B24.5251**
		25mm	**01B25251**
		26mm	**01B26251**
		27mm	**01B27251**
		Special	**01BSP251**

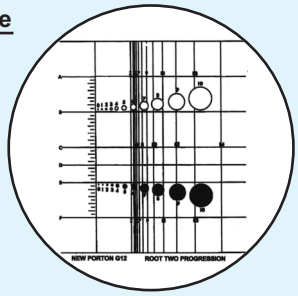


Reference: K.R.May, Journal of Scientific Instruments Vol. 22 Oct 1945.
"The Cascade Impactor." An instrument for sampling coarse aerosols.

New Porton

NG12
The NG12 is particularly useful since the array of globes and circles are conveniently close to where the particles pass. At the end of each band of the sample the mechanical stage is traversed vertically to take in the next band until the whole sample has been covered.

Pattern	Description	Diameter	Order Code
NG12	Modified Porton pattern globes/circle.	16mm	**01B16253**
		19mm	**01B19253**
		20.4mm	**01B20.4253**
		21mm	**01B21253**
		23mm	**01B23253**
		24mm	**01B24253**
		24.5mm	**01B24.5253**
		25mm	**01B25253**
		26mm	**01B26253**
		27mm	**01B27253**
		Special	**01BSP253**

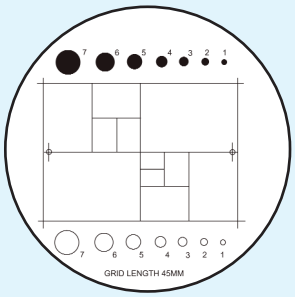


Reference: K.R.May, Journal of Scientific Instruments Vol. 42 1965.
"A New Graticule for Particle Counting and Sizing." Pp 500-501.

British Standard Reticle

NG10
In this reticle the circle areas double progressively, hence the diameters alter by Root 2, so that the size classes can form a continuation of the standard series of sieves for particle sizing. Each particle is assigned to a size class defined by two adjacent circles which represent the size limits of that class. Thus the distribution of size is obtained in terms of the diameter of circles having the same projected area as the particles. This method will cover particles in the range 150 micron to 0.38 micron. The size distributions with respect to their number and weight are determined separately. Final results are calculated as cumulative percents. Actual size of circles and globes are nominally 560µ, 400µ, 280µ, 200µ, 149µ, 100µ and 70µ.
Circle1 is defined as 1unit.
Originally designed by the National Coal Board for use in coal mining.
References: BS3625/BS3260

Pattern	Description	Diameter	Order Code
NG10	British standard (BS3625/BS3260) globes & circles.	16mm	**01B16252**
		19mm	**01B19252**
		20.4mm	**01B20.4252**
		21mm	**01B21252**
		23mm	**01B23252**
		24mm	**01B24252**
		24.5mm	**01B24.5252**
		25mm	**01B25252**
		26mm	**01B26252**
		27mm	**01B27252**
		Special	**01BSP252**

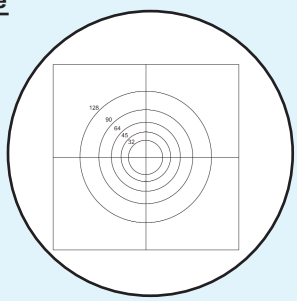


Drawings not to scale

Fairs

NG5
Designed to extend the sizing range of globe and circle reticles. Example: Used in conjunction with NG2 the overall size range = 128:1. The circles increase by root 2. Note that both reticles would have to be used with the same microscope, eyepiece and objective.
Reference: G.L Fairs Chem Ind. 1943 Vol. 62. Pp 374-378. “The Use Of The Microscope In Particle Size Analysis.”

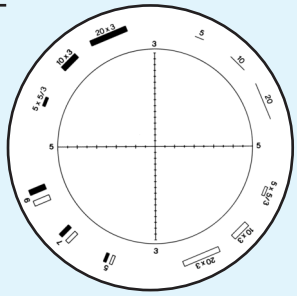
Pattern	Description	Diameter	Order Code
NG5	Fairs.	16mm	**01A16077**
		19mm	**01A19077**
		20.4mm	**01A20.4077**
		21mm	**01A21077**
		23mm	**01A23077**
		24mm	**01A24077**
		24.5mm	**01A24.5077**
		25mm	**01A25077**
		26mm	**01A26077**
		27mm	**01A27077**
		Special	**01ASP077**



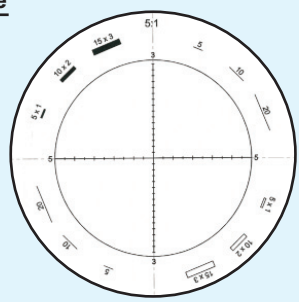
Asbestos Fibre Analysis - Walton & Beckett Reticle

G22,G24
Calibration factors are required for each of these reticles, see note below. The Walton and Beckett
reticle is used for counting fibrous dust (e.g. asbestos or glass fibres) and is particularly useful where the majority of fibres to be counted are shorter than 5 micron. The circle is divided into four by two diametrical lines scaled in units of 5 and 3 microns
respectively. 3 and 5 microns are the critical measurements of fibre lengths and diameter used in fibre counting. Unlike the usual globes of other particle reticles the Walton and Beckett has a series of shapes to compare objects with. These shapes have been designed for comparison with fibres, especially since they
incorporate an aspect ratio of 3:1 or 5:1 essential for such analysis.
Reference: W.H.Walton and S.T. Beckett. Occupational Hygiene. Vol. 20 pp 19-23. “A Microscope
Eyepiece For The Evaluation of Fibrous Dusts.”

Pattern	Description	Diameter	Order Code
G22	Walton & Beckett for asbestos. 3:1 ratio.	16mm	**01A16062**
		19mm	**01A19062**
		20.4mm	**01A20.4062**
		21mm	**01A21062**
		23mm	**01A23062**
		24mm	**01A24062**
		24.5mm	**01A24.5062**
		25mm	**01A25062**
		26mm	**01A26062**
		27mm	**01A27062**
		Special	**01ASP062**

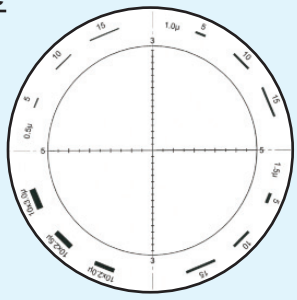


Pattern	Description	Diameter	Order Code
G24	Walton & Beckett for asbestos. 5:1 ratio.	16mm	**01A16063**
		19mm	**01A19063**
		20.4mm	**01A20.4063**
		21mm	**01A21063**
		23mm	**01A23063**
		24mm	**01A24063**
		24.5mm	**01A24.5063**
		25mm	**01A25063**
		26mm	**01A26063**
		27mm	**01A27063**
		Special	**01ASP063**



G25
Based on the G22, the G25 is produced to a new design by the Institute of Occupational Health.

Pattern	Description	Diameter	Order Code
G25	Walton & Beckett for asbestos (1996).	16mm	**01A16085**
		19mm	**01A19085**
		20.4mm	**01A20.4085**
		21mm	**01A21085**
		23mm	**01A23085**
		24mm	**01A24085**
		24.5mm	**01A24.5085**
		25mm	**01A25085**
		26mm	**01A26085**
		27mm	**01A27085**
		Special	**01ASP085**



IMPORTANT NOTE. The circle on these Walton & Beckett reticles must represent 100 microns at the stage and each one must be manufactured to suit the individual instrument. Therefore, details should be provided with your order of :- Calibration factor, if known or Objective magnification, eyepiece magnification, diameter of reticle disc required, microscope make and model.

All Walton & Beckett reticles are normally used with 40x objectives giving a calibration factor of 4. In some microscopes there is also an additional 1.25x magnification to give a total objective magnification of 50x - these will have a calibration factor of 5. All standard Walton & Beckett reticles are supplied with a calibration factor of 4. Other calibration factors are made to special order. These reticles will require a calibrated stage micrometer to verify the sizes - See S12 or PS12 in Calibration Standards Brochure. For phase contrast verification see also S84.

Drawings not to scale

SPECIALIST DESIGNS

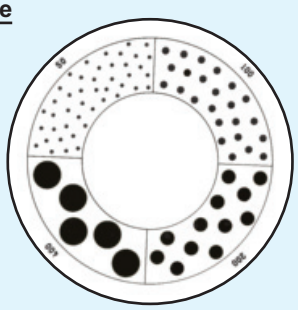
Spray Droplet Sizing Reticle (Matthews)

NG30
For size and distribution assessments of aerosol droplets.

Used with 4x objective for direct measurements of droplets groups of 50, 100, 200, 400 microns diameter.

W.H.O.
(Details on request) and G.A. Mathews. Imperial College.

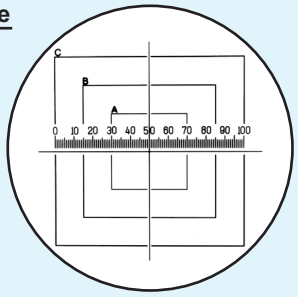
Pattern	Description	Diameter	Order Code
NG30	Matthews spray droplet.	16mm	**01B16261**
		19mm	**01B19261**
		20.4mm	**01B20.4261**
		21mm	**01B21261**
		23mm	**01B23261**
		24mm	**01B24261**
		24.5mm	**01B24.5261**
		25mm	**01B25261**
		26mm	**01B26261**
		27mm	**01B27261**
		Special	**01BSP261**



Thompson

G23
For counting particles in any of three areas of known size. The graticle is calibrated in the same manner as a normal eyepiece scale. The result is then used to calculate the area of any square.

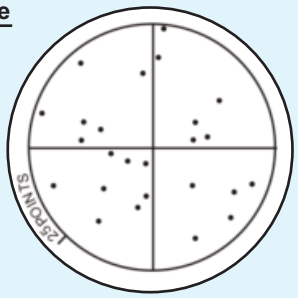
Pattern	Description	Diameter	Order Code
G23	Thompson for dust analysis. 10mm, 7mm and 4mm squares with 10mm scale in 0.1mm divisions and cross lines	16mm	**01A16056**
		19mm	**01A19056**
		20.4mm	**01A20.4056**
		21mm	**01A21056**
		23mm	**01A23056**
		24mm	**01A24056**
		24.5mm	**01A24.5056**
		25mm	**01A25056**
		26mm	**01A26056**
		27mm	**01A27056**
		Special	**01ASP056**



Chalkley Point Array

NG52
This is used to quickly determine the relationship of components to each other using random sampling. An example of its application is given by Curtis, where a researcher might want to see whether or not a certain drug affects the volume proportion of cell types in a given organ. With this reticle the proportion of points lying over the image of one type of component is statistically proportional to the area occupied by that component. The 25 points of the array are placed over the field of view at random, so that a comparison can be made between the number of points touching the one type of component, with the number touching the other type of component in each viewing. A series of observations will yield an increasingly accurate ratio of the comparative incidence of each type of particle. Ref. A.S.C.Curtis. Medical and Biological Illustration, Vol. 10. pp 261- 266. “Area and Volume Measurements by Random Sampling Methods”

Pattern	Description	Diameter	Order Code
NG52	Chalkley point array.	16mm	**01B16257**
		19mm	**01B19257**
		20.4mm	**01B20.4257**
		21mm	**01B21257**
		23mm	**01B23257**
		24mm	**01B24257**
		24.5mm	**01B24.5257**
		25mm	**01B25257**
		26mm	**01B26257**
		27mm	**01B27257**
		Special	**01BSP257**



Drawings not to scale

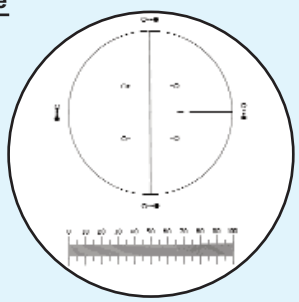
Pharmaceutical PSA Pattern

G57
This reticle was designed for the pharmaceutical industry. However, it is also useful where particle size considerations are restricted to 10µ and 25µ. Dots and circles give quick references for these two sizes. In addition a scale is incorporated.

The microscope must be calibrated when ordering this reticle, such that the circle must equate to 1mm on the microscope stage.

Reference: The United States Pharmaceutical Conventions Inc. Pharmaceutical Forum Vol.19 No.6.

Pattern	Description	Diameter	Order Code
G57	Pharmaceutical PSA Pattern. IMA Reticle (USP 788) Actual dot sizes are 100µm and 250µm	19mm	**01A19076**
		20.4mm	**01A20.4076**
		21mm	**01A21076**
		23mm	**01A23076**
		24mm	**01A24076**
		24.5mm	**01A24.5076**
		25mm	**01A25076**
		26mm	**01A26076**
		27mm	**01A27076**
		Special	**01ASP076**



This reticle is normanly used with a 10x objective: calibration factor of 1. If a different objective magnification is used then a calibration factor will be needed to allow us to make it to the correct size. S8 and PS8 are recommended stage micrometers for use with this reticle.

Counting Pattern

NG14
Simple counting for geological and soil analysis.
Reference: L.G.Briarty. “Stereology : Methods for Quantitative Light and Electron Microscopy.” Sci. Prog. Oxf. 1975 62; 1-32

Pattern	Description	Diameter	Order Code
NG14	Counting pattern for soil analysis. 10mm square.	16mm	**01B16254**
		19mm	**01B19254**
		20.4mm	**01B20.4254**
		21mm	**01B21254**
		23mm	**01B23254**
		24mm	**01B24254**
		24.5mm	**01B24.5254**
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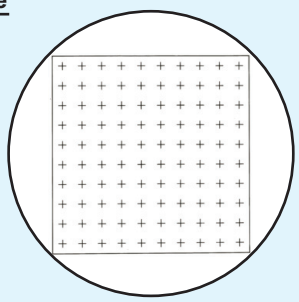
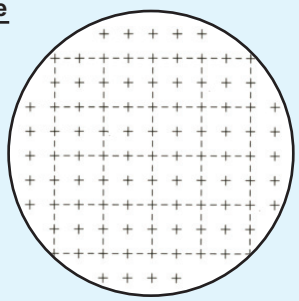
		26mm	**01B26254**
		27mm	**01B27254**
		Special	**01BSP254**



Lennox Grain Analysis

NG21

Pattern	Description	Diameter	Order Code
NG21	Lennox for grain analysis.	16mm	**01B16255**
		19mm	**01B19255**
		20.4mm	**01B20.4255**
		21mm	**01B21255**
		23mm	**01B23255**
		24mm	**01B24255**
		24.5mm	**01B24.5255**
		25mm	**01B25255**
		26mm	**01B26255**
		27mm	**01B27255**
		Special	**01BSP255**

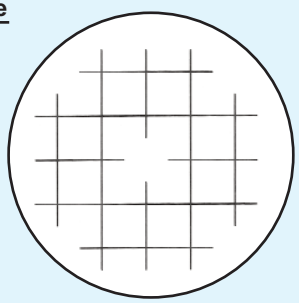


Kotter

G48
Reference: I.S.O. 7404-4: 1988 (E). Methods for Analysis of Bitumous Coal and Anthracite. Part 4 and Methods of Determining Microlithotype Composition.

Normally used with 20x objective = calibration factor of 1. For use with 40x objective specify calibration factor of 2, for 50x specify 2.5. For other objective magnifications the reticle will need to be custom made.

Pattern	Description	Diameter	Order Code
G48	Kotter pattern. Note: This pattern requires a calibration factor.	16mm	**01A16072**
		19mm	**01A19072**
		20.4mm	**01A20.4072**
		21mm	**01A21072**
		23mm	**01A23072**
		24mm	**01A24072**
		24.5mm	**01A24.5072**
		25mm	**01A25072**
		26mm	**01A26072**
		27mm	**01A27072**
		Special	**01ASP072**

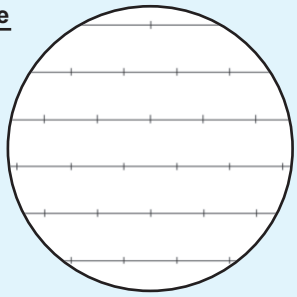


Drawings not to scale

Zeiss Integrating Eyepiece Disc 1 or Henning Reseau Pattern 25 points

G49
Reference: Zeiss Werkzeitschrift.

Pattern	Description	Diameter	Order Code
G49	Henning Reseau pattern. (Zeiss integrating disc 1)	16mm	**01A16073**
		19mm	**01A19073**
		20.4mm	**01A20.4073**
		21mm	**01A21073**
		23mm	**01A23073**
		24mm	**01A24073**
		24.5mm	**01A24.5073**
		25mm	**01A25073**
		26mm	**01A26073**
		27mm	**01A27073**
		Special	**01ASP073**

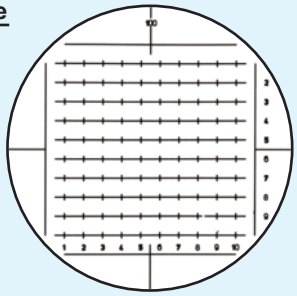


Part scale shown

Zeiss Integrating Eyepiece Disc 100

G47
Similar to G49 but extended to 100 points, which are indexed.

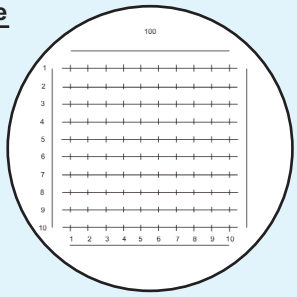
Pattern	Description	Diameter	Order Code
G47	Zeiss Integrating eyepiece disc.	16mm	**01A16090**
		19mm	**01A19090**
		20.4mm	**01A20.4090**
		21mm	**01A21090**
		23mm	**01A23090**
		24mm	**01A24090**
		24.5mm	**01A24.5090**
		25mm	**01A25090**
		26mm	**01A26090**
		27mm	**01A27090**
		Special	**01ASP090**



Integrating Eyepiece

G50

Pattern	Description	Diameter	Order Code
G50	Integrating eyepiece (simplified).	19mm	**01A19075**
		20.4mm	**01A20.4075**
		21mm	**01A21075**
		23mm	**01A23075**
		24mm	**01A24075**
		24.5mm	**01A24.5075**
		25mm	**01A25075**
		26mm	**01A26075**
		27mm	**01A27075**
		Special	**01ASP075**



Stereology

In its simplest form, stereology is the science where information about a three dimensional object is obtained from only a two-dimensional section of that structure.

Measurements are usually made with these reticles in the following manner:-

1. An adequate representation of sections of a specimen is obtained.
2. The reticle is superimposed upon the specimen (or micrograph/projected image of the section).
3. Finally, the interaction between the superimposed reticle and the test sections are recorded.

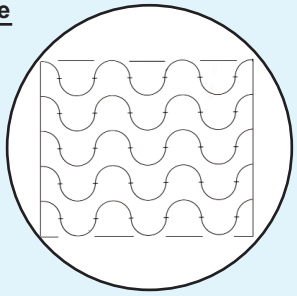
An overall introduction is given by: L.G.Briarty. “Stereology : Methods for Quantitative Light and Electron Microscopy.” Sci. Prog. Oxf. 1975 62; 1-32

Drawings not to scale

The Mertz Reticle (36 point)

NGM1
Used to estimate the three dimensional surface areas or the surface density of a component in a given volume, when the component does not have a random orientation. It comprises a test system with parallel curved lines used for measuring the intersection of points. Reference: W.A.Mertz . " Mikroskopic" Vol. 22 1967 pp 132-142.

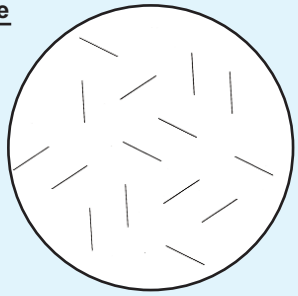
Pattern	Description	Diameter	Order Code
NGM1	Mertz for stereology.	16mm	**01B16258**
		19mm	**01B19258**
		20.4mm	**01B20.4258**
		21mm	**01B21258**
		23mm	**01B23258**
		24mm	**01B24258**
		24.5mm	**01B24.5258**
		25mm	**01B25258**
		26mm	**01B26258**
		27mm	**01B27258**
		Special	**01BSP258**



Weibel 1

NGW1
15 lines of equal length connecting the verticals of a regular hexagonal point network.
Reference: E.R.Weibel Lab. Invest. Vol. 22 pp131-152. Principles and Methods for the Morphometric Study of the Lung and Other Organs.

Pattern	Description	Diameter	Order Code
NGW1	Weibel Type 1 for stereology.	16mm	**01B16259**
		19mm	**01B19259**
		20.4mm	**01B20.4259**
		21mm	**01B21259**
		23mm	**01B23259**
		24mm	**01B24259**
		24.5mm	**01B24.5259**
		25mm	**01B25259**
		26mm	**01B26259**
		27mm	**01B27259**
		Special	**01BSP259**

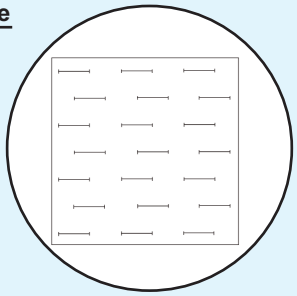


Weibel 2

NGW2
Used when making a surface to volume ratio of a structure per mass unit. This reticle consists of a number of short lines with interruptions as long as the lines. Basically, the number of intersections falling over the short lines are counted and the number of endpoints falling on the end of the structure are determined.

Reference: E.R.Weibel, Journal of Microscopy Vol. 95. Pp 373-378. Current Capabilities and Limitations of Available Stereological Techniques, point counting method.

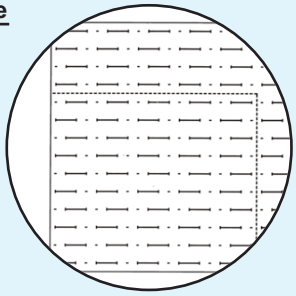
Pattern	Description	Diameter	Order Code
NGW2	Weibel Type 2 for stereology.	16mm	**01B16260**
		19mm	**01B19260**
		20.4mm	**01B20.4260**
		21mm	**01B21260**
		23mm	**01B23260**
		24mm	**01B249260**
		24.5mm	**01B24.5260**
		25mm	**01B25260**
		26mm	**01B26260**
		27mm	**01B27260**
		Special	**01BSP260**



Weibel 3

GW3
Reference: E.R.Weibel, G.S.Kistler & W.F.Scherle. 1966. J.Cell Biology. 30,23.

Pattern	Description	Diameter	Order Code
GW3	Weibel Type 3 for stereology.	16mm	**01A16074**
		19mm	**01A19074**
		20.4mm	**01A20.4074**
		21mm	**01A21074**
		23mm	**01A23074**
		24mm	**01A24074**
		24.5mm	**01A24.5074**
		25mm	**01A25074**
		26mm	**01A26074**
		27mm	**01A27074**
		Special	**01ASP074**



Part image shown

Drawings not to scale

Metallurgy

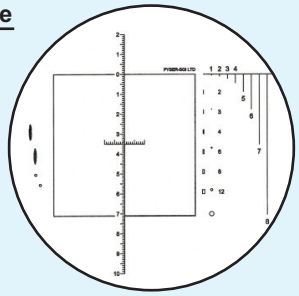
Standard pattern discs for metallurgical stereometric analysis of grain size in polished metal sections.

Grain Sizing Patterns EN10247/ISO4976

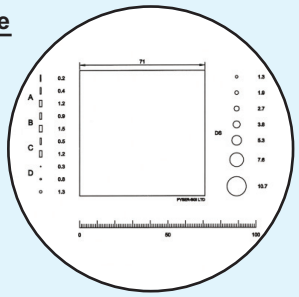
For the determination of non-metallic inclusion content of steel.

NG60 meets EN10247 & **NG61** meets ISO 4967. Both are scaled for use with 10x objective magnification.

Pattern	Description	Diameter	Order Code
NG60	Grain Sizing reticle to EN10247	21mm	**01B21265**
		23mm	**01B23265**
		24mm	**01B24265**
		24.5mm	**01B24.5265**
		25mm	**01B25265**
		26mm	**01B26265**
		27mm	**01B27265**
		Special	**01BSP265**



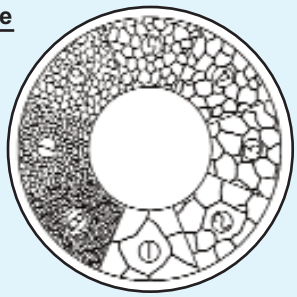
Pattern	Description	Diameter	Order Code
NG61	Grain Sizing reticle to ISO4967. and JIS GO555	21mm	**01B21266**
		23mm	**01B23266**
		24mm	**01B24266**
		24.5mm	**01B24.5266**
		25mm	**01B25266**
		26mm	**01B26266**
		27mm	**01B27266**
		Special	**01BSP266**



ASTM Austenite 1:1 Grain Sizing Disc

G41
Reference: VDEH 1510-61

Pattern	Description	Diameter	Order Code
G41	ASTM Grain sizing austenite.	19mm	**01A19064**
		20.4mm	**01A20.4064**
		21mm	**01A21064**
		23mm	**01A23064**
		24mm	**01A24064**
		24.5mm	**01A24.5064**
		25mm	**01A25064**
		26mm	**01A26064**
		27mm	**01A27064**
		Special	**01ASP064**



ASTM E112 Plate 1 Grain Sizing Disc

G42

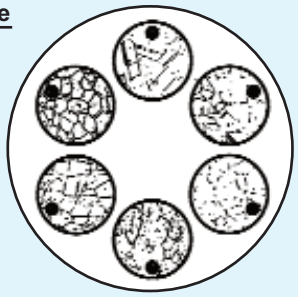
Pattern	Description	Diameter	Order Code
G42	Grain sizing E112.	19mm	**01A19065**
		20.4mm	**01A20.4065**
		21mm	**01A21065**
		23mm	**01A23065**
		24mm	**01A24065**
		24.5mm	**01A24.5065**
		25mm	**01A25065**
		26mm	**01A26065**
		27mm	**01A27065**
		Special	**01ASP065**

Drawings not to scale

ASTM Carbide grain sizing chart

G43

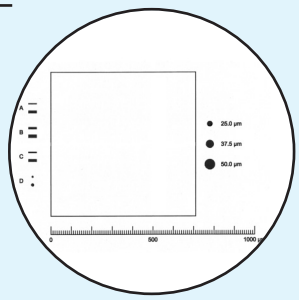
Pattern	Description	Diameter	Order Code
G43	ASTM Grain sizing carbide.	19mm	**01A19066**
		20.4mm	**01A20.4066**
		21mm	**01A21066**
		23mm	**01A23066**
		24mm	**01A24066**
		24.5mm	**01A24.5066**
		25mm	**01A25066**
		26mm	**01A26066**
		27mm	**01A27066**
		Special	**01ASP066**



ASTM E45

G44
For some applications customers require the square to be 10mm x 10mm.
Please state special on order for this version

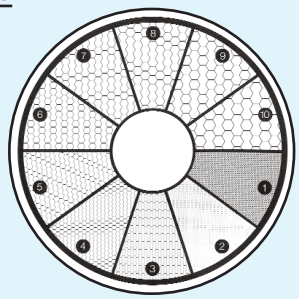
Pattern	Description	Diameter	Order Code
G44	ASTM Grain sizing Root 2 sides. 7.1mm square, 10mm scale.	19mm	**01A19086**
		20.4mm	**01A20.4086**
		21mm	**01A21086**
		23mm	**01A23086**
		24mm	**01A24086**
		24.5mm	**01A24.5086**
		25mm	**01A25086**
		26mm	**01A26086**
		27mm	**01A27086**
		Special	**01ASP086**



ASTM E19-46 Grain sizing disc

G45

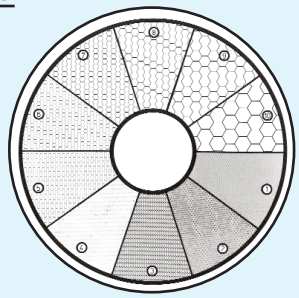
Pattern	Description	Diameter	Order Code
G45	ASTM Grain sizing E19-46.	19mm	**01A19067**
		20.4mm	**01A20.4067**
		21mm	**01A21067**
		23mm	**01A23067**
		24mm	**01A24067**
		24.5mm	**01A24.5067**
		25mm	**01A25067**
		26mm	**01A26067**
		27mm	**01A27067**
		Special	**01ASP067**



ASTM E19-46 Grain sizing disc root 2

G46

Pattern	Description	Diameter	Order Code
G46	ASTM Grain sizing E19-46. Root 2	19mm	**01A19068**
		20.4mm	**01A20.4068**
		21mm	**01A21068**
		23mm	**01A23068**
		24mm	**01A24068**
		24.5mm	**01A24.5068**
		25mm	**01A25068**
		26mm	**01A26068**
		27mm	**01A27068**
		Special	**01ASP068**

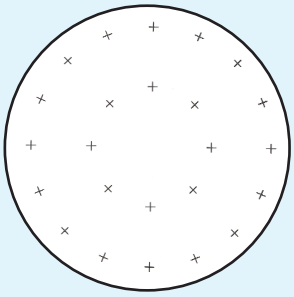


Drawings not to scale

Circular grid ASTM 24 points

G54
Reference: ASTM E562

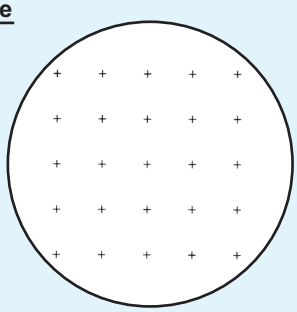
Pattern	Description	Diameter	Order Code
G54	ASTM 24 point circular grid.	19mm	**01A19078**
		20.4mm	**01A20.4078**
		21mm	**01A21078**
		23mm	**01A23078**
		24mm	**01A24078**
		24.5mm	**01A24.5078**
		25mm	**01A25078**
		26mm	**01A26078**
		27mm	**01A27078**
		Special	**01ASP078**



Square grid ASTM 25 points

G55
Reference: ASTM E562

Pattern	Description	Diameter	Order Code
G55	ASTM 25 point Square grid.	19mm	**01A19079**
		20.4mm	**01A20.4079**
		21mm	**01A21079**
		23mm	**01A23079**
		24mm	**01A24079**
		24.5mm	**01A24.5079**
		25mm	**01A25079**
		26mm	**01A26079**
		27mm	**01A27079**
		Special	**01ASP079**



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