



Scales and Calibration Standards



SCALES AND CALIBRATION STANDARDS

For over 60 years Graticules Optics have been manufacturing precision micropattern products at our UK facility. Our stage micrometers and calibration standards are used all round the world for calibrating microscopes, imaging systems and co-ordinate measuring equipment. Where you need to have traceability of calibration, Graticules Optics offer certificates of calibration, traceable to International standards.

S-Range Stage Micrometers

The scale or grid is chrome deposited centrally on a glass disc mounted in a black anodised aluminium slide mount 76mm x 25mm x 1.5mm thick. The metal mount gives these stage micrometers greater durability than those of all glass construction. These products are supplied in a plastic case with foam insert and are intended for general microscope calibration.



PS-Range Stage Calibration Standards

The scale is chrome deposited centrally on a glass disc mounted in a stainless steel slide mount, 76mm x 25mm x 1.5mm thick, with a unique serial number engraved in the top surface. These are the products of choice where you need certified scales to have unequivocal traceability for ISO, NIST, DIN or other standards. These products are supplied in a polished wooden case to indicate that they are superior calibration tools.



PS Multi-Image Calibration Slide

This unique artefact provides the most comprehensive solution to calibrating image analysis systems. An array of 16 different patterns and scales to a very high resolution, is chrome deposited on a glass slide, 76mm x 25mm x 1.5mm thick. A unique serial number is etched into the slide.



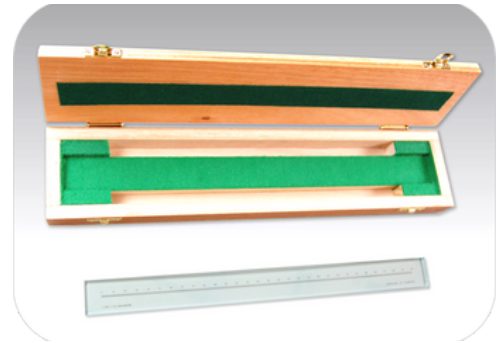
Calibration Slides for Hardness Testers

Whichever test method you use, be it Vickers, Rockwell or Brinell, Graticules Optics have the ideal calibration slide for you. For many years companies have used products such as the S78 and S1R reflected light stage micrometer scales which give a very straightforward calibration on one axis. Following long discussions with manufacturers of Hardness Testing equipment Graticules Optics has introduced two new products specifically designed for this calibration with shapes to accurately replicate the impression.



PS-Range of Long Scales

Scales from 50mm to 1 metre in length, chrome deposited on glass substrate, and supplied in a polished wooden case (except 50mm version). Typically used for calibration of linear or two dimensional measuring systems.



PGR Two Dimensional Calibration Standards

Glass plates with 10mm grid squares occupying either 100mm x 100mm or 140mm x 240mm, central area of 20mm further subdivided into 1mm squares. Typically used for calibration of co-ordinate measuring systems.



High Precision Optical Dimension Standards

For customers requiring the ultimate in precision and calibration traceability, Graticules Optics offer the NPL line scales, reference stage graticule, two dimensional position standard and photomask line width standard. These are all supplied with NPL's Internationally Traceable calibration certificate

Custom Made Calibration Products

For some customers a standard calibration product may not fulfill their requirements. In this case Graticules Optics are able to offer cost-effective production to custom designs. Please send drawing/specification or contact us to discuss.



Certificates of Calibration

Wherever there is a need for measurements to be traceable for quality purposes, Graticules Optics offer UKAS and NPL certificates of calibration that are internationally traceable, to satisfy the requirements of NIST, DIN and National Metrology Institutes across the world.

CERTIFICATE OF CALIBRATION

Each day industrial companies carry out a vast range of physical measurements, the accuracy of which must satisfy their business requirements. It is well known that accurate measurements are needed, not only to achieve an acceptable level of quality and efficiency of manufacturing, but also to allow the testing of products to satisfy both the demands of direct customers and the broader requirements for international trade (such as ISO). To be consistent with measurements made elsewhere, such measurements should also be traceable¹ to International or National measurement standards.

The technical infrastructure in each country that underpins the measurement requirements of industry and ensures that measurements are consistent and traceable, is termed the National Measurement System. In the UK for example, this system comprises the hierarchy of calibration and testing laboratories, many of which are accredited by the United Kingdom Accreditation Service (UKAS). These laboratories carry out measurements and calibrations for industry traceable to National measurement standards held in the UK's National Metrology Institute, the National Physical Laboratory (NPL). In addition to providing measurement standards for use by other laboratories, the NPL also offers traceable measurements for industry when the highest accuracy is required.

To ensure world-wide consistency of measurements, all the National Metrology Institutes (NMI's) in the world work in harmony. This is carried out under the auspices of the International diplomatic treaty, the Treaty of the Metre, signed in 1875 whereby Nations agreed, amongst other things, to the setting up of the International Committee of Weights and Measures (CIPM). Besides establishing the worldwide definitions of physical units, the CIPM organises an ongoing series of key comparisons between NMI'S to support the mutual recognition of measurement standards and calibration certificates. These key comparisons also involve regional metrology organisations, such as EUROMET (EU +EFTA +European Commission), APMP (Asia Pacific Metrology Programme) and SIM (Canada, USA, Mexico plus most Latin, South American and Caribbean states), which act as regional focuses for the growing number of NMI's throughout the world.

This means that UKAS and NPL calibrations offered by Graticules Optics will satisfy the requirements of NIST, DIN, Cofrac, Accredito Laboratory and all other NMI's across the world, and provide compliance for ISO17025.

S-Range Stage Micrometers

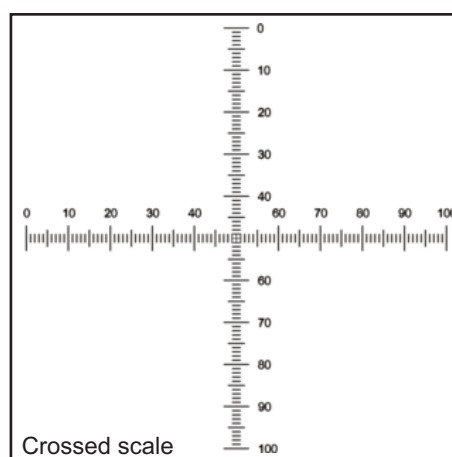
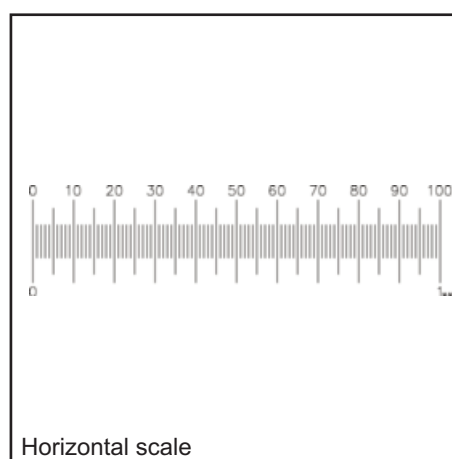
These stage graticules are intended for the routine calibration of eyepiece reticles particularly when alternating between objectives on one microscope or when using the same reticle in different microscopes.

Their robust construction, with metal slide mount, makes them ideal for student use and for instructional purposes. The scale or grid is centred on a glass disc mounted in a black anodised aluminium slide 76mm x 25mm x 1mm thick. The image is created using vacuum deposited chrome which is resistant to normal wear and tear. Note: S18 is all glass scale.

Versions are available for transmitted light and reflected (incident) light

Horizontal and Crossed Scales - for Transmitted Light

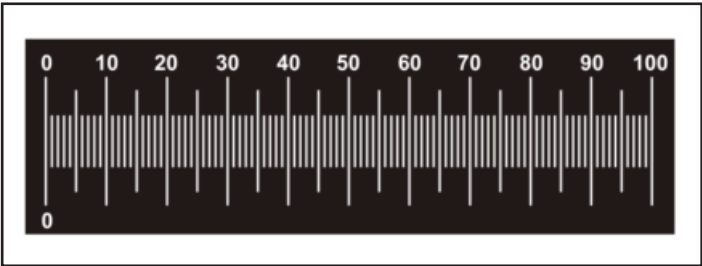
Pattern	Description	Line Width	Accuracy (overall)	Order Code
S1	Micrometer scale 10mm in 0.1mm divisions	0.005mm (5 μ m)	Within 0.002mm	02A00400
S2	Micrometer scale 5mm in 0.05mm divisions	0.005mm (5 μ m)	Within 0.0015mm	02A00401
S4	Micrometer scale 0.1inch in 0.001inch divisions	0.002mm (2 μ m)	Within 0.0001 inch	02A00402
S8	Micrometer scale 1mm in 0.01mm divisions	0.002mm (2 μ m)	Within 0.0015mm	02A00404
S11	Micrometer scale 0.005inch in 0.0001inch divisions	0.001mm (1 μ m)	Within 0.00005 inch	02A00407
S12	Micrometer scale 0.1mm in 0.002mm divisions	0.001mm (1 μ m)	Within 0.001mm	02A00408
S16	Crossed micrometer scales 1mm in 0.01mm divisions	0.003mm (3 μ m)	Within 0.001mm	02A00429
S22	Micrometer scale vertical 2mm in 0.01mm divisions	0.003mm (3 μ m)	Within 0.0015mm	02A00411
S48	Micrometer scale 1mm in 0.01mm divisions, no coverglass	0.0027mm (2.7 μ m)	Within 0.0015mm	02A00414



Horizontal Scales - for Reflected Light

These scales are etched through highly reflective vacuum coated metal. When viewed under vertical illumination, as with a metallurgical microscope, the scale appears black against a bright background.

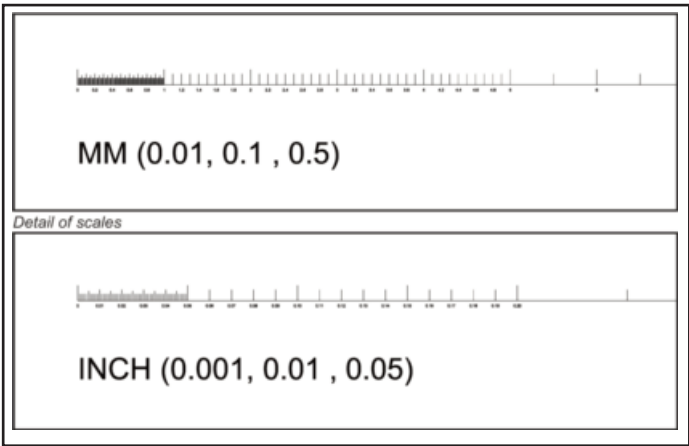
Pattern	Description	Line Width	Accuracy (overall)	Order Code
S78	Micrometer scale 1mm in 0.01mm divisions	0.003mm (3μm)	Within 0.001mm	02B00421
S1R	Micrometer scale 10mm in 0.1mm divisions	0.005mm (5μm)	Within 0.002mm	02A00440
S4R	Micrometer scale 0.1inch in 0.001inch divisions	0.002mm (2μm)	Within 0.0001 inch	02A00442



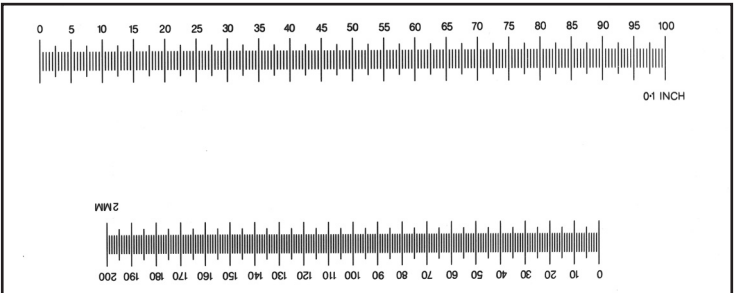
Combined Metric/English Scales

Pattern	Description	Line Width	Accuracy (overall)	Order Code
S20	Double micrometer scale 2mm in 0.01mm divisions and 0.1inch in 0.0005inch divisions	0.003mm (3μm)	Within 0.0015mm	02A00409
S18	Graduated double micrometer scales: 25mm in 0.5mm, of which the last 5mm in 0.1mm and final 1mm in 0.01mm divisions. 1" in 0.05" of which the last 4/20 in 0.01" and final 1/20 in 0.001" divisions. All glass slide.	0.0025mm (2.5μm)	Within 0.002mm	02A00418

See also PS52 on page13



S18



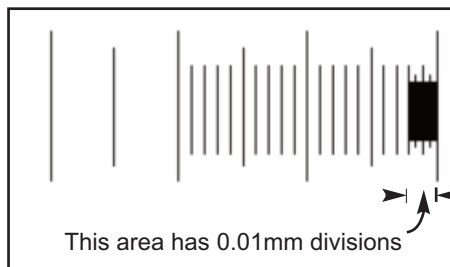
S20

Grouped Graduation Scale

For speedy determination of a range of feature sizes within a given specimen.

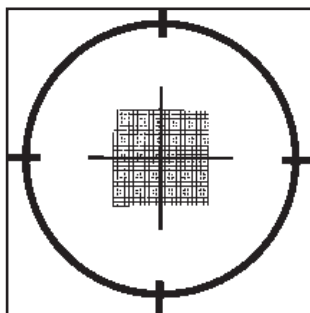
Pattern	Description	Line Width	Accuracy (overall)	Order Code
S21	Micrometer scale 5mm in 0.5mm divisions, 2mm in 0.1 divisions, and 0.2 in 0.01mm divisions	0.0025mm (2.5µm)	Within 0.002mm	02A00410

See also S18

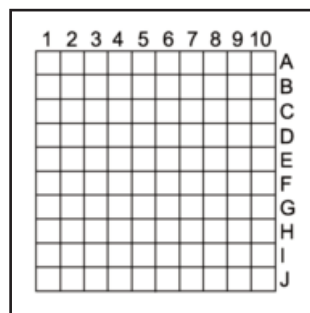


Grids

Pattern	Description	Line Width	Accuracy (overall)	Order Code
S9	Counting slide 0.1mm squares	0.005mm (5µm)	Within 0.0015mm	02A00405
S10	Counting slide 0.05mm squares	0.004mm (4µm)	Within 0.0015mm	02A00406
S28	0.01mm grid / 0.2 x 0.2mm overall	0.003mm (3µm)	Within 0.0015mm	02B00428
S29	0.01mm grid / 1.5 x 1.5mm overall	0.003mm (3µm)	Within 0.0015mm	02B00429



S28/S29

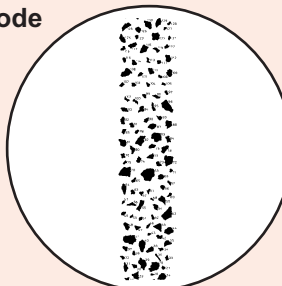


S9/S10

Particle Analysis Test Slide

SG7

Ideal for staff training, this has 200 particles of various shapes and sizes. Each shape is numbered. Designed for comparing various shapes and sizes, and as a means for logging and communicating this information.

Pattern	Description	Order Code
SG7	Test slide for particle sizing.	02A00422
This slide is now available with a Type Test Certificate, please enquire for details.		



H.S.E./N.P.L. MKIII Test Slide for Phase Contrast Microscopy

This test slide is made in the UK under licence from the National Physical Laboratory.

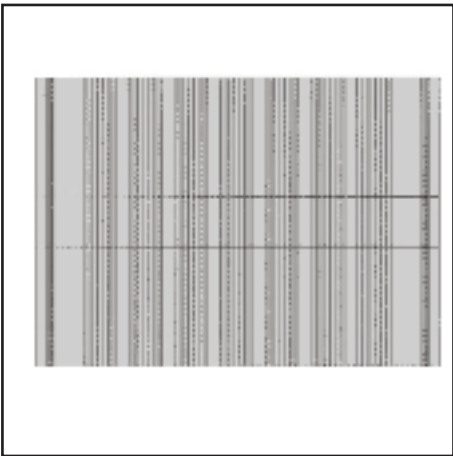
It is an epoxy replica of a master slide produced and certified by that laboratory. The replicas are mounted on microscope slides of 1.2 mm thickness with cover glass of 0.17 mm thickness.

The purpose of the slide is to provide a standard means to check the performance of phase microscopes prior to the analysis of asbestos. The pattern consists of seven bands of twenty lines with widths ranging from 0.25µ to 1.1µm.

A satisfactory system will detect block 5. Full details are supplied with the slide.

Pattern	Description	Order Code
S84	HSE Test slide for calibration in asbestos analysis (Band 5 version)	02F00490

Block No.	Ridge Width (Micrometers)	Maximum Calculated Phase Change (in degrees) for light rays (wavelength = 530 nanometers) passing through test objects.
1	1.08	6.6
2	0.77	4.7
3	0.64	3.9
4	0.53	3.2
5	0.44	2.7
6	0.36	2.2
7	0.25	1.5

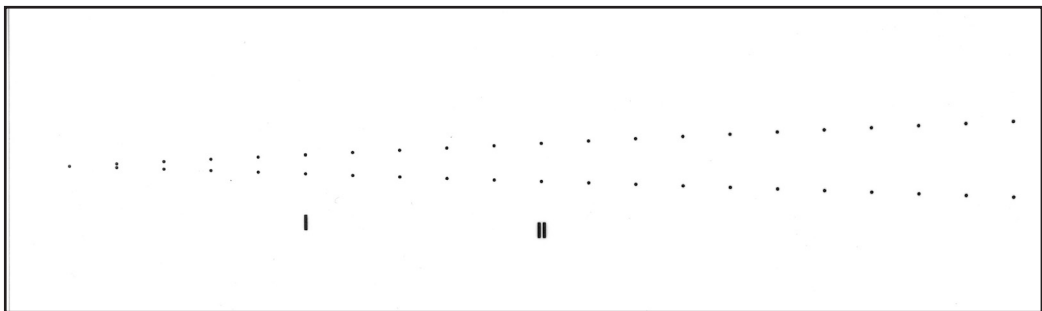


Vibration (FOE PPL Dot)

The amount of vibration of the slide in the appropriate axis is determined by the pair of dots which appear to merge into a single dot.

The pattern on the S25 is an array of 20 pairs of dots converging on a single dot. The distance between each dot pair increases by 0.001 inch to a maximum of 0.02 inches, pairs being equispaced 0.25 inch. Supplied on 76 x 26mm glass slide.

Pattern	Description	Order Code
S25	FOE PPL Dot vibration test pattern	02A00412



Finder Graticules

Finder graticules are used to swiftly and accurately give a position of reference to an area of interest on a specimen slide.

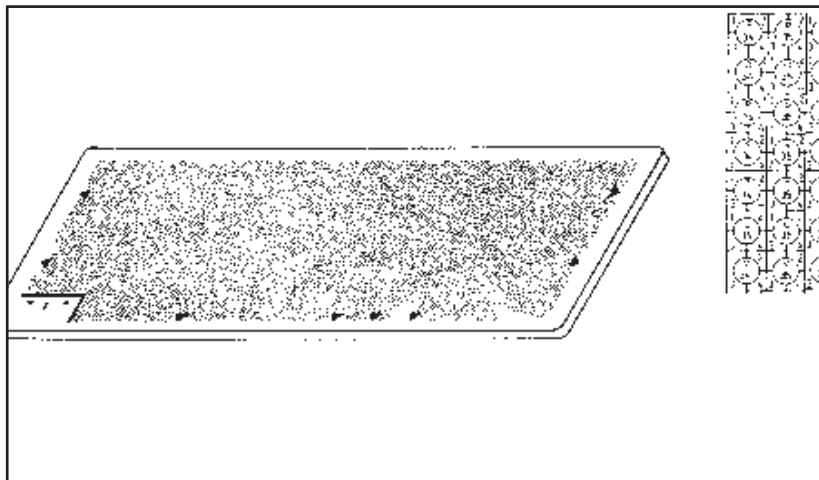
The England Finder - 9045 Findable Locations

The England Finder is a glass slide marked over the top surface in a way that a referenced position can be directly read relative to the locating edges.

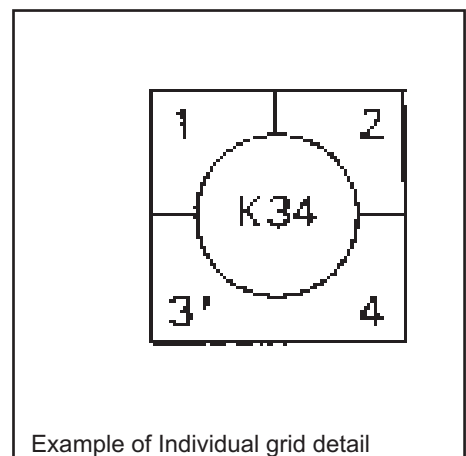
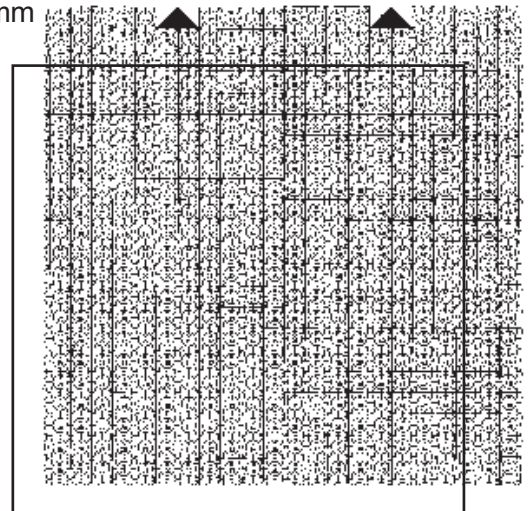
All England Finders produced by Graticules for over 40 years are identical. The purpose of the finder is to give the microscopist an easy method of recording the position of a particular field of interest, so that the same position can be re-located at a later date, or by another person in another laboratory, or when using any other England Finder on any other microscope.

The location of the arrows is identical for all England Finder slides. The method of use is as follows: Mark a label on the left hand side of the specimen slide, indicating the orientation to be repeated. By replacing the specimen slide with the England finder, taking care not to disturb the position, the feature of interest can be noted. The feature can also be re-located at another place or time by reversing the procedure. A total of 9045 positions on a 76mm x 26mm

Pattern	Description	Order Code
S7	The England Finder	02A00403



The ruled area is approximately 73mm x 24mm, each square is approximately 1mm and line width is nominally 25μ



Example of Individual grid detail

The Halton Finder

Pattern as per S7 but covers only a 5mm x 5mm area in the form of a stage graticule.

Pattern	Description	Order Code
S30	The Halton Finder	02A00413

PS-Range Stage Calibration Standards

Stage calibration standards differ from the stage micrometers in that they have a unique serial number etched into the surface of the slide mount, so they are fully traceable when supplied with a NPL or UKAS certificate of calibration. This means that they satisfy the requirements of ISO traceability.

a) Calibration by NPL

The National Physical Laboratory carries out measurements at selected points on the scales and grids and issues a certificate of calibration. This calibration is Internationally traceable.

b) Calibration by UKAS Accredited Laboratory

A UKAS accredited laboratory carries out measurements at selected points on the scales and grids and issues a calibration certificate. This calibration is Internationally traceable.

c) Measurement by Graticules

For applications which do not require the accuracy provided by calibrations carried out by NPL or a UKAS accredited laboratory, Graticules can provide a certificate of comparison. The scale or grid is compared with NPL calibrated in-house standards and a statement is provided on the accuracy of the item with respect to these standards. This calibration is Internationally traceable.

When ordering any of the following parts with calibration certificate please add a suffix to the order code

ie:- 05A01040/**NPL** for PS1 with NPL certificate

05A01040/**UKA** for PS1 with UKAS certificate

05A01040/**GRA** for PS1 with Graticules certificate



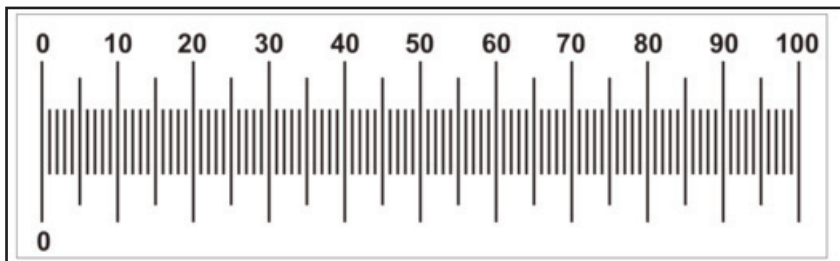
Microscope Standards for Calibration of Eyepiece Reticles & Imaging Systems

The scale is created as a vacuum deposited chrome image on a glass disc. The glass discs are then mounted in stainless steel slides with engraved serial numbers. Each slide is supplied in a polished wooden presentation and storage box to distinguish it as a traceable standard of high value.

For Transmitted Light

Pattern	Description	Line Width	Accuracy (overall)	Order Code
PS1	Micrometer scale 10mm in 0.1mm divisions	0.005mm (5 μ m)	Within 0.002mm	05A01040
PS4	Micrometer scale 0.1 inch in 0.001 inch divisions	0.002mm (2 μ m)	Within 0.0001 inch	05A01041
PS5	Micrometer scale 20mm in 0.01mm divisions	0.002mm (2 μ m)	Within 0.004mm	05B01048
PS8	Micrometer scale 1mm in 0.01mm divisions	0.002mm (2 μ m)	Within 0.001mm	05A01042
PS12	Micrometer scale 0.1mm in 0.002mm divisions	0.001mm (1 μ m)	Within 0.001mm	05A01043
PS16	Crossed micrometer scale 1mm in 0.01mm divisions	0.003mm (3 μ m)	Within 0.001mm	05A01040

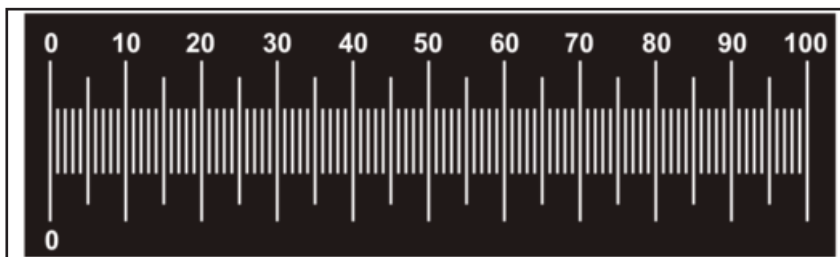
For longer scales see page 15



For Reflected (incident) Light

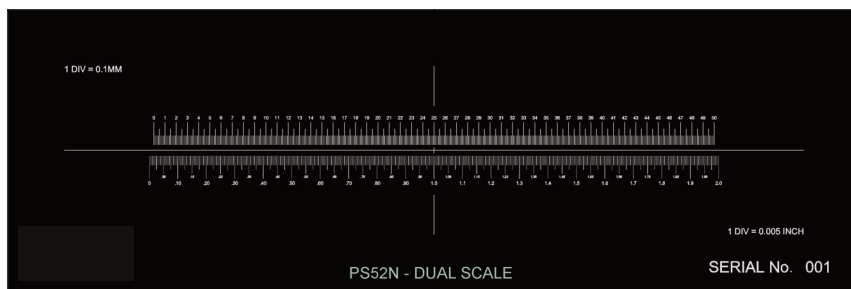
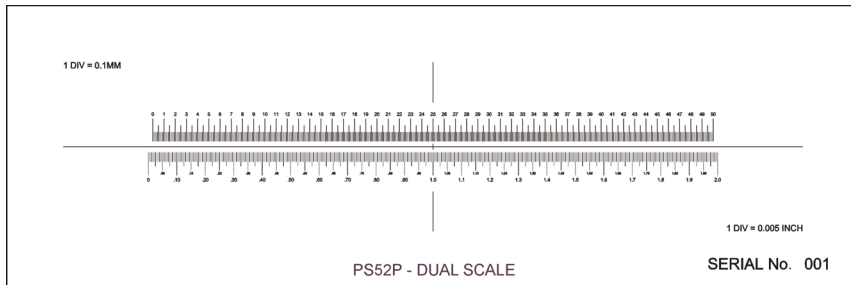
Pattern	Description	Line Width	Accuracy (overall)	Order Code
PS78	Micrometer scale 1mm in 0.01mm divisions	0.003mm (3 μ m)	Within 0.001mm	05B01050
PS1R	Micrometer scale 10mm in 0.1mm divisions	0.005mm (5 μ m)	Within 0.002mm	05A01047
PS5R	Micrometer scale 20mm in 0.01mm divisions	0.002mm (2 μ m)	Within 0.004 mm	05B01046
PS4R	Micrometer scale 0.1" in 0.0001" divisions	0.002mm (2 μ m)	Within 0.0001 inch	05A01049

For longer scales see page 15



New Dual Scale Calibration Slides

Graticules has introduced two new calibration slides that have the benefit of dual imperial/metric scales. The PS52P is for transmitted light applications and has a bright chrome positive image. The PS52N has a negative pattern, formed in low reflective chrome for incident light applications to give excellent contrast. Both are ideal for calibrating optical products with a large field of view, such as stereo microscopes or imaging systems.



Highlights

- New Dual-Scale Calibration Slides
- 2" Imperial (English) and 50mm Metric Scales on a Single Slide
- Positive and Negative Versions
- Unique Serial Number for Traceability
- Available with Internationally Traceable Certificates of Calibration

General Specification

Metric scale Imperial (English) scale Line thickness Accuracy (overall) Glass size/type Serial number Case Calibration certificate	50mm in 0.1mm divisions 2inch in 0.005inch divisions 12 microns Within $\pm 0.005\text{mm}$ 76mm x 25mm x 1.5mm, B270 Unique serial number on slide surface Supplied in polished wooden box Can be supplied with UKAS certificate of calibration which is internationally traceable and acceptable in all world markets
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Pattern	Description	Order Code
PS52P	Dual calibration scale for transmitted light (positive image), 50mm in 0.1mm, 2" in 0.005", serial numbered, supplied in wooden case	05B01052P
PS52P/UKA	As above but with UKAS certificate of calibration, 20 point check	05B01052P/UKA
PS52N	Dual calibration scale for incidental light (negative image), 50mm in 0.1mm, 2" in 0.005", serial numbered, supplied in wooden case	05B01052N
PS52N/UKA	As above but with UKAS certificate of calibration, 20 point check	05B01052N/UKA

Universal Calibration Slide

Calibration of microscopes and image analysis systems is becoming more sophisticated, with the requirement being for a variety of image patterns to satisfy the numerous parameters.

Multiple images on a single slide provide the most cost-effective solution to calibration and resolution checking of microscopes and image analysis systems. The combination of scales, dots, circles, squares, rulings, grids and angles can be supplied with an internationally traceable certificate of calibration for those who require ISO conformity.

Each glass slide has a unique permanent serial number and can be supplied with full or partial UKAS certificate of accuracy.

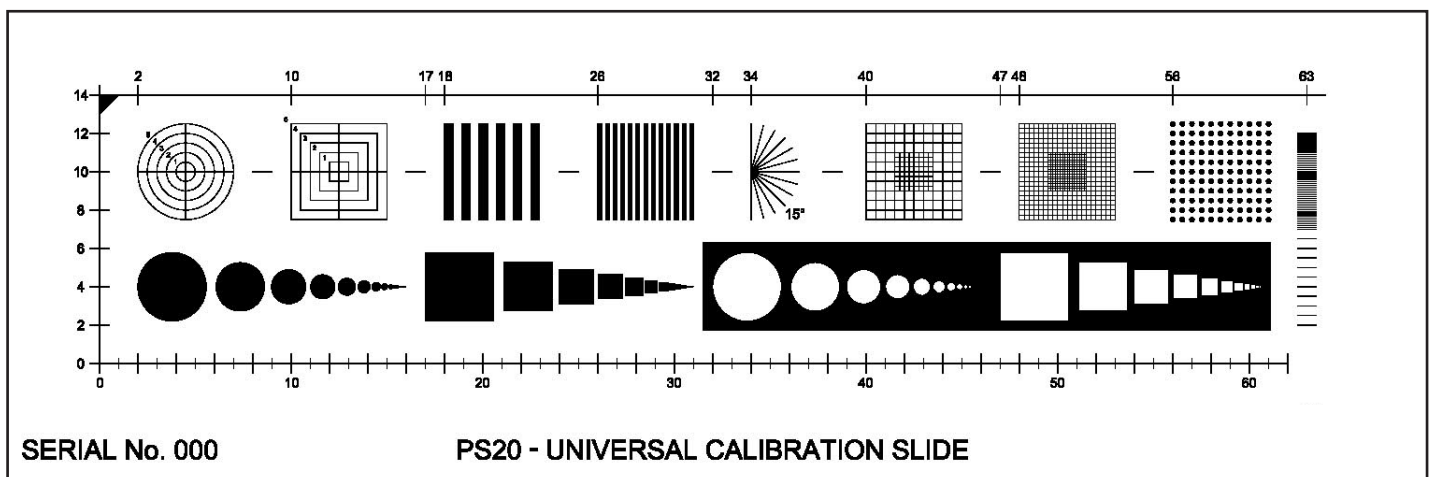


Starting from a fixed 'Datum point' mark, each individual pattern or array can be located using X, Y coordinates. See table (over).

Pattern	Description	Order Code
PS20	Universal calibration slide	05B01095

General Specification

General tolerance (microns)	Feature size	Tolerance
	≤ 10	0.5
	10-50	1.0
	50-127	1.3
	127-250	1.9
	> 250	2.54
62mm scale overall accuracy	± 0.003mm	
Coating	Enduring evaporated chrome image	
Optical density	>2.5	
Substrate	Soda lime glass	
Size	76mm x 25mm x 1.5mm	
Package	Polished wooden case	



For full details see over...

PS20 Universal Calibration Slide Image Details

ID	Pattern Name	Location	Description
A	Concentric Circles	X=2 Y=10	1, 2, 3, 4, 5mm Circles with Cross Line and circle identifier. Line width 20 μ m
B	Concentric Squares	X=10 Y=10	1, 2, 3, 4, 5mm Squares with Cross Line and circle identifier. Line width 20 μ m
C	Line Grating 25 lines /mm	X=18 Y=10	12.5 Line Pairs per mm (40 μ line 40 μ space)
D	Line Grating 100 lines /mm	X=26 Y=10	50 line pairs per mm (10 μ line 10 μ space)
E	Half Protractor	X=34 Y=10	15°Spacing Line width 20 μ
F	Grid Array Coarse	X=40 Y=10	5mm square array with 0.5mm divisions and central 2mm square with 0.25mm divisions. Line width 20 μ
G	Grid Array Fine	X=48 Y=10	5mm square array with 0.1mm divisions and central 2mm square with 0.05mm divisions. Line width 8 μ
H	Dot Array	X=56 Y=10	Dot diameter 0.25mm, dot centre to centre spacing 0.50mm — 11x11 grid=121 dots
I	Geometric progression of Opaque Dots	X=2 Y=4	<p>Line array of dot or square shapes, of either clear or opaque. Reducing in size in a Root 2 progression for the purposes of edge threshold detection to enable an image analyser to measure the size correctly, or general shape size comparison.</p> <p>Root 2 progression of 21 dots or square shapes, from 3.5μm to 3.5mm</p> <p>Nominal size in mm</p> <p>Dot/square size — Large to small in mm</p> <p>3.5833; 2.5338; 1.7917; 1.2669; 0.8959; 0.6335; 0.4479; 0.3167; 0.2240 0.1584; 0.1120; 0.0792; 0.0560; 0.0396; 0.0280; 0.0198; 0.0140; 0.0099; 0.0070; 0.0049; 0.0035</p>
J	Geometric progression of Opaque Squares	X=17 Y=4	
K	Geometric progression of Clear Dots	X=32 Y=4	
L	Geometric progression of Clear Squares	X=47 Y=4	
M	Vertical Scale Fine Variable	X=63 Y=2	<p>Overall Scale length 10mm.</p> <p>5mm in 0.5mm divisions. Line width 20μ</p> <p>4mm in 0.1mm divisions. Line width 10μ</p> <p>1mm in 0.01mm divisions. Line width 3μ</p>
N	Horizontal Scale Coarse	X=0 Y=0	Scale length 62mm long in 2mm divisions, subdivided in 1mm divisions with a 20 μ line width

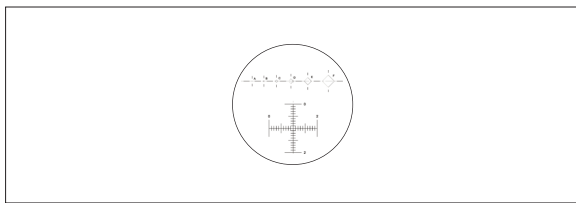
New Calibration Slides for Hardness Testers

Whichever test method you use, be it Vickers, Rockwell or Brinell, Graticules Optics have the ideal calibration slide for you. For many years companies have used products such as the S78 and S1R reflected light stage micrometer scales which give a very straightforward calibration on one axis. Following long discussions with manufacturers of Hardness Testing equipment Graticules Optics has introduced two new products specifically designed for this calibration with shapes to accurately replicate the impression.

For Vickers and Rockwell methods we offer the PS25 which has a series of diamond shapes of varying size and x-y scales. Each of the markings on the slide is clearly identified with its size. The PS25 has a glass disc with the image precision marked in vacuum deposited chrome and this is cemented into a stainless steel slide mount, making the item very durable. The slide has a unique serial number indelibly marked on the slide mount and can be supplied with an Internationally traceable certificate of calibration.

For Brinell methods we offer the PS26 which has a series of circles, to represent the ball indentation shape, of varying size and x-y scales. The PS26 has a precision marked chrome deposition image on a glass slide. Each of the markings on the slide is clearly identified with its size. The slide has a unique serial number indelibly marked on the slide mount and can be supplied with an Internationally traceable certificate of calibration.

Both products are supplied in a polished wooden box.

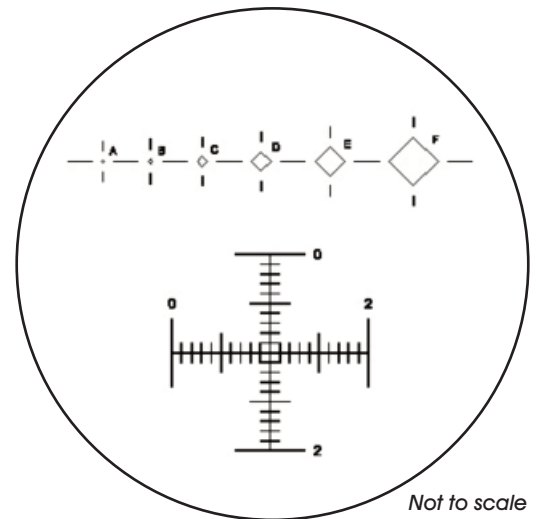


PS25 MKII Pattern Detail

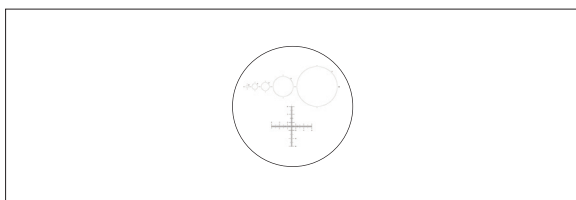
Diamonds: (Point to point, mm's) 0.5, 0.3, 0.2, 0.1, 0.05, 0.02

Scales: Horizontal & vertical, 2mm in 0.1mm divisions

Accuracy (overall) $\pm 0.0015\text{mm}$



*Not to scale
and shown as
positive image
for clarity*

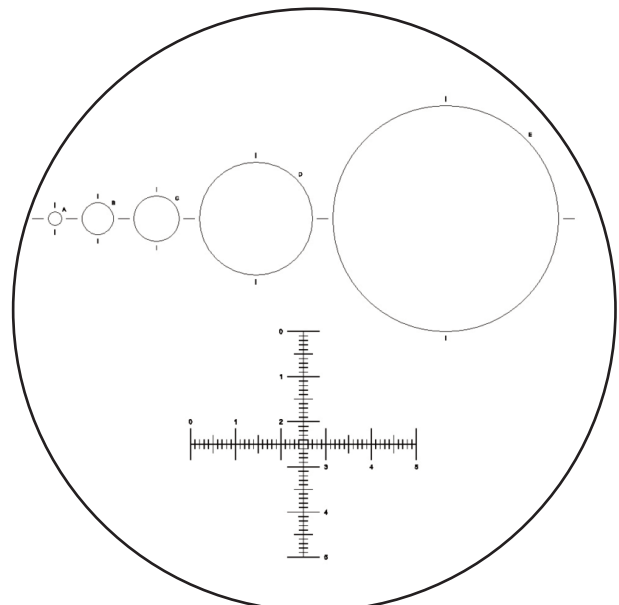


PS26 MKII Pattern Detail

Circles: (Diameter, mm's) 5.0, 2.5, 1.0, 0.7, 0.3

Scales: Horizontal & vertical, 5mm in 0.1mm divisions

Accuracy (overall) $\pm 0.0015\text{mm}$



Pattern	Description	Order Code
PS25	PS25 MKII Calibration slide for Vickers and Rockwell hardness testers, serial numbered, supplied in wooden case	05B01025
PS25/UKA	As above with UKAS (Internationally traceable) certificate of calibration	05B01025/UKA
PS26	PS26 MKII Calibration slide for Brinell hardness testers, serial numbered, supplied in wooden case	05B01026
PS26/UKA	As above with UKAS (Internationally traceable) certificate of calibration	05B01026/UKA

Calibration is performed by a UKAS accredited laboratory, whose measurements are traceable back to the UK's National Metrology Institute, the National Physical Laboratory. All of the NMI's in the world work in harmony under the International diplomatic treaty, the Treaty of the Metre signed in 1875. This means that all measurements carried out by the UKAS accredited laboratory are Internationally traceable so acceptable to satisfy the requirements of NIST, DIN and all other NMI's across the world.



High Definition Long Linear Combination Glass Scales

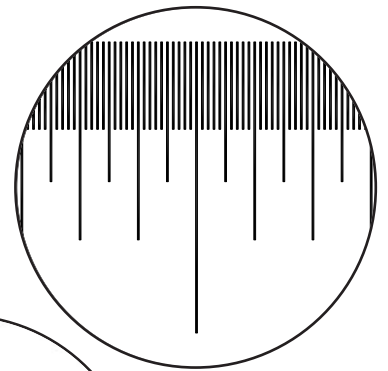
Superior PS-XO Versions

- High definition images for accurate calibration – line edge or line centre
- Dots, Crosses and Scales
- 300mm, 200mm, 150mm and 100mm lengths, all in 0.1mm divisions
- Extended 0.5mm, 1.0mm and 5.0mm lines allow calibrations in those increments too

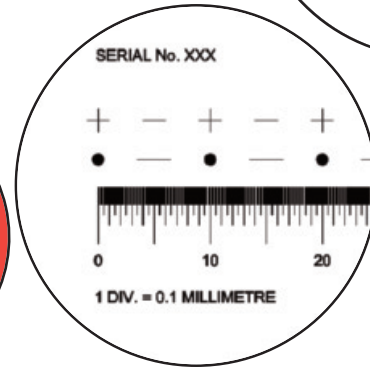


All supplied in wooden cases. Alternative glass types and calibrations available to special order.

Also
now available 70µ line
width high definition
100mm, 150mm, 200mm &
300mm scales
in 1mm divisions



Section images
from PS-XO
scales



PS300XO

Pattern	Description	Size	Order Code
PS300XO	300mm combination scale, 300mm ruling in 0.1mm divisions, 1mm dots at 10mm centres, crosses at 10mm centres, line width 0.03mm	330mm x 30mm x 6mm, green float glass, bright chrome image	05B01064
As above but with UKAS certificate of calibration, 10 points measured on scale			05B01064/UKA
PS200XO	200mm combination scale, 200mm ruling in 0.1mm divisions, 1mm dots at 10mm centres, crosses at 10mm centres, line width 0.03mm	230mm x 30mm x 6mm, green float glass, bright chrome image	05B01065
As above but with UKAS certificate of calibration, 10 points measured on scale			05B01065/UKA
PS150XO	150mm combination scale, 150mm ruling in 0.1mm divisions, 1mm dots at 10mm centres, crosses at 10mm centres, line width 0.03mm	180mm x 30mm x 6mm, green float glass, bright chrome image	05B01063
As above but with UKAS certificate of calibration, 10 points measured on scale			05B01063/UKA
PS100XO	100mm combination scale, 100mm ruling in 0.1mm divisions, 1mm dots at 10mm centres, crosses at 10mm centres, line width 0.03mm	130mm x 30mm x 6mm, green float glass, bright chrome image	05B01062
As above but with UKAS certificate of calibration, 10 points measured on scale			05B01062/UKA

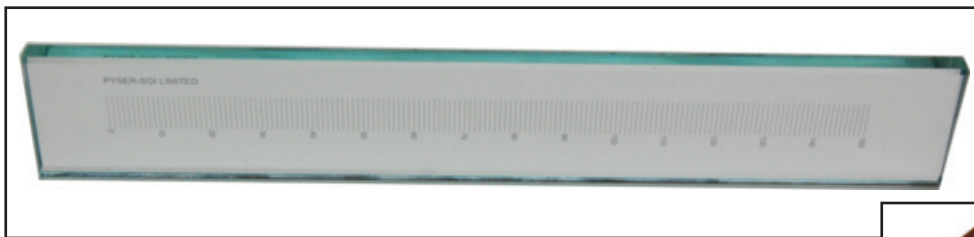
High Definition Long Linear Glass Scales

Parallax free readings - ideal for measuring systems and CMM's

High levels of accuracy and pattern definition. Hard wearing scales in vacuum deposited chrome on substantial glass substrates. For measurement and calibration of instruments and standards.

Pattern	Description	Line Width	Accuracy (overall)	Size (overall)	Order Code
PS100HS MKII	Long scale 100mm in 1mm divisions	0.07mm	Within 0.007mm	130mm x 30mm x 6mm	05B01069
PS150HS MKII	Long scale 150mm in 1mm divisions	0.07mm	Within 0.008mm	180mm x 30mm x 6mm	05B01066
PS200HS MKII	Long scale 200mm in 1mm divisions	0.07mm	Within 0.008mm	230mm x 30mm x 6mm	05A01067
PS300HS MKII	Long scale 300mm in 1mm divisions	0.07mm	Within 0.008mm	330mm x 30mm x 6mm	05B01068

All available with Certificate of Calibration



Measuring Scales

These are standard glass scales for in-contact measurements. Ideal for direct vision, for pocket magnifiers and for use in measuring profiles on projector screens.

Pattern	Description	Order Code
P6	Contact nonparallax scale 100mm in 0.1mm divisions. Overall size 125mm x 25mm x 3.0mm Line width 0.025mm	22B01300
P16	Contact nonparallax scale 300mm in 0.5mm divisions. Overall size 330mm x 30mm x 6.0mm Line width 0.10mm	22B01303

Standard Definition Long Linear Glass Scales

Pattern	Description	Line Width	Accuracy (overall)	Size (overall)	Order Code
PS50	Micrometer scale 50mm in 0.1mm divisions	0.012mm	Within 0.007mm	75mm x 75mm x 3mm	05B01051
PS100	Long scale 100mm in 0.1mm divisions	0.03mm	Within 0.015mm	130mm x 30mm x 6mm	05B01053
PS150	Long scale 150mm in 0.1mm divisions	0.03mm	Within 0.015mm	180mm x 30mm x 6mm	05B01055
PS300	Long scale 300mm in 0.1mm divisions	0.03mm	Within 0.025mm	330mm x 30mm x 6mm	05B01056
PS500	Long scale 500mm in 1mm divisions	0.07mm	Within 0.025mm	530mm x 30mm x 6mm	05B01057
PS1000	Long scale 1000mm in 1mm divisions	0.07mm	Within 0.025mm	1060mm x 30mm x 6mm	05B01058

Parallax free readings - ideal for profile projectors

Hard wearing scales in vacuum deposited chrome on substantial glass substrates. For measurement and calibration of instruments and standards.



Calibration Grids

For checking two-dimensional instruments for straightness and accuracy. The patterns are produced in vacuum deposited chrome on glass.

- Lines every 10mm
- Central 20mm subdivided in 1mm rulings.
- Line width 0.008mm
- Linear straightness 0.002mm.
- Angular accuracy within 5 seconds

	PGR 100	PGR 200
Overall divided area	100 x 100mm	140 x 220mm
Glass size	120 x 120mm	160 x 240mm
Glass thickness	6mm	6mm

Pattern	Description	Order Code
PGR100	Calibration grid	05B01030
PGR200	Calibration grid	05B01031

Available with Certificate of Calibration



NPL High Precision Optical Dimensional Standards

This range of high precision optical dimensional standards are supplied complete with internationally traceable certificates of calibration from NPL.

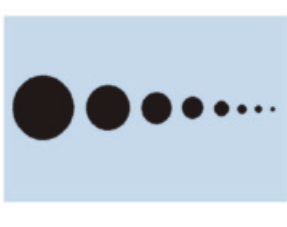
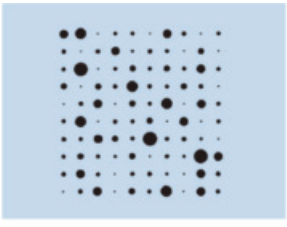
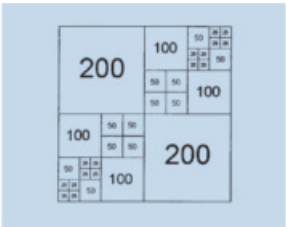
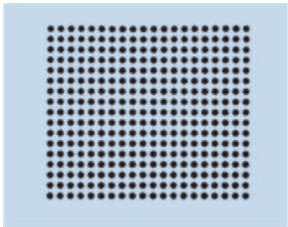
Image Analysis Standard (Reference Stage Graticule)

This calibration stage contains four test areas comprising; a 400 x 400 micron square grid, a 20 x 17 monosize array of 15 micron diameter spots, a Root-2 array of spots from 3 to 48 micron diameter, and a log normally distributed array of 100 spots ranging from 4.5 to 27 micron diameter. It is ideally suited for calibrating image analyser systems and can also be used as a high precision micrometer.

Pattern	Description	Order Code
RSG	Reference stage graticule 75mm x 25mm slide	05B01085

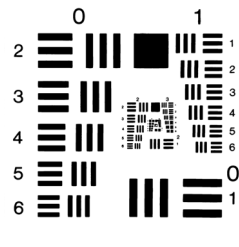
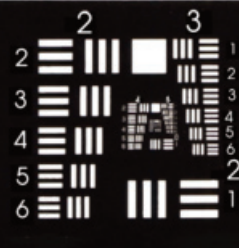
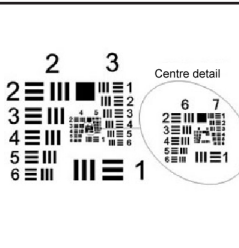
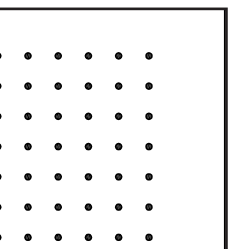
For all other NPL High Precision Dimensional Standards including:

- Two dimensional grid plate standards
- Line scale standards
- Line width standards
- Optical dimensional standards



USAF Test Chart

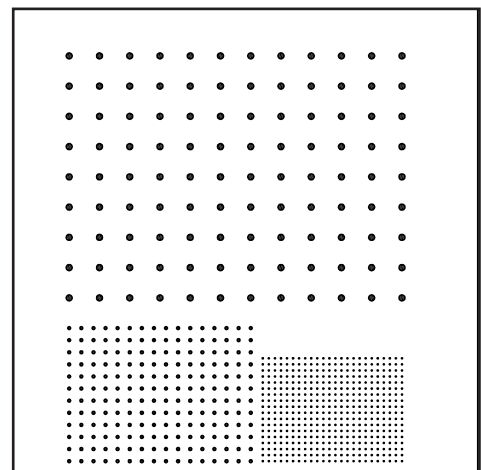
USAF resolution charts are recognised the world over as a universal standard for testing the vertical and horizontal resolution of imaging systems. Each element on the chart comprises three vertical bars and three horizontal bars, and the detail on these slides is as fine as 0.78microns (644 line-pairs per mm). The resolution of the imaging system is normally specified as the Group and Element of the finest bars that can be clearly defined - :

Pattern	Description	Order Code	
R70	USAF Test Chart, positive image. Group 0, element 1 to Group 7, element 6. B270 glass, size 50mm x 50mm	06B01096	
R71	USAF Test Chart, positive image. Group -2, element 1 to Group 7, element 6. B270 glass, size 75mm x 75mm	06B01097	
R75P	USAF Resolution Chart, positive version. Group 0, element 1 to group 9, element 3. Soda lime glass size 50mm x 50mm	06B01102	
R75N	USAF Resolution Chart, negative version. Group 0, element 1 to group 9, element 3. Soda lime glass size 50mm x 50mm	06B01103	
PS75P	USAF Resolution Chart, positive version. Group 2, element 1 to Group 9, element 3. Soda lime glass mounted in stainless steel microscope slide, with engraved serial number for traceability, 76mm x 25mm. Supplied in polished wood case.	05B01090	
PS75N	USAF Resolution Chart, negative version. Group 2, element 1 to Group 9, element 3. Soda lime glass mounted in stainless steel microscope slide with engraved serial number for traceability, 76mm x 25mm. Supplied in polished wood case	05B01091	

Grid Dot Arrays

- 3 image areas all on one plate
- Different dot size and pitch in each area
- Ideal for different magnifications to test field flatness, distortion and size

Sizes: 12 x 9 array of 1mm dots at 5mm pitch
 16 x 12 array of 0.5mm dots at 2mm pitch
 24 x 18 array of 0.2mm dots at 1mm pitch



Pattern	Description	Size	Order Code
R76	Grid dot array, 3 image areas, as detailed above	101mm x 101mm x 2.2mm, green float glass, high reflective chrome image	06B01104
Available with certificate of calibration.			

The grid dot array can be made on other substrates, other chrome finishes and white glass to special order.



**GRATICULES
OPTICS**

Graticules Optics Ltd

17-19 Morley Road, Tonbridge, Kent, TN9 1RN, UK