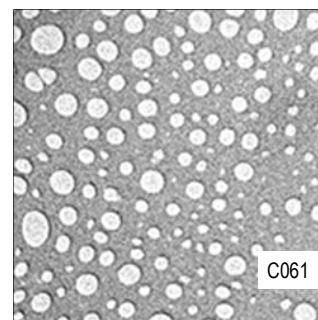


TEM Standards for Resolution & Magnification

Perforated Carbon Films

A carbon film containing many small holes of various sizes mounted on a 400 mesh 3mm \varnothing grid, used for correcting astigmatism and for checking the performance of the electron microscope. It is one of the quickest and easiest ways to check microscope resolution. The holes are circular with smooth edges.

C061 Perforated carbon film each



Lattice Plane Specimens

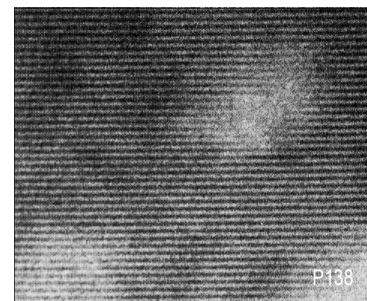
Crystal lattice plane specimens provide two measurement checks. They give a good test of microscope stability and as the spacing of the lattice is accurately known from X-ray measurements, they provide a calibration of magnification in the upper range of microscope magnification.

Copper Phthalocyanine

Plane spacing 1.0nm

Well documented in the literature for TEM the spacing gives a convenient test but the specimens are beam sensitive and quickly lose their crystallinity under the electron beam.

P138 Copper phthalocyanine on 3mm grid each

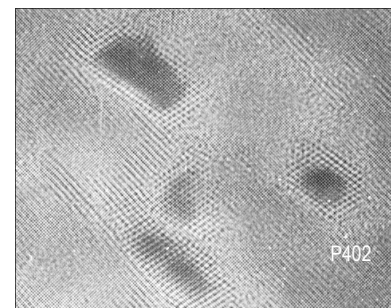


Chloro-Copper Phthalocyanine

Plane spacing 1.75 and 1.3nm

More irradiation resistant than copper phthalocyanine and therefore better for the visualisation of lattice planes. The sample must be tilted at 26.5° to the horizontal to reveal the spacings. Owing to preparation difficulties with this specimen the grid coverage is fragmentary and normal grid coverage is *not* achieved.

P402 Chloro-copper phthalocyanine crystals on 3mm grid each

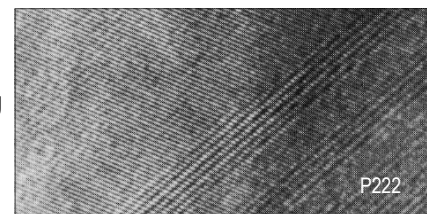


Crocidolite

Plane spacing 0.9nm and 0.45nm

The 0.9 spacing (020) is oriented along the axis of the crocidolite fibres. The 0.45 spacing appears at an angle of about 60° to this in suitable crystal orientations

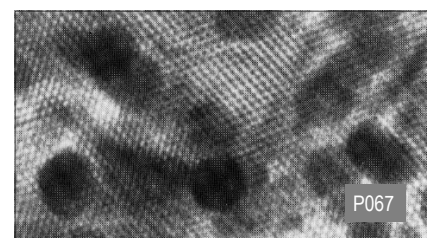
P222 Crocidolite on 3mm grid each

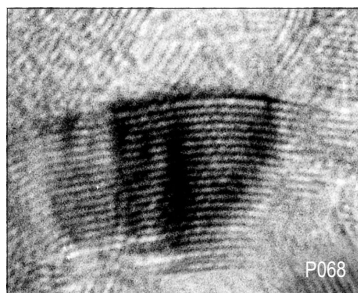


Potassium Chloroplatinate

Plane spacing 0.56nm

P067 Potassium chloroplatinate crystal on 3mm grid each





Graphitised Carbon Black

Plane spacing 0.34nm

Graphitised carbon black is stable and highly reproducible and is a popular standard resolution test for TEM's.

P068 Graphitised carbon black on 3mm grid. each

Single Crystal Gold Foil

Plane spacing 0.204nm, 0.143nm and 0.102nm

Higher resolution TEM's can be checked for resolution, image quality, magnification and instrumental stability by setting up the conditions for imaging 0.204nm, 0.143nm and 0.102nm planar spacings in these specially prepared crystals. The tests are particularly recommended if height adjustments are made on the specimen stage.

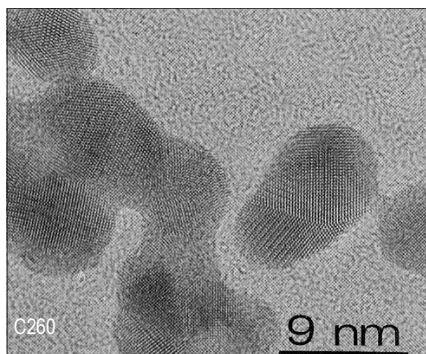
P066 Oriented single crystal gold foil on 3mm gold grid each

High Resolution TEM Test Specimens

Gold Particles on Carbon Film

Finely dispersed thin gold particles for tests of high resolution imaging capabilities of TEM's giving some advantages over Single Crystal Gold. The checking of image quality, magnification and instrumental stability can all be readily undertaken, but for the determination of resolution this gold particle specimen is superior since it offers a choice of crystalline orientations on static or low tilt stages. In addition the thickness of the crystalline material is easily calculated from the projected shape of the gold crystal.

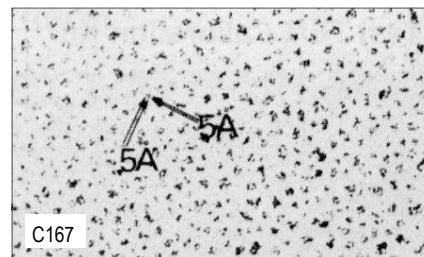
C260 High resolution test specimen gold on carbon 3mm grid each



Evaporated Platinum/Iridium

Evaporated platinum/iridium on a perforated carbon film. The support film provides holes for ease of focus and astigmatism correction. The grains of evaporated metal provide dense particles for resolution checks by the particle separation test

C167 Platinum/Iridium on perforated carbon on 3mm grid each



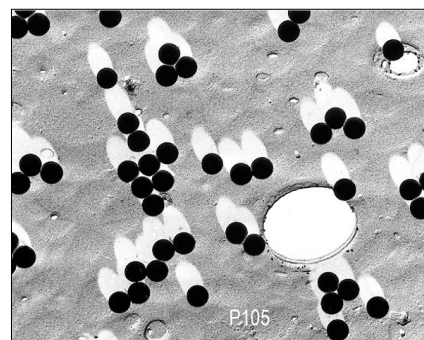
Shadowed Polystyrene Latex Particles

Shadowed latex particles of $0.216\mu\text{m}$ \varnothing provide dense markers and at the edges of the metal shadowing small metal aggregates may be found for particle separation resolution checks.

P105 Polystyrene latex beads $0.216\mu\text{m}$ \varnothing shadowed with palladium/platinum alloy on 3mm grid

P105/1 As above with beads $0.12\mu\text{m}$ \varnothing

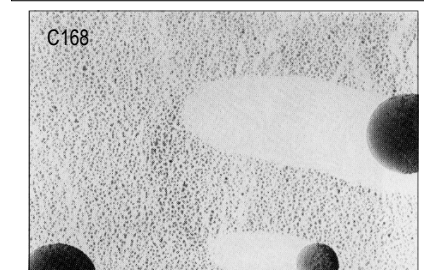
P105/2 As above with beads $0.945\mu\text{m}$ \varnothing



Gold Shadowed Latex

Heavily gold shadowed latex particles $0.22\mu\text{m}$ \varnothing on a carbon film. The gold forms islands of strongly scattering material and produces a test object suitable for **STEM**.

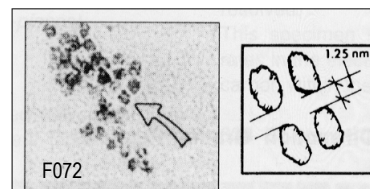
C168 Gold shadowed polystyrene latex particles on 3mm grid each



Ferritin

Some ferritin molecules display a quad structure with a separation of 1.25nm . This is useful as a resolution check. The ferritin is dispersed on a formvar/carbon substrate.

F072 Ferritin on 3mm grid each

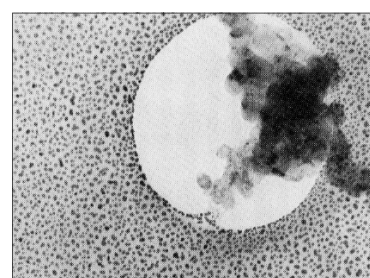


Combined Test Specimen

A perforated carbon film is shadowed with gold onto which graphitised carbon particles are deposited. These particles viewed over the holes may be used to assess factors limiting microscope performance. The evaporated gold forms small polycrystalline islands and within these islands, lattice fringes can be resolved.

This specimen can also be used for the **measurement of contamination rates in the electron microscope** by noting the deposition rate of carbon within the holes found in the gold film.

S529 Combined test specimen on 3mm grid each

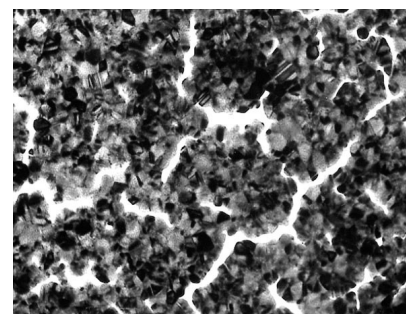


S529

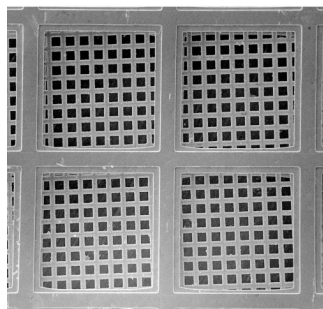
HVEM Standard

Low contrast on the viewing screen makes normal test specimens difficult to see in the HVEM. These specimens are grids coated with a thick layer of evaporated gold which forms crystallites containing lines of strong diffraction contrast. These are of different spacings allowing the performance to be checked at various levels.

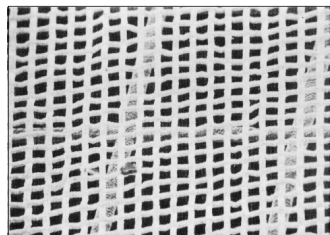
S530 HVEM test specimen, evaporated gold on 3mm grid each



S530



C138/C139



Calibration of TEM Magnification

Fine Copper, Nickel or Gold Mesh

Suitable for Light Microscopes, SEM's and the low magnification range of Transmission Electron Microscopes. The repeat distances are either 25 μ m (1000 mesh) or 12.5 μ m (2000 mesh). This material is not claimed to be of high accuracy over any one cell spacing. An average of at least 20 spacings should be taken to give reasonable accuracy.

- | | | |
|-------------|--|------|
| C138 | 1000 mesh copper in sandwich 3mm \varnothing grid | each |
| C139 | 2000 mesh copper in sandwich 3mm \varnothing grid | each |
| | Use suffix N for nickel or G for gold if required (e.g. 138/N or /G) | |

The mesh is also available in 25mm squares

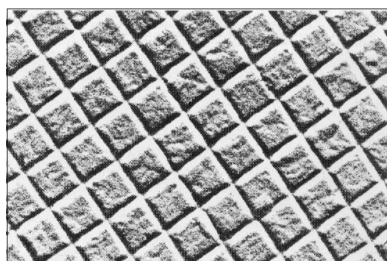
- | | | |
|-------------|------------------------------|------|
| C165 | 1000 mesh copper 25mm x 25mm | each |
| C166 | 2000 mesh copper 25mm x 25mm | each |

Diffraction Grating Replicas

Cross Grating Replica

Rulings of 2160 lines/mm ruled at 90° to one another to give additional accuracy to magnification calibration and aid in distortion checks. These replicas are fragile and should not be subjected to excessive exposure at high probe/beam currents.

- | | | |
|-------------|-----------------------------------|------|
| G073 | Cross grating replica on 3mm grid | each |
|-------------|-----------------------------------|------|



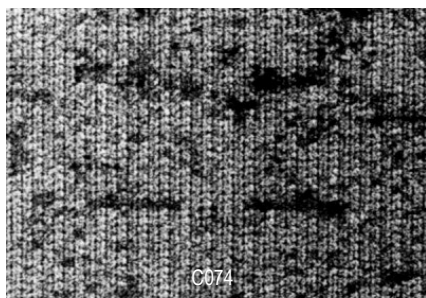
G073

Catalase

Negatively stained catalase crystals for TEM and STEM. The lattice plane spacings of approx. 8.75nm and 6.85nm show very clearly and are valuable for high magnification calibration.

- | | | |
|-------------|---------------------------------------|------|
| C074 | Catalase crystals mounted on 3mm grid | each |
|-------------|---------------------------------------|------|

For the very highest magnifications one of the crystal lattice plane specimens listed as a resolution check can be used e.g. **P068** or **P065**.



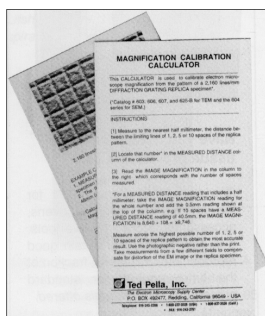
C074

Magnification Calibration Guide/Calculator

This calculator will give the correct magnification of a micrograph when used with a 2160 lines/mm grating replica (G072).

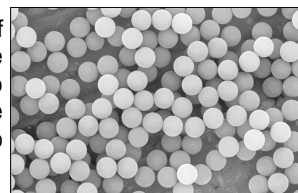
The measured distance between the lines of the replica pattern is set in a window in the calculator. The resultant magnification appears in an adjacent window.

- | | | |
|-------------|--------------------------------------|------|
| C405 | Magnification calibration calculator | each |
|-------------|--------------------------------------|------|



Certified Particle Size Standards

The Duke Scientific particle size standards are certified for mean diameter and are traceable to National Institute of Standards and Technology (NIST). The highly uniform polystyrene spheres are calibrated by NIST traceable methods which include photon correlation spectroscopy, TEM and LM. The range of diameters from 1µm to 1000µm is ideal for calibration of electron and optical microscopes and particle sizing instrumentation. A certificate of calibration and traceability is provided with each standard. Detailed physical and chemical properties are also shown.



Monosized Microsphere Size Standards

These are some of the most uniform spheres available in this size range. Products from 1 - 160µm are packaged as 15ml aqueous suspensions in dropper topped bottles. Diameters of 200µm and larger are packaged as dry spheres. The spheres have a density of 1.05g/cm³ and a refractive index of 1.59 @ 589nm wavelength.

Cat. No.	Nominal Diameter	Certified Mean Diameter	Size d'buton/Std Dev/CV	Solids Content
D191	1.0µm	0.993µm ± 0.021µm	0.010µm (1.0%)	1.0%
D192	2.0µm	2.013µm ± 0.025µm	0.022µm (1.1%)	0.5%
D208	5.0µm	4.988µm ± 0.035µm	0.05µm (1.2%)	0.3%
D209	7.0µm	6.992µm ± 0.050µm	0.07µm (1.0%)	0.3%
D193	10µm	9.975µm ± 0.061µm	0.09µm (0.9%)	0.2%
D194	15µm	15.02µm ± 0.08µm	0.15µm (1.0%)	0.3%
D210	20µm	20.00µm ± 0.10µm	0.20µm (1.0%)	0.3%

Other sizes available up to 1000µm. Please ask for Data Sheet

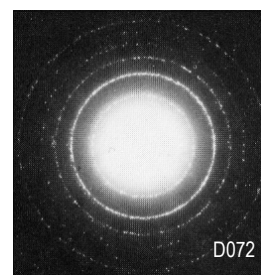
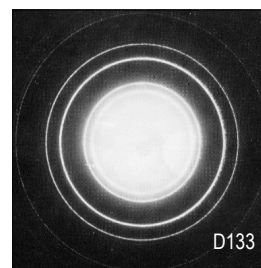
Diffraction Standards

Evaporated Aluminium Film

Camera Length

The nominal value of the effective camera length of an electron microscope operating in the selected area mode is not sufficiently accurate for any calculations of lattice spacing. The actual value of camera length must be calibrated at the same accelerating voltage and objective lens setting by reference to a known substance with well defined diffraction spacings. The normal specimens are evaporated films of *aluminium* or *thallous chloride*. The very small crystallite size yields ring patterns suitable for calibration purposes. Each specimen is supplied with a list of the principle lattice spacings.

D133	Evaporated aluminium film on 3mm grid	each
D072	Evaporated thallous chloride on 3mm grid	each

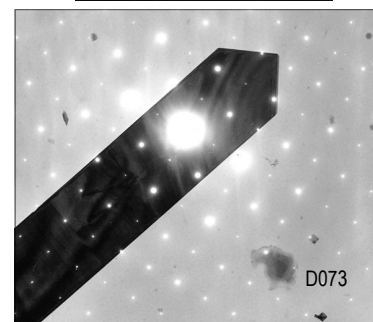


Molybdenum Oxide

Image Rotation

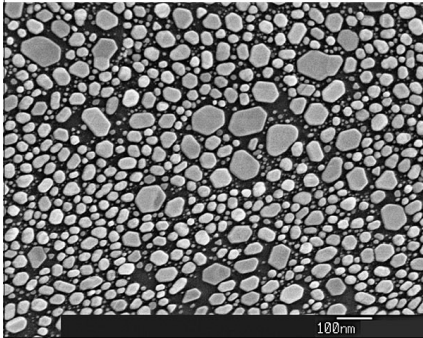
When changing from a selected area image of a specimen to a diffraction pattern, the strength of the intermediate lens is changed producing an image rotation between the image and the diffraction pattern. The amount of this rotation can be measured by photographing a crystal whose shape gives a clear indication of orientation. A molybdenum oxide crystal is very suitable for this purpose.

D073	Molybdenum oxide standard on 3mm grid	each
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SEM Calibration Specimens

High Resolution Gold on Carbon Test Specimen



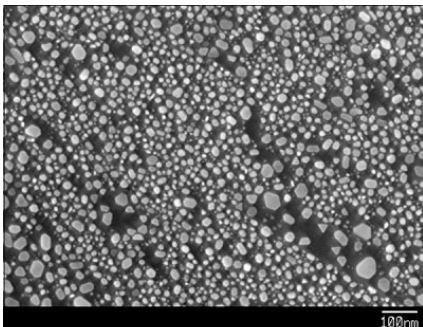
For assessing the resolution in SEM's this sample is suitable for tests of SE and BSE imaging and also for chemical mapping in high resolution systems such as an Auger scanning instrument.

Each specimen has a square grid pattern with large crystals in the centre of each grid square and very fine crystals at the edges of each grid. Hence medium and high resolution gap tests are performed on the same specimen. In addition the larger crystals show facets which allow an assessment of the grey level reproduction available at high resolution

Particle sizes range from approx. 5nm to 150nm.

- S120** High resolution Au-C test specimen on 12.5mm (½") pin stub
 - S194** High resolution Au-C test specimen on JEOL stub
 - S195** High resolution Au-C test specimen on ISI stub
 - S196** High resolution Au-C test specimen on Hitachi stub
- Available on other stubs to order - please ask

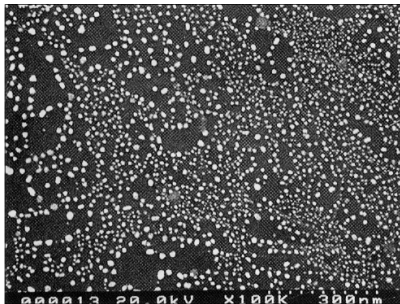
Ultra High Resolution Gold on Carbon >2nm-30nm



For very high resolution performance testing this specimen has a smaller gold island particle size compared with the S120 specimen above. Suitable for testing at instrument magnifications of 50,000x and above. Particle size range from >2-30nm

- S326** Ultra high resolution test specimen (gold) on 12.5mm (½") pin stub
 - S326J** Ultra high resolution test specimen (gold) on JEOL stub
 - S326I** Ultra high resolution test specimen (gold) on ISI stub
 - S326H** Ultra high resolution test specimen (gold) on Hitachi stub
- Available on other stubs to order - please ask

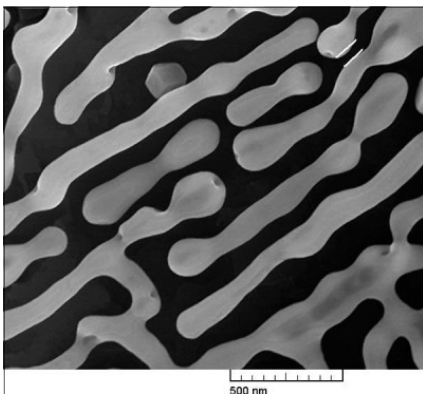
Ultra High Resolution Gold on Carbon <1nm-20nm



Particularly suited for assessing the image quality of ultra high resolution SEM's such as those fitted with field emission sources. A magnification of at least 80,000x is required to clearly resolve the gold particles. Particle size range from <3nm to 50nm.

- S328** Ultra high resolution test specimen (gold) on 12.5mm (½") pin stub
 - S328J** Ultra high resolution test specimen (gold) on JEOL stub
 - S328I** Ultra high resolution test specimen (gold) on ISI stub
 - S328H** Ultra high resolution test specimen (gold) on Hitachi stub
- Available on other stubs to order - please ask

Medium Resolution - Aluminium Tungsten Dendrites



The various spacings created by the dendritic structure give the gap test, and the topographical arrangement of the dendrites leads to the grey level test. The specimen is non-magnetic, vacuum clean, has no adverse reaction to the electron probe and requires no surface coating. It is most useful for working in the probe size range from 25 - 75nm. Supplied unmounted but can easily be attached to a stub with a proprietary stub adhesive.

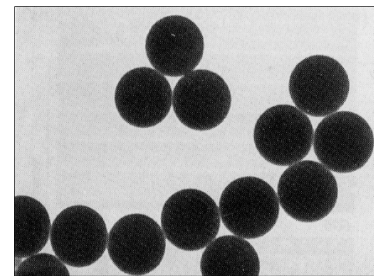
- S604** SEM medium resolution and grey level test specimen

Suspended Polystyrene Latex Spheres

A drop from a suspension of Dow Corning uniform polystyrene latex spheres can provide a useful size check when added to any preparation for TEM or SEM. The spheres can also act as a focus aid or to delineate structure of low slope when the preparation has been shadow cast. The particle sizes are listed below with the standard deviation.

It should be noted that although the standard deviations are very small, the suspension may contain some particles of materially different diameter from the mean. A statistically significant number of latex particles should be included in any micrograph where a size comparison is to be attempted.

It is important not to subject these spheres to excessive irradiation. All solutions are approx. 0.1% weight/volume. Packed in vials of 5ml.



Cat no.	Mean Ø µm	Standard deviation µm	Approximate particle concentration n/ml
P404	0.112	0.0010	1.29×10^{12}
P405	0.132	N/A	7.91×10^{11}
P406	0.182	N/A	3.02×10^{11}
P407	0.204	0.0019	2.14×10^{11}
P408	0.303	0.0019	6.60×10^{10}
P409	0.520	N/A	1.29×10^{10}
P410	0.945	N/A	2.34×10^{10}

Please Note



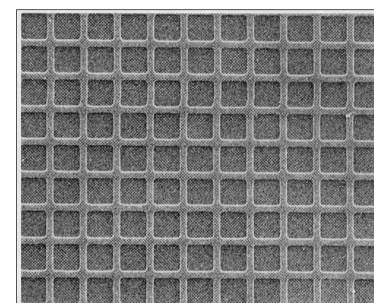
Actual mean diameters and concentrations can vary from batch to batch according to production circumstances. We will supply the nearest matching available spheres.

Silicon Test Specimen for SEM & LM

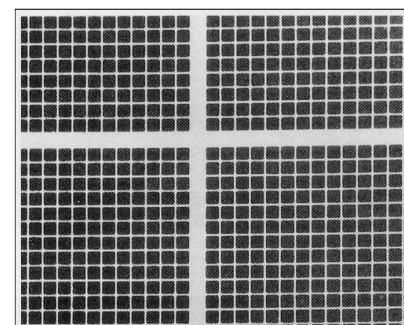
This test specimen is made of a single crystal silicon of overall dimension 5mm x 5mm. It is marked with clearly visible squares of periodicity of 10µm. The dividing lines are about 1.9µm in width and are formed by electron beam lithography. A broader marking line is written every 500µm. This is a very useful additional feature for Light Microscopy.

This is an excellent specimen for comparing magnification and assessing any distortion in the image field.

S336	Planotec silicon test specimen unmounted	each
S327	Planotec silicon test specimen on 12.5mm SEM stub	each
S336/C	Calibration certificate (can be supplied at extra cost if required) Available on other stub types - please specify	
S350	Planotec silicon test specimen for incident light microscopy	each



High Mag



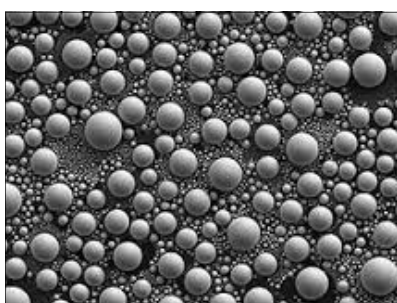
Low Mag

Resolution and Grey Level Test Specimens

SEM resolution is tested by a range of criteria including counteracting astigmatism, resolving gaps and measuring the number of grey levels in the image. This is to ensure that the resolution has not been distorted by using the contrast to maximise the visibility of edges. High resolution images should ideally show fine detail together with a lack of noise evidenced by a good range of grey levels.

Specimens are available for for checking medium, high and ultra high resolution including FE sources.

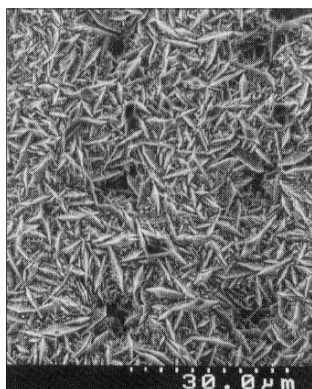
Medium Resolution - Tin on Carbon



An alternative specimen for medium resolution evaluation and for day to day visual checking of instrument performance. This specimen consists of a dispersion of tin spheres within the size range 10-40nm on a carbon substrate. It is ideal for astigmatism correction and is recommended for use in SEM's employed in the semiconductor industry where the usual gold on carbon sample cannot be used due to the risk of gold 'poisoning'.

- S605** Medium resolution tin on carbon specimen on 12.5mm (1/2") pin stub
- S605/J** Medium resolution tin on carbon specimen on JEOL stub
- S605/I** Medium resolution tin on carbon specimen on ISI stub
- S605/H** Medium resolution tin on carbon specimen on Hitachi stub

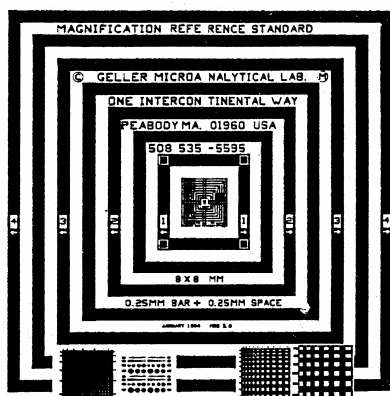
Prickly Gold for Astigmatism Correction



Pelco™ Prickly Gold mounted on a 1000 mesh grid gives clear, sharp, high contrast images that are easy to stigmatize. The presence of astigmatism is determined and corrected using this specimen.

- S606** Prickly gold on 12.5mm (1/2") pin stub
 - S606/J** Prickly gold on JEOL stub
 - S606/I** Prickly gold on ISI stub
 - S606/H** Prickly gold on Hitachi stub
- Available on other stubs to order - please ask
Also available unmounted

Magnification Reference Standard for LM, SEM, AFM etc



Transmitted Optical Image

This Geller reference standard is suitable for light microscopy (transmitted and incident light), scanning electron microscopy, scanning tunnelling and atomic force microscopy. It has patterns for calibration of particle size analysis systems and video spacial resolution determination.

The geometric design of the standard contains groups of concentric squares spanning several orders of magnitude with line widths and spaces of 250μm and 25μm and a fine pitch of 2μm. Measurements in the X-Y plane can be certified to NPL & NIST standards. The overall size is approximately 9 x 9 x 2.3mm. A 3mm version is available for use in TEMs in the SED and BED modes (uncertified).

Pattern accuracy is within ±0.1μm and the appropriate graphics are included on the standard for identification purposes. Suitable for use in the magnification range x10 to x50,000 the standard can also be used for checking image distortion and measuring tilt angles by observing 'foreshortening' of the image. The anti-reflective chromium pattern is coated on an optically transparent, electrically conductive thin film over fused silica. Further coating for SEM applications is not required. The use of a special holder is strongly recommended. The universal holder enables the standard to be used in the SEM, optical microscopes and other instruments. It can also be supplied mounted on a metal slide for optical use only (transmitted and incident light). Further details available.

- S607** Geller reference standard uncertified
- S607/C** Certified standard (NPL & NIST traceable)
- S607/XYZ** Certified standard X, Y & Z (NIST)
- S607/XYZ/N** Standard non certified 3mm Ø

Please add suffix "S" for universal holder and "O" for optical microscope holder

Critical Dimension (CD) Test Specimen

This specimen is of particular interest to microscopists and test engineers using high performance SEMs for critical measurement of semi-conductor line width dimensions.

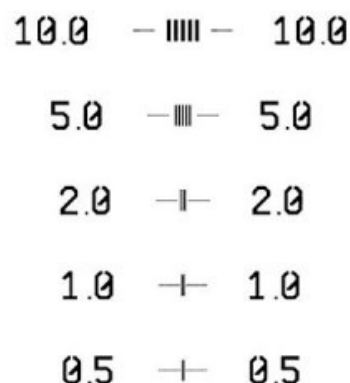
The 4.8 x 4.5mm silicon standard has a series of chess patterns around its edges with a side length of 480µm. These can be used for optimising imaging parameters and distortion checking.

The central area of the standard contains a series of four line patterns each clearly identified with its pitch size. Each pattern is made up from 5 bars and spaces of equal width. Pitches for the individual patterns range in size from 1.0µm - 10µm. Each standard is identified by a unique serial number.

Three forms are available - non certified, certified with the manufacturers certificate or certified by the German Physikalisch Technische Bundesanstalt. For certified standards each pitch is measured and a mean value calculated from a series of five measurements. Measured were made on a dedicated CD measuring system fitted to a FEG SEM at an accelerating voltage of 700eV. The specimen can be unmounted or mounted on any standard SEM stub - please specify.

S608 CD calibration specimen non certified **S608/MC** CD calibration spec. (manufacturers cert.)

S608/GPTB CD calibration specimen certified by GPTB



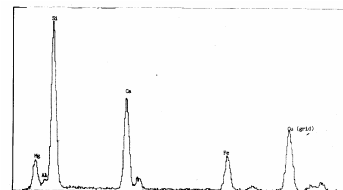
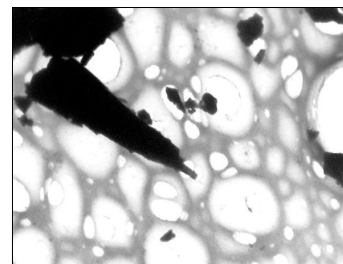
Standards for X-ray Microanalysis

X-ray Reference Standards for TEM

These standards are supplied as fine powders dispersed onto holey carbon films on 400 mesh 3mm Ø copper grids and are selected from a range of certified material and synthetic compounds. The universal set contains 25 compound standards and the rare earth set 14 compounds.

S609 Universal TEM X-ray standard set

S610 Rare earth TEM X-ray standard set

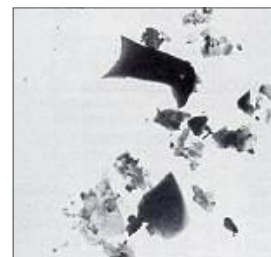


X-ray energy spectrum for Augite

Boron Carbide Standard

A dispersion of small boron carbide particles on a 3mm carbon coated grid which provides a low atomic number analysis standard for determining the energy resolution of wavelength dispersive X-ray spectrometers

S611 Boron carbide on 3mm grid each

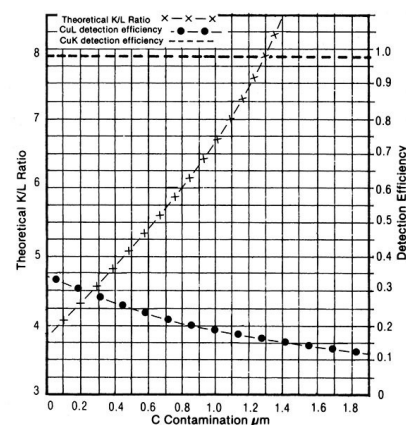


Copper Foil on Aluminium Grid

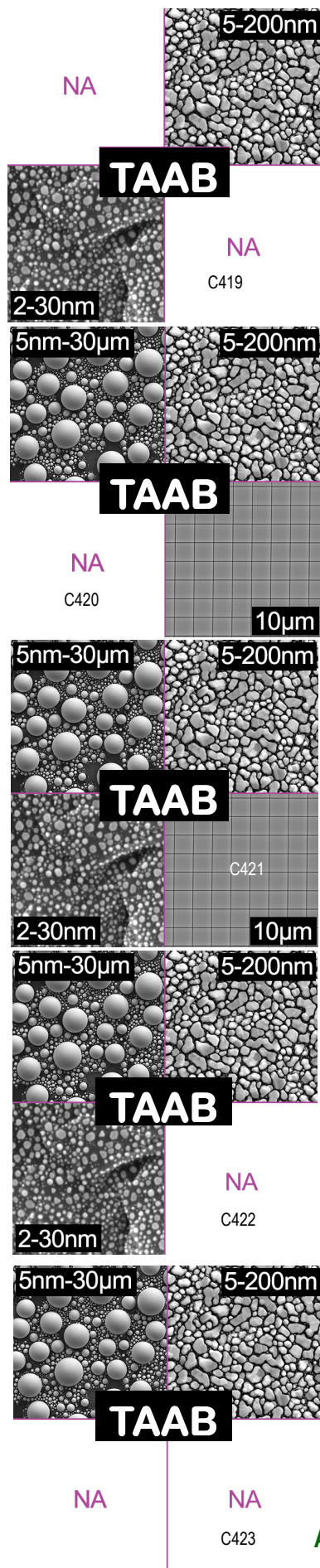
A specimen used to determine detector efficiency.

This is a dual purpose specimen which generates two well separated K-lines to check the calibration of the X-ray detector. The aluminium generates a low energy line at 1.49keV and the copper K-alpha peak occurs at 8.04keV. The copper film has a very uniform thickness of about 60nm and carbon coated on both sides. The ratio of the Cu K/Cu L X-ray intensities is measured for assessing detector efficiency. Although detector efficiency is assumed to be constant any contaminant on the beryllium window can be detrimental to performance.

S612 Calibrating copper foil for X-ray detectors on 3mm grid each



SEM Multi & Combination Test Standards



Gold on Carbon resolution standards with their varying sized gaps between gold crystals on a carbon substrate allow tests for resolution, as well as checking the quality of grey-level reproduction at high resolution. **Tin on Carbon** resolution standard is good for astigmatism and image shift measurements for SEMs. The **Ruled Silicon Grid** is excellent for comparing magnification and assessing distortion in the image field.

Gold and Hi Res Gold on Carbon

C419/P	Dual standard gold & Hi Res gold on carbon	12.5mm Ø pin stub
C419/H	Dual standard gold & Hi Res gold on carbon	15mm Ø Hitachi Stub
C419/J	Dual standard gold & Hi Res gold on carbon	10mm Ø JEOL Stub

Tin and Gold on Carbon with Ruled Silicon

C420/P	Triple standard Tin & gold on carbon & ruled silicon	12.5mm Ø pin stub
C420/H	Triple standard Tin & gold on carbon & ruled silicon	15mm Ø Hitachi stub
C420/J	Triple standard Tin & gold on carbon & ruled silicon	10mm Ø JEOL stub

Tin, Gold and Hi Res Gold on Carbon with Ruled Silicon

C421P	Multi standard Tin, Gold, & Hi Res Gold on carbon and ruled Silicon	12.5mm Ø pin stub on
C421/H	Multi standard Tin, Gold & Hi Res Gold on carbon and ruled Silicon	15mm Ø Hitachi stub
C421/J	Multi standard Tin, Gold & Hi Res Gold on carbon and ruled Silicon	10mm Ø JEOL stub

Tin, Gold and Hi Res Gold on Carbon

C422/P	Triple standard Tin, Gold & Hi Res Gold on carbon	12.5mm Ø pin stub
C422/H	Triple standard Tin, Gold & Hi Res Gold on carbon	15mm Ø Hitachi stub
C422/J	Triple standard Tin, Gold & Hi Res Gold on carbon	10mm Ø JEOL stub

Tin and Gold on Carbon

C423/P	Dual standard Tin & Gold on carbon	12.5mm Ø pin stub
C423/H	Dual standard Tin & Gold on carbon	15mm Ø Hitachi stub
C423/J	Dual standard Tin & Gold on carbon	10mm Ø JEOL stub

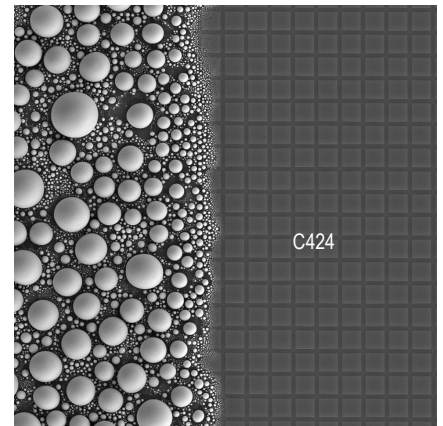
All combination standards can be mounted on a stub of your choice to special order

SEM Combination Test Standards cont

Tin on Ruled Silicon Magnification and Resolution Standard

C424/P	Dual standard Tin on Silicon resolution	12.5mm pin stub
C424/H	Dual standard Tin on Silicon resolution	15mm Hitachi stub
C424/J	Dual standard Tin on Silicon resolution	10mm JEOL stub
C424	Dual standard Tin on Silicon resolution	unmounted

Save time effort and money by using our SEM Multiple Combination Standards where you can move immediately from one standard to the next. **Ideal for Benchtop SEMs.**



SEM Magnification Calibration Standards

The **MCS series** calibration standards can be used with standard and table top SEMs. FESEM, FIB, Auger, SIMS and incident light microscope systems. They are an excellent replacement for the discontinued **SIRA** standard and can be used for **magnification** or **critical dimension** measurements. Two ranges are available with either **NIST traceability** or optionally **Individual Certification**.

MCS-1 for compact or table top SEMs with a scale from 2.5mm to 1µm covers 10x - 20,000x magnifications.

MCS-0.1 for larger SEM, FESEM and FIB systems with a scale from 2.5mm to 100nm covers 10x - 200,000x magnifications.

Manufactured from fully conductive materials with all features on an ultra-flat plane, compatible with both SE and BSE imaging. Easily plasma cleaned.

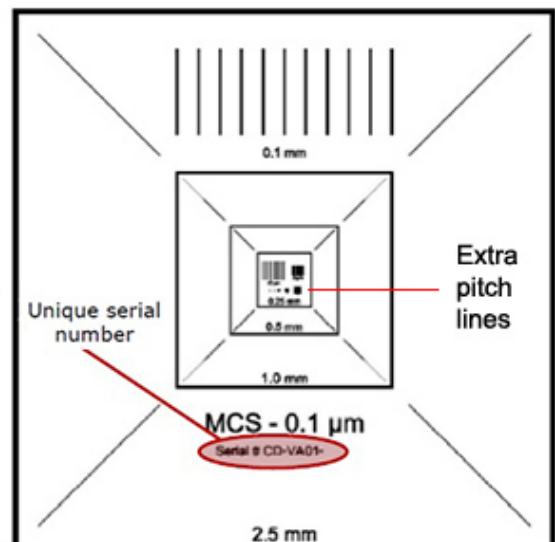
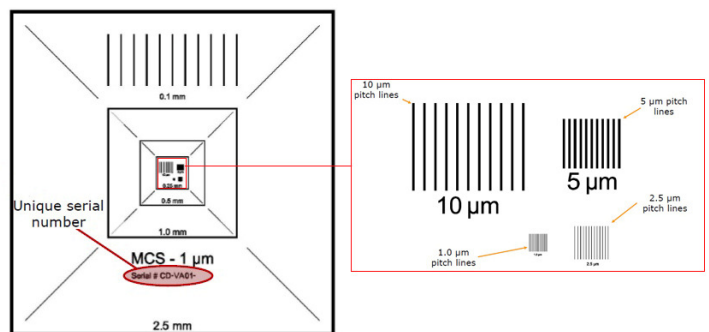
Traceable uniformity 0.2% or better Certified uniformity 0.03% Supplied unmounted in Gel-Pak box

- C425 MCS-1TR **traceable calibration standard** unmounted
- C425/P MCS-1TR on 12.7mm std pin stub
- C425/Z MCS-1TR on Zeiss 12.7mm pin stub
- C425/J MCS-1TR on JEOL 12.2mm stub
- C425/H MCS-1TR on Hitachi 15mm stub

- C426 MCS-1CF **NIST certified calibration std** unmounted
- C426/P MCS-1CF NIST certified on 12.7mm std pin stub
- C426/Z MCS-1CF NIST certified on Zeiss 12.7mm pin stub
- C426/J MCS-1CF NIST certified on JEOL 12.2mm stub
- C426/H MCS-1CF NIST certified on Hitachi 15mm stub

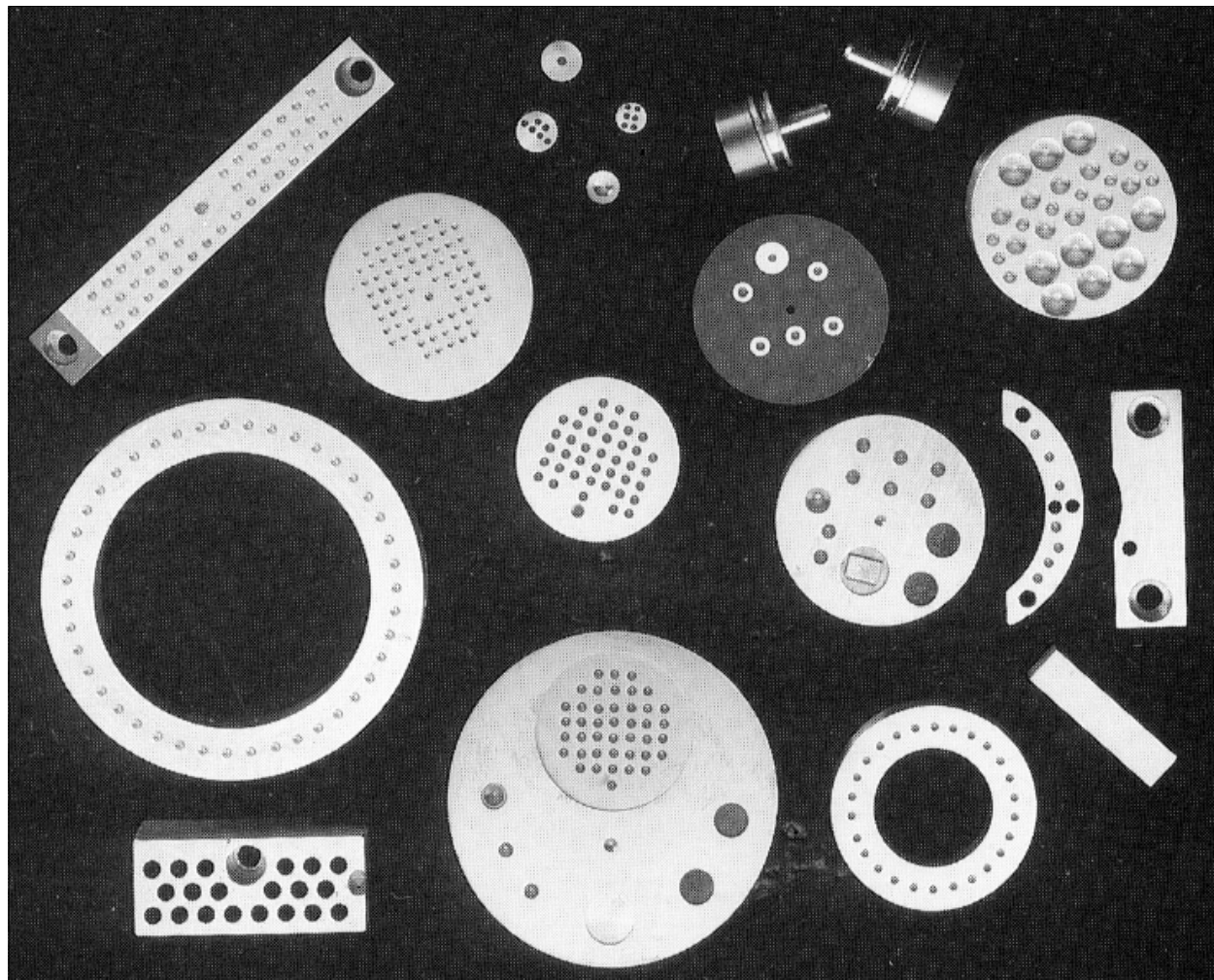
- C427 MCS-0.1TR **traceable calibration standard** unmounted
- C427/P MCS-0.1TR on 12.7mm standard pin stub
- C427/Z MCS-0.1TR on Zeiss 12.7mm pin stub
- C427/J MCS-0.1TR on JEOL 12.2mm stub
- C427/H MCS-0.1TR on Hitachi 15mm stub

- C428 MCS-0.1CF **NIST certified calibration std** unmounted
- C428/P MCS-0.1CF NIST certified on 12.7mm std pin stub
- C428/Z MCS-0.1CF NIST certified on Zeiss 12.7mm pin stub
- C428/J MCS-0.1CF NIST certified on JEOL 12.2mm stub
- C428/H MCS-0.1CF NIST certified on Hitachi 15mm stub



X-ray Reference Standards for SEM

Micro Analysis Consultants Range



Examples from the Range of Standard Holders Available

We can supply standards from **Micro Analysis Consultants** that are suitable for electron beam Energy Dispersive or Wavelength Dispersive X-ray microanalysis systems. Only high quality reference samples are used for fitting into the brass blanks (or aluminium, stainless steel or carbon resin to order) after diamond polishing to a 0.25 μ m finish. They are then carbon coated.

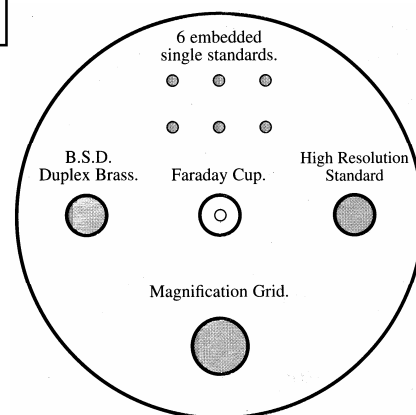
All samples are supplied with a certificate of analysis and many standards are traceable to a national institution. Each block of standards has its own unique number and comes with a map for standard identification. A Faraday cage for accurate specimen current measurements is standard on some blocks and available as an option on others. Carousels, 13mm \varnothing blocks to fit pin stubs and singles of 5mm, 3mm and 2mm are also available.

SEM Calibration Block

This block of standards is used to calibrate, set up and check most of the functions of an SEM with optional Energy-Dispersive X-ray analysis, Specimen Current and Backscattered Electron Detector.

4 styles available in 32mm x 8mm brass block
1 version available in 50mm x 8mm brass block

S613 SEM calibration block each



Backscattered Electron Detector Calibration Standard

30mm x 5mm Carbon Block. Checks Detector and SEM performance with certified standards for system calibration.

Contains:

Standards to check 1 Atomic number resolution
Faraday cage to set probe current
Duplex brass to check 0.1 Atomic number resolution

S614 Backscattered ED calibration standard each

Also available 5mm x 5mm single standards containing 2 elements:

S615/1 Platinum/Gold (Atomic numbers 78/79) each

S615/2 Palladium/Silver (Atomic numbers 46/47) each

S615/3 Nickel/Silver (Atomic numbers 28/29) each

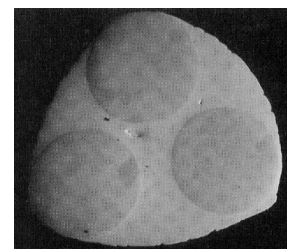
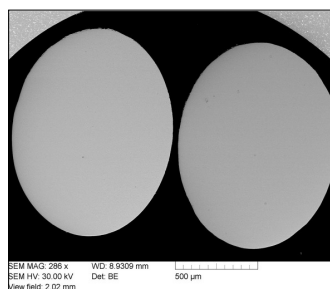
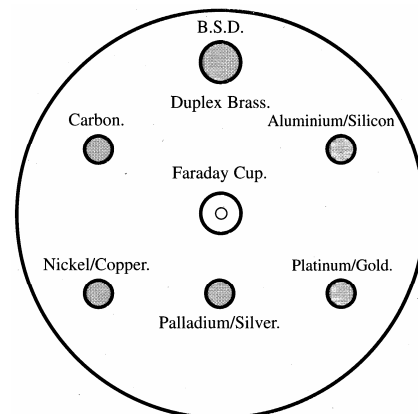
S615/4 Aluminium/Silicon (Atomic numbers 13/14) each

S615/6 Copper/Nickel each

5mm x 5mm single standard containing:

S615/5 Duplex brass (0.1Z Mean atomic number between phases)

Other block combinations available - please ask



Standard Sets

Biological Block

BN	Al	CaCO ₃	FeS ₂	BaSO ₄
C	SiO ₂	CaCO ₄	Se	B1
NaCl	KCl	Ti	InP	Faraday Cup
MgO	KBr	V	BaF ₂	Cup

S244 25mm Ø Biological block with Faraday Cage

S245 32mm Ø Biological block with Faraday Cage

Semiconductor Block

B	Si	CuS ₂	Ge	InSb
C	CaF ₂	ZnS	Ag ₂ S	HgTe
Mg ₂ Sn	FeSi ₂	GaP	CdS	PbTe
Al ₂ SiO ₃	Fe ₂ S ₂	GaAs	InP	Bi ₂ Se ₃
		Bi ₂ Te ₃		

S248 25mm Ø Semiconductor standards set

S249 32mm Ø Semiconductor standards set

42 Standard Universal Block

Jade	Fe	SrF ₂	InAs	Ir
MgO	FeS ₂	Y	Sn	Pt
Al ₂ O ₃	Co	Zr	Sb	Au
Ortho	Ni	Nb	BaF ₂	HgTe
Wollas	Cu	Mo	LaB ₆	PbTe
Ti	Zn	Rh	CeAl ₂	Bi
V	GaP	Pd	Hf	
Cr	Ge	Ag	Ta	
Mn	Se	Cd	W	

S242 Universal block 25mm Ø

S243 Universal block 32mm Ø

Rare Earth (REE-glass) Block

Y,Pr,Dy,Er
Ce,Eu,Ho,TM
All 15

La,Sm,Gd,Yb
Nd,Tb,Lu
Glass Blank

S353 Rare earth (REE-glass) block 25mm Ø

Rare Earth Block

LaB₆ NdF₃ TbF₃ ErF₃
LaF₃ SmF₃ TbSi₂ Tm
CeAl₂ EuF₃ DyF₃ TmSi₂
PrF₃ GdF₃ HoF₃ YbF₃
LuF₃ LuSi₂

S246 Rare earth block 25mm Ø

S247 Rare earth block 32mm Ø

45 Standard + FC Universal Block

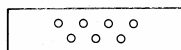
B	V	GaP	Pd	Hf
BN	Cr	Ge	Ag	Ta
C	Mn	Se	Cd	W
Jade	Fe	SrF ₂	InAs	Ir
MgO	FeS ₂	Y	Sn	Pt
Al ₂ O ₃	Co	Zr	Sb	Au
Ortho	Ni	Nb	BaF ₂	HgTe
Wollas	Cu	Mo	LaB ₆	PbTe
Ti	Zn	Rh	CeAl ₃	Bi

S354 45 Standard + FC universal block 25mm Ø

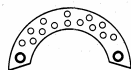
S355 45 Standard + FC universal block 32mm Ø

Special Holders for EMs

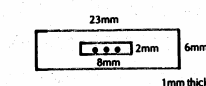
S250 for JSM 35



S251 for JEM 100CX



S252 for JXA 733



S253 for Jeol Temscan

These holders are *specials* and are hand polished. Pricing is **per holder** and not the number of specimens in the holder. A holder containing 10 standards in a 21 standard holder is the *same price as the holder with 21 standards*.

S250 JSM 35 standard block containing 21 standards

S251 JEM 100CX STEM block containing 7 standards

S252 JXA 733 standard holder containing 12 standards

S253 JEOL Temscan bulk holder containing 3 standards

Others available to special order

Transmission Standards**Thin Foil**

A comprehensive range of high purity metal foils 3mm x 0.1mm Ø to fit into TEM grid holders for use in STEM mode. They are polished to a 3 µm finish.

Al	Hf	Ni	Ag	V
Cd	In	Nb	Ta	Y
Co	Fe	Pd	Sn	Zn
Cu	Mg	Pt	Ti	Zr
Au	Mo	Rh	W	316

S254 Thin foil standard set

Thin Film

A range of thin film microanalysis standards for calibrating energy-dispersive detectors for thin film microanalysis. These come on 3mm Ø copper (or user choice) grids or holey carbon films for TEMs.

Universal Thin Film Sets

Ag ₂ Te ₃	CaWO ₄	GaAs	KAlSi ₃ O ₈	K453
BaSO ₄	CdTe	Gd ₃ Ga ₅ O ₁₂	LaB ₆	SrTiO ₃
Be ₃ Al ₂ Si ₆ O ₁₈	CeAl ₂	HgTe	Li ₂ Ta ₂ O ₆	TiBr
Bi ₂ Se ₃	Cu ₂ S	InP	(Mg,Fe) ₂ SiO ₄	ZnS
CaMoO ₄	FeCr ₂ O ₃	InSb	Na ₃ AlF ₆	ZrSiO ₄

S255 Universal thin film set on 3mm grid

Rare Earth Thin Film Set

CeAl ₂	HoF ₃	SmF ₃	DyF ₃	LaF ₃	TbF ₃	ErF ₃
LuF ₃	TmF ₃	EuF ₃	NdF ₃	YbF ₃	GdF ₃	PrF ₃

S256 Rare earth thin film set on 3mm grid

Compound and Pure Standards

Compound standards are available from Augite (Ca,Mg,Fe)₂(SiAl)₂O₆ to Zircon ZrSiO₄.

Pure standards are available from Ag (silver) to Zr (Zirconium)
Please ask for quotation.

MBH/NIST/NBS/BAS Material

A range of materials to the above standards is available including stainless steels, brass, gold/copper wires, phosphor bronze etc., etc.

Please ask for list

EM Calibration Standards 3

Chessy SEM Calibration Specimen

Applications

Imaging

- Calibration of SEM magnification in all ranges between 20x and 50,000x
- Check of equal scaling in X and Y
- Check of orthogonality and distortion
- Resolution test at high magnification on the edges of the gold squares

Motorised stages

- Measurement of reproducibility using stored positions
- Calibration of readings in X and Y
- Calibration of stage orthogonality
- Measurement of absolute positioning accuracy

Experimental Electron Lithography

- Generation of metric writing fields between 10 μ m and 5mm square via mark recognition and alignment
- Measurement of SEM distortion at any magnification via mark recognition on different places
- Check of defocusing in outer areas

Structure

There are more than 1.6 million gold squares on 1 μ m size of silicon forming a 4-fold checkerboard pattern in an area 5mm square. The smallest metric checkerboard has a size of 10 x 10 μ m. Such checkerboards form large metric checkerboards of 100 x 100 μ m and these again form checkerboards of 1mm square. Finally such 1mm squares are arranged in the same manner covering a field of 5mm square.

The edges of the empty corners in 100 μ m checkerboards are additionally marked. The surrounding frame is 10 μ m wide and has an outer side length of 5.04mm.

C340 Chessy Calibration Specimen

