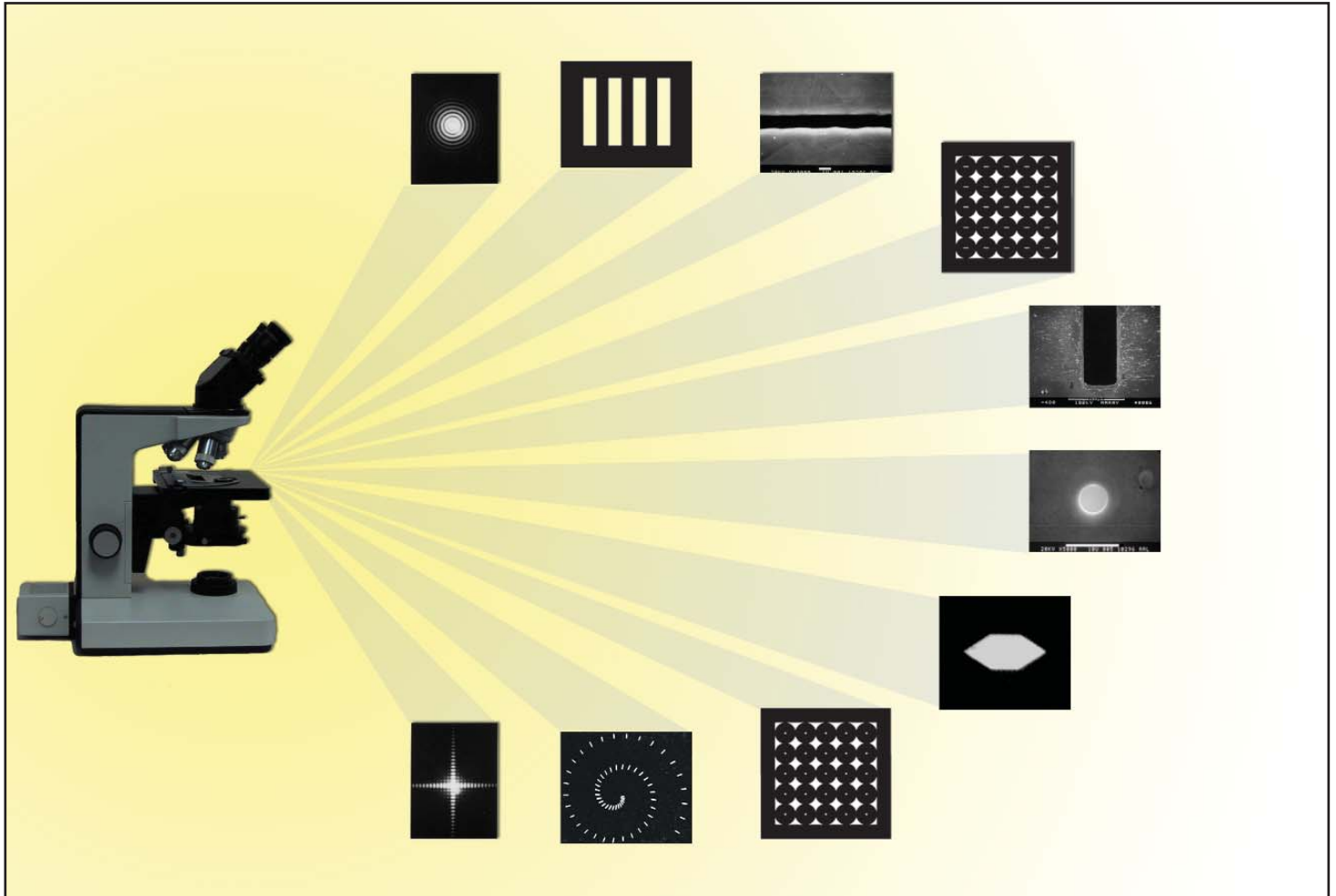




Precision Micro-Aperture Catalog

Version 2012



PLEASE CONTACT:

Data Optics, Inc.

Distributor for National Aperture, Inc.

Phone: (734) 483-8228 (800) 321-9026 Fax: (734) 483-9879

115 Holmes Road, Ypsilanti, MI 48198-3020 www.dataoptics.com



PRECISION APERTURES

National Aperture is the leading manufacturer of **precision micro-apertures, pinholes, slits, bar patterns and custom configurations.**

Our specialty is **micro-miniature pinholes and slits.**

Standard pinholes range in size from 0.5 μ m to 1000 μ m with custom sizes available. Standard slits range in size from 1.0 μ m to 200 μ m, with custom sizes available.

High Power pinholes and slits are available as standard items.

All APERTURE EDGES are carefully fabricated employing proprietary computerized micro-drilling, micro-slitting and micro-finishing techniques. All finished components are rigidly quality controlled before shipping. Standards are traceable to NIST.

For special applications, we have provided a choice of options at an additional cost.

Some typical applications of our apertures include:

- spatial filtering,
- high power laser light control,
- gas/liquid flow control,
- spectrometry,
- fiber optics,
- astronomy, etc.

Basic types:

- Standard precision round apertures
- Standard precision air slit apertures
- High power precision round apertures
- High power precision air slit apertures
- Patterns on dielectric laser coatings

Materials

Standard:

- Stainless Steel
- Copper

Optional:

- Nickel
- Brass
- Tantalum
- Tungsten
- Beryllium copper
- Molybdenum
- Gold
- Titanium
- Platinum

General Quality Specifications:

Results may vary depending on type and thickness of material.
See each Aperture page for Specs.

Certificate of Compliance:

available on request

Mounts

See page 6

Pinhole Positioners

See MM-1 and MM-3 Accessories Data sheet

Delivery:

Catalog items including B1 and B2 option, \leq 3 working days
Unlisted sizes and HS option \leq 10 working days



precision round

Standard

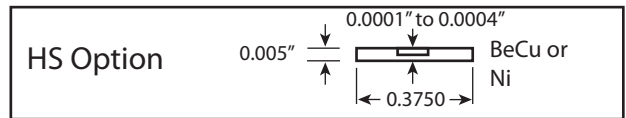
Specifications:

Finish: Unblackened (see OPTIONS below)
Material: 300 series stainless steel, (except for HS option)
Diameter: 3/8 inch (0.375 inch max.) 9.53mm
Positional tolerance: 0.006 inch (0.15mm)
Thickness: 0.0005 inch (12.7µm) on holes 5µm and up

Catalog #	Size	Tolerance	Price
1 - 0.5 + HS	0.5µm	+0.3µm, -0µm	\$95.00
1 - 1.0 + HS	1.0µm	+5µm, -0µm	\$65.00
1 - 2.0 + HS	2.0µm	± 0.5µm	\$65.00
1 - 3.0 + HS	3.0µm	± 0.5µm	\$65.00
1 - 5.0	5.0µm	± 1µm	\$36.00
1 - 10	10µm	± 1µm	\$36.00
1 - 15	15µm	± 1.5µm	\$28.00
1 - 20	20µm	± 2µm	\$26.00
1 - 25	25µm	± 2µm	\$26.00
1 - 30	30µm	± 2µm	\$26.00
1 - 35	35µm	± 2µm	\$26.00
1 - 40	40µm	± 3µm	\$26.00
1 - 50	50µm	± 3µm	\$26.00
1 - 75	75µm	± 3µm	\$26.00
1 - 100	100µm	± 4µm	\$26.00
1 - 150	150µm	± 6µm	\$26.00
1 - 200	200µm	± 6µm	\$26.00
1 - 300	300µm	± 8µm	\$26.00
1 - 400	400µm	± 10µm	\$24.00
1 - 500	500µm	± 10µm	\$24.00
1 - 600	600µm	± 10µm	\$24.00
1 - 700	700µm	± 10µm	\$24.00
1 - 800	800µm	± 10µm	\$24.00
1 - 900	900µm	± 10µm	\$24.00
1 - 1000	1000µm	± 10µm	\$24.00
1 - "size"	up to 7000µm		quote
Unlisted hole size for standard materials:			
One time setup charge + price of nearest hole size			
	6µm to 19µm		\$75.00
	20µm to 1000µm		\$55.00
Non-standard substrate or tolerance			quote

OPTIONS **ADD'L COST**

- B-1** Poly black, one side, ultra-high (98%) emissivity on holes 5.0µm and up. \$15.00
- B-2** Oxide, dull black, both sides on 5.0µm and up \$15.00
- HS** Extra-heavy substrate, 0.005 inch (0.127mm) thick thinned down to required Ni thickness (included with 0.5µm - 3.0µm apertures). \$20.00
Unlisted Size \$40.00



- CT** Closer Tolerance; half of listed tolerance, \$45.00
5µm to 15µm \$75.00
Unlisted Size \$25.00
20µm and up \$45.00
Unlisted Size \$20.00
- C** Calibrated; actual size ± 0.5µm or 1% \$20.00

For Mounted Apertures see page

Ordering information Example; 25µm round, black 2 sides, mounted on 25mm disc. Cat no.: **1-25+B-2+M**

General Quality Standards for Round Apertures:

Roundness: Major Axis - Minor Axis, max.
0.5µm on holes 1-15µm
1.µm on holes 20-50µm
2.0µm on holes 100µm and up

Finish:
<20µ-inch on holes 5µm to 30µm
30 to 40µ-inch on holes 31µm to 100µm
40 to 80 µ-inch on holes over 100µm

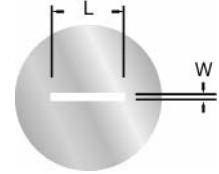


precision air slit

Standard

Specifications:

Finish: Unblackened (see OPTIONS below)
Material: 300 series stainless steel, (except for HS option)
Diameter: 3/8 inch (0.375 inch max.) 9.53mm
Positional tolerance: 0.006 inch (0.15mm)
Thickness: 0.0005 inch (12.7µm) on slits 5µm and up



Catalog #	Slit Width (µm)	Tolerance	Length =	Price
2 - 1 - 1 + HS	1.0µm	+0.5µm, -0µm	1 mm	\$250.00
2 - 2.5 - 3 + HS	2.5µm	+1µm, -0.5µm	3 mm	\$95.00
2 - 5 - 3	5µm	± 1µm	3 mm	\$55.00
2 - 10 - 3	10µm	± 1µm	3 mm	\$55.00
2 - 25 - 3	25µm	± 2µm	3 mm	\$45.00
2 - 50 - 3	50µm	± 2µm	3 mm	\$45.00
2 - 100 - 3	100µm	± 4µm	3 mm	\$45.00
2 - 150 - 3	150µm	± 4µm	3 mm	\$45.00
2 - 200 - 3	200µm	± 4µm	3 mm	\$45.00

	Width Range	Set-Up
For non-standard lengths up to 7.5mm: unlisted unit price per quote + setup shown	6µm to 23µm	\$95.00 per size
	26µm to 750µm	\$50.00 one time charge per order
Custom	Non-standard substrate or tolerance:	quote

OPTIONS	ADD'L COST
B-1 Poly black, one side, ultra-high (98%) emissivity (5µm and up only)	15.00
B-2 Oxide, dull black, both sides (5µm and up only)	15.00
HS Extra-heavy substrate, 0.005 inch (0.127mm thick, thinned down to required Ni thickness and with 0.047 inch orientation notch. (included with 1-2µm slits. Maximum slit length; 5mm).	40.00
<div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> </div>	
CT Closer Tolerance; half of listed tolerance, 25µm to 50µm Unlisted Size	60.00 85.00
100µm and up Unlisted Size	25.00 45.00
Longer Lengths quoted on request	

CALIBRATIONS AND CERTIFICATIONS	ADD'L COST
C Calibrated; actual size ± 1µm or 1%	45.00
General Quality Standards for Slit Apertures:	
Edge Finish: 40µ-inch <0.0006 inch thick 60µ-inch 0.001 inch thick	
Straightness: <0.5µm/mm, <2.0µm/inch	
For mounted Apertures see page 6	
Ordering information Example; 25µm air slit, 3mm long, black one side, calibrated. Cat no.: 2-25+B-1+C	



precision round

High Power

Specifications:

Finish: Gold plated one side, flat poly black (98% emissivity) on reverse side (see OPTIONS below)

Material: Copper

Diameter: 3/8 inch (0.375 inch maximum), 9.53mm

Positional tolerance: 0.006 inch (0.1524mm)

Thickness: 0.001 inch (25µm)

High Power

Catalog #	Size	Tolerance	Price
3 - 5	5µm	± 1µm	\$60.00
3 - 10	10µm	± 1µm	\$60.00
3 - 15	15µm	± 1.5µm	\$60.00
3 - 25	25µm	± 2µm	\$60.00
3 - 50	50µm	± 3µm	\$60.00
3 - 100	100µm	± 4µm	\$60.00
3 - 200	200µm	± 6µm	\$60.00
3 - "size"	>200µm and ≤7000µm		quote

Unlisted hole size for standard materials: One time setup charge + price of nearest hole size

	6µm to 19µm	\$75.00
	20µm to 1000µm	\$55.00
Non-standard substrate or tolerance		quote

OPTIONS	ADD'L COST
HS Extra-heavy substrate; 0.004 inch (0.1016mm) thick thinned down to 0.001 inch Cu thickness.	
5µm to 15µm	\$40.00 . . .
Unlisted Size	\$75.00
20µm to 1000µm	\$30.00 . . .
Unlisted Size	\$50.00
G2 Gold plated both sides	\$20.00
Note: Listed sizes and unlisted sizes will be charged a setup and get normal delivery. Standby status for listed sizes will eliminate setup cost, but can add up to 4 weeks to delivery time.	
CT Closer Tolerance; half of listed tolerance,	
5µm to 15µm	\$75.00
Unlisted Size	\$95.00
20µm and up	\$35.00
Unlisted Size	\$65.00

Ordering information Example;

25µm round, mounted on 25mm disc. Cat no.: **3-25+M**

CALIBRATIONS AND CERTIFICATIONS	ADD'L COST
C Calibrated;	
actual size ± 0.5µm or 1% (5µm and up)	20.00
Power Resistance Examples:	
0.5 to 1 megawatt/mm ² , 75 nanosecond duration, 700nm	
1 to 2 megawatt/mm ² , 10 nanosecond duration, 700nm	
Note: Because of numerous power density conditions, a test on 1 mil Cu in your direct operating environment is recommended.	
General Quality Standards for Round Apertures:	
Roundness: Major Axis - Minor Axis, max.	
0.5µm on holes 1-15µm	
1.µm on holes 20-50µm	
2.0µm on holes 100µm and up	
Finish:	
<20µ-inch on holes 5µm to 30µm	
30 to 40µ-inch on holes 31µm to 100µm	
40 to 80 µ-inch on holes over 100µm	

For mounted Apertures see page 6

precision air slit

High Power

Specifications:

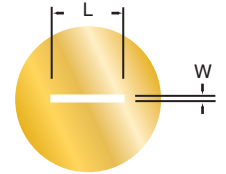
Finish: Gold plated one side, flat poly black (98% emissivity) on reverse side (see OPTIONS below)

Material: Copper

Diameter: 3/8 inch (0.375 inch maximum), 9.53mm

Positional tolerance: 0.006 inch (0.1524mm)

Thickness: 0.001 inch (25µm)



High Power

Catalog #	Tolerance	Slit Width (µm)	Length =	Price
4 - 5 - 3	± 1µm	5µm	3 mm	\$85.00
4 - 10 - 3	± 1µm	10µm	3 mm	\$85.00
4 - 25 - 3	± 2µm	25µm	3 mm	\$75.00
4 - 50 - 3	± 3µm	50µm	3 mm	\$75.00
4 - 100 - 3	± 4µm	100µm	3 mm	\$75.00
4 - 200 - 3	± 4µm	200µm	3 mm	\$75.00
			Width Range	Set-Up
For non-standard lengths up to 7.5mm: unlisted unit price per quote + setup shown			6µm to 24µm	per size: \$95.00
			26µm to 750µm	one time charge per order: \$50.00
Custom	Non-standard substrate or tolerance:			quote

OPTIONS ADD'L COST

HS Extra-heavy substrate, 0.004 inch (0.1016mm) thick thinned down to 0.001 inch Cu thickness.	
5µm to 20µm	\$65.00
Unlisted Size	\$75.00
25µm to 750µm	\$45.00
Unlisted Size	\$50.00



G2 Gold plated both sides	\$20.00
CT Closer Tolerance; half of listed tolerance,	
25µm to 50µm	\$85.00
Unlisted Size	\$95.00
100µm to 1000µm	\$35.00
Unlisted Size	\$65.00

Longer lengths quoted on request

CALIBRATIONS AND CERTIFICATIONS ADD'L COST

C Calibrated; actual size ± 1µm or 1% (25µm and up, average of end-center-end)	\$45.00
---	---------

Power Resistance Examples:

0.5 to 1 megawatt/mm², 75 nanosecond duration, 700nm

1 to 2 megawatt/mm², 10 nanosecond duration, 700nm

Note: Because of the numerous power density condition a test on 1 mil Cu in your direct operating environment is recommended.

General Quality Standards for Slit Apertures:

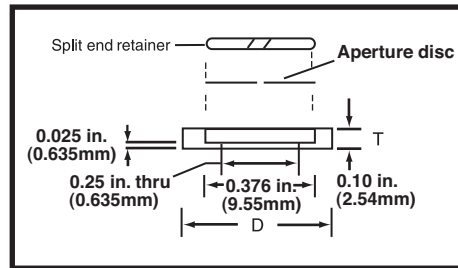
Edge Finish: 60µ-inch 0.001 inch thick

Straightness: <0.5µm/mm, <2.0µm/inch

For Mounted Apertures see page 6

Ordering information Example; 25µm air slit 3mm long (4-25), calibrated (C)

The part number would be **4-25-3+C**



25mm Aperture Mount

M-25 25mm diameter blackened aluminum mount
D = 24.95mm T = 2.54mm \$20.00



1 inch Aperture Mount

M-1 1.0 inch diameter blackened aluminum mount
D = 0.996 inch T = 0.100 inch \$20.00



18mm Aperture Mount

M-18 18mm diameter blackened aluminum mount
D = 18mm T = 2.54mm \$20.00



16mm Aperture Mount

M-16 16mm diameter blackened aluminum mount
D = 16mm T = 2.54mm \$20.00



0.5 inch Aperture Mount

M-0.5 0.5 inch diameter blackened aluminum mount
D = 0.496 inch T = 0.100 inch \$20.00

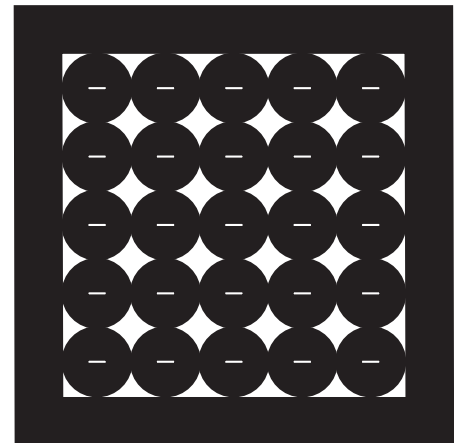
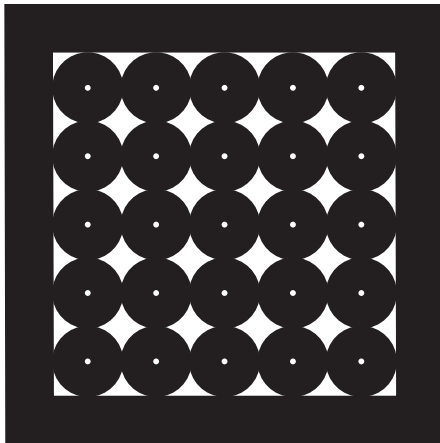
High Quality
Palettized Precision APERTURES
For Volume Applications

New

Pinholes



Slits



Custom Palettes

- Highly competitive on **pricing** and **quality** with Lithography and Etching
- **Volume** pricing on 500 pc. quantity and up
- Low NRE charges
- Features easily modifiable (post NRE)
- Highly competitive **delivery**
- Top quality feature interior **finish**



National Aperture, Inc.

High Quality Spatial Filter APERTURES

spatial filter

New

FITS MOST STANDARD SPATIAL FILTERS

Specifications

Substrate:

Material: 300 series stainless steel
Substrate Diameter: 3/8 inch (0.375 inch) 9.53mm

Thickness: 0.0005 inch
(12.7µm)

Finish: Black both sides

Mount:

Thickness: 0.1 inch
Diameter: 1 inch
Aperture Tolerance: ø.006 inch
(0.1524mm)



Catalog #	Size (µm)	Tolerance	Price Ea. \$
SP-5	5.0µm	± 1µm	63.00
SP-10	10µm	± 1µm	60.00
SP-15	15µm	± 1.5µm	59.00
SP-25	25µm	± 2µm	59.00
SP-35	35µm	± 2µm	59.00
SP-50	50µm	± 3µm	59.00
SP-75	75µm	± 3µm	59.00
SP-100	100µm	± 4µm	59.00
SP-150	150µm	± 6µm	59.00
SP-200	200µm	± 6µm	59.00

SPATIAL FILTER HIGH POWER PINHOLES

Specifications

Substrate:

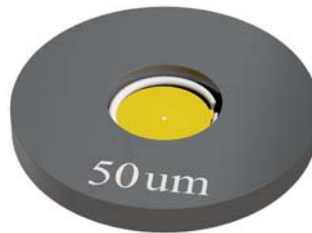
Material: Copper
Substrate Diameter: 3/8 inch (0.375 inch) 9.53mm

Thickness: 0.001 inch
(25.4µm)

Finish: Black one side,
Gold one side

Mount:

Thickness: 0.1 inch
Diameter: 1 inch
Aperture Tolerance: ø.006 inch (0.1524mm)



Catalog #	Size (µm)	Tolerance	Price Ea. \$
SPHP-5	5.0µm	± 1µm	85.00
SPHP-10	10µm	± 1µm	85.00
SPHP-15	15µm	± 1.5µm	85.00
SPHP-50	50µm	± 3µm	80.00
SPHP-100	100µm	± 4µm	80.00
SPHP-150	150µm	± 6µm	74.00
SPHP-200	200µm	± 6µm	74.00

SPATIAL FILTERS FIXED SLITS

Specifications

Substrate:

Material: 300 series stainless steel
Substrate Diameter: 3/8 inch (0.375 inch) 9.53mm

Thickness: 0.0005 inch (12.7µm)

Finish: Black both sides

Slit Length: = 3.0 mm

Mount:

Thickness: 0.1 inch
Diameter: 1 inch
Aperture Tolerance: ø.006 inch
(0.1524mm)



Catalog #	Size (µm)	Tolerance	Price Ea. \$
SS-5	5.0µm	± 1µm	75.00
SS-10	10µm	± 1µm	75.00
SS-15	15µm	± 1.5µm	75.00
SS-25	25µm	± 2µm	72.00
SS-50	50µm	± 3µm	72.00
SS-100	100µm	± 4µm	69.00
SS-200	200µm	± 4µm	69.00

We are the manufacturer

Apertures on Chrome/Aluminum/Gold Coated Glass First Surface Mirrors

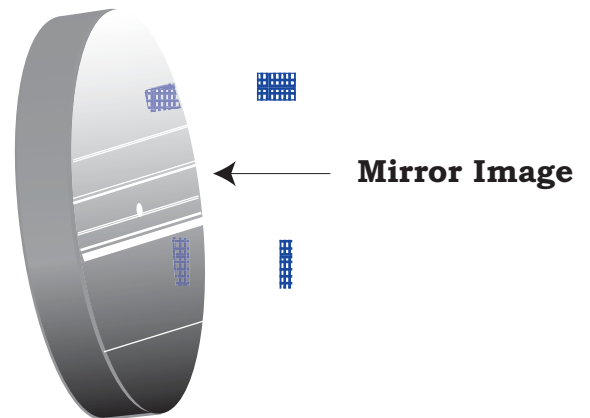
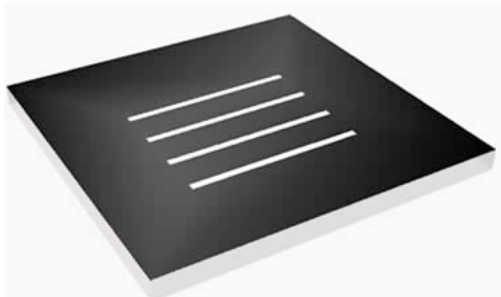
Custom Only

LOW SETUP COSTS compared to conventional reticle artwork

Darkfield only

Patterns: small holes preferably less than 100 μ m and narrow slits, preferably less than 50 μ m wide, any length

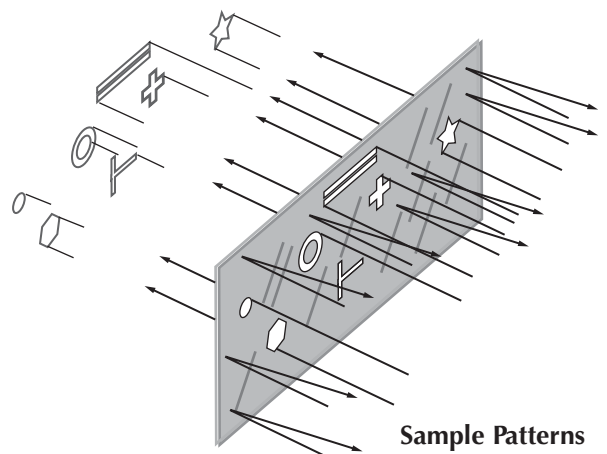
Substrate: Edmund Optics Tech Spec™ or Commercial Quality, or other suitable first surface mirror, per customer choice



Clear Patterns, Reticles, Apertures on high power dielectric laser reflector coatings

For applications requiring transparency and/or power resistance greater than achievable with opaque (metallic, etc.) surfaces this process creates patterns on dichroic reflectors with selective transparency.

Wavelength:	Per standard high power dielectric coating, visible and near visible
Reflectivity:	20% to 98%, based on requirement
Incidence:	0° - 90°, per specification
Power resistance:	2 - 8 Megawatts/mm ² , pulsed
Pattern definition:	< 1 μ m (semiconductor pattern quality)
Material:	Glass, fused silica, etc.
Dimensions:	Up to 6 inch (1.524mm) thickness, 0.04 inch (1.016mm) - 0.09 inch (2.286mm)
Pattern generation:	Per customer or National Aperture, Inc. via AutoCad™
Pricing:	Quote



Typical materials:

- Stainless steel
- Brass
- Copper
- Beryllium copper
- Gold
- Nickel
- Tantalum
- Tungsten
- Molybdenum
- Titanium
- Platinum
- etc.

Suggested materials (unless otherwise required):

For best quality and cost;
300 series stainless steel 0.001 inch thick or under.

Gas, Liquid, Material FLOW Oriented:

Leak test grade;

The emphasis normally on roundness is replaced by orifice area specification to improve cost effectiveness. To optimize quality, materials should be kept as thin as allowable. 302 stainless steel is suggested unless otherwise required.

Metered Flow;

Same as Leak Test above

Dies (wire polymer), Jets (liquid or gas);

Up to 0.010 inch diameter x 0.010 inch deep

X-ray shielding, selective:

Typical materials are tantalum, tungsten and platinum

Special Micro Patterns:

Round, square, rectangular, slit, arc, hexagon, octagon, annular, etc. and combinations of patterns or arraysper quote

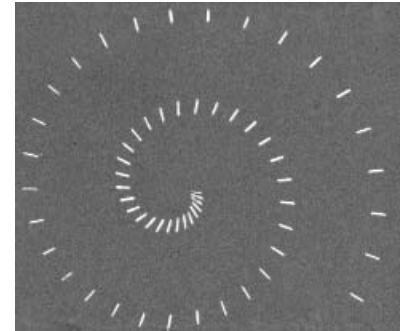
Four-Bar Patterns:

Standard or 302 stainless steel 0.0005 in. x 0.375 in., or copper 0.001 in.
Up to 5mm square; not including applicable air slit options\$85.00
Up to 0.750 in., any workable materialper quote

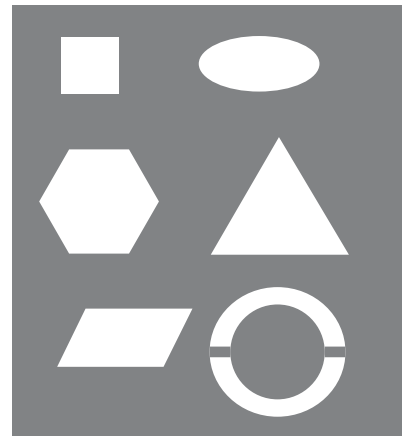
SEM photos:

per feature\$95.00
per additional shot/angle\$25.00
(Not to be used for calibration or measurement.)

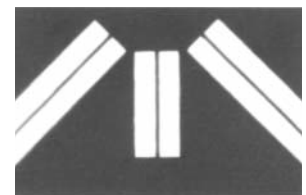
Quality projection samples are available at minimal or no cost.



Spiral Slits



Shapes



Slits

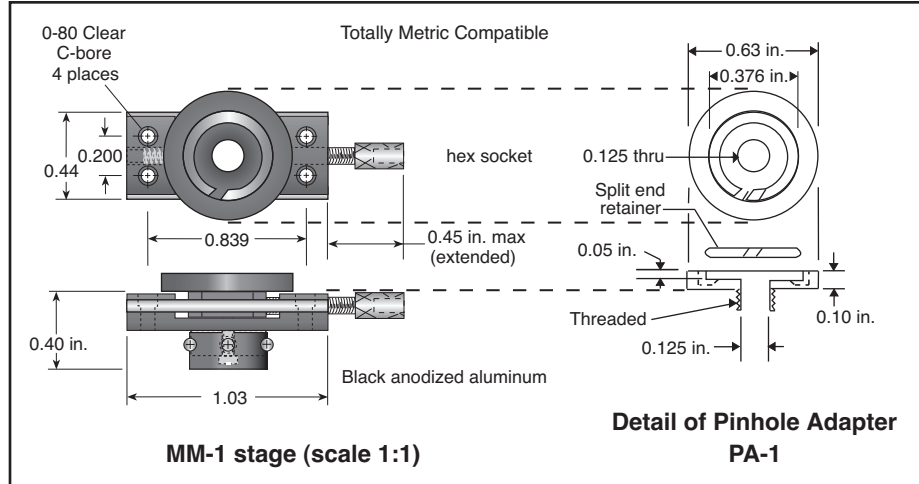
Accessories

Model MM-1XY/PA

The pinhole (aperture) positioner is a composite of the MM-1 MicroMini™ stage and the PA-1 pinhole adapter.

Specifications:

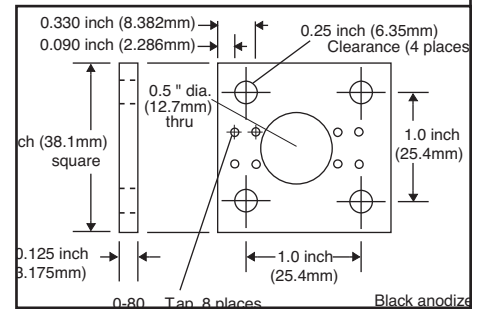
Travel:	0.125 inch, X and Y
Screw Pitch:	80 TPI
Sensitivity:	0.5μ
Backlash:	0
Wobble:	0 (no ball bearings)
Thermal Stability:	15° to 75°C
Weight:	8g



Accessories

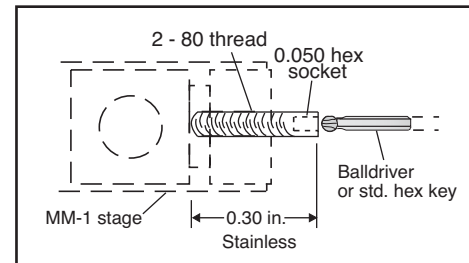
AP4-1 Adapter Plate

A multi-position mounting plate to interface with standard optical tables and accessories, or to stabilize free-standing stages.



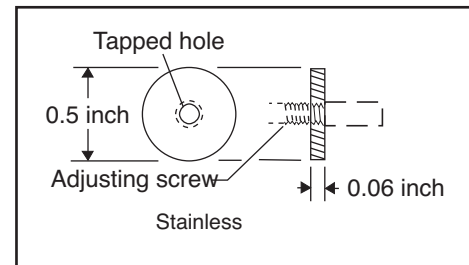
SS-1 Headless Adjusting Screw

This custom designed lead screw replaces the standard thumb screw. It provides full linear travel, while reducing the overall length of the stage by 0.4 inches.



TG-1 Thumb Grip

This knurled 1/2 inch diameter adjustment ring provides increased sensitivity. The TG-1 can be added to the standard MM-1 adjusting screw and may alternately be used as a locking nut.



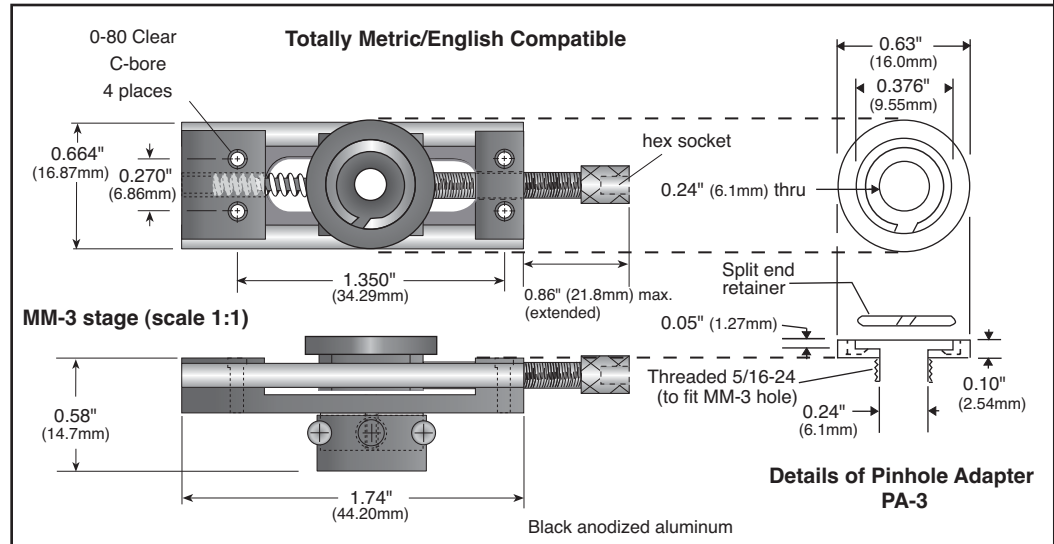
Accessories

Model MM-3XY/PA

The pinhole (aperture) positioner is a composite of the MM-3 MicroMini™ stage and the PA-1 pinhole adapter.

Specifications:

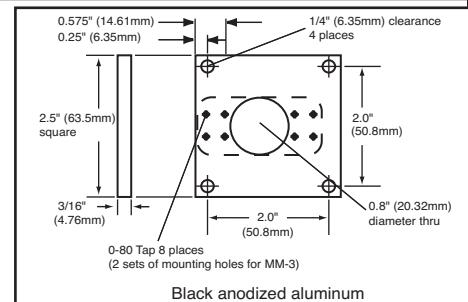
Travel:	0.125 inch, X and Y
Screw Pitch:	80 TPI
Sensitivity:	0.5μ
Backlash:	0
Wobble:	0 (no ball bearings)
Thermal Stability:	15° to 75°C
Weight:	8g



Accessories

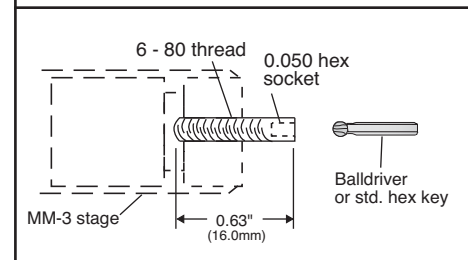
AP4-3 Adapter Plate

A multi-position mounting plate to interface with standard optical tables and accessories, or to stabilize free-standing stages.



SS-3 Headless Adjusting Screw

This custom designed stainless lead screw replaces the standard thumb screw, and provides full linear travel while reducing the overall length of the stage by 0.5 inches.



TG-3 Thumb Grip

The knurled 5/8 inch diameter adjustment ring provides increased sensitivity. The TG-3 can be added to the standard MM-3 adjusting screw and may alternately be used as a locking nut.

