MATERIALS SCIENCE, INC.
Vacuum & Thin Film Technology

SPECIFICATION NO. 10000000, REVISION E

ROUND TARGET, BACKING PLATE

AND TARGET BONDING REQUIREMENTS

12 DECEMBER 2010

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1.0 TARGET FABRICATION REQUIREMENTS

Note: See Target Fabrication Drawings as noted below in the Table of Standard Target Thicknesses.

- Method of target fabrication is the responsibility of the material supplier.

- The material supplier shall seal the finished target in an inert gas or dry nitrogen atmosphere and label the bag with the following minimum information:

1. Inspection Date
2. Customer Purchase Order Number
3. Quantity
4. Size
5. Any Identifying Part Number
6. Melt/Lot Number
7. Purity
8. Trace Elements/Dopants
9. Other Relevant Information, ie, Resitivity, etc.

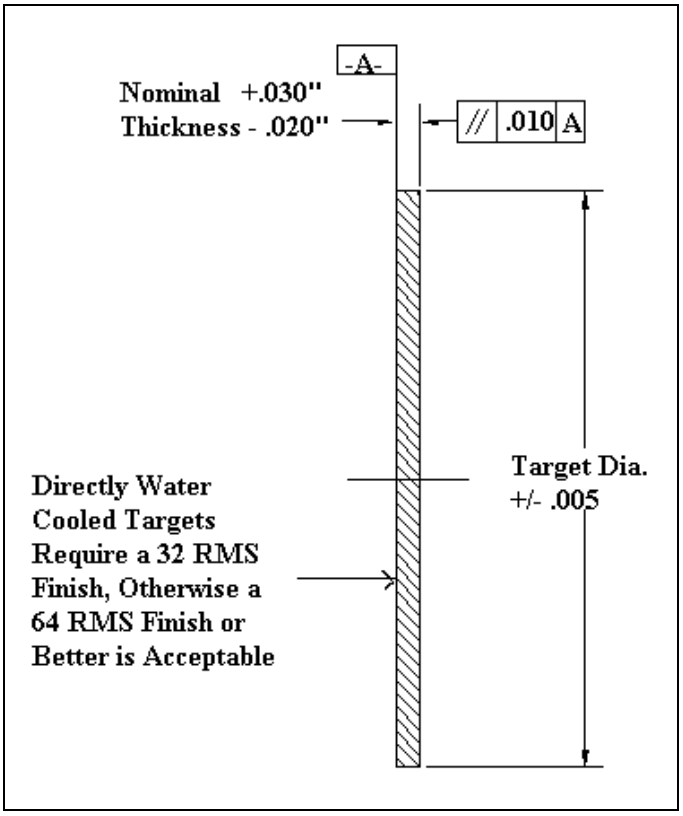
- A Certificate of Compliance is required.

TABLE OF STANDARD TARGET THICKNESSES

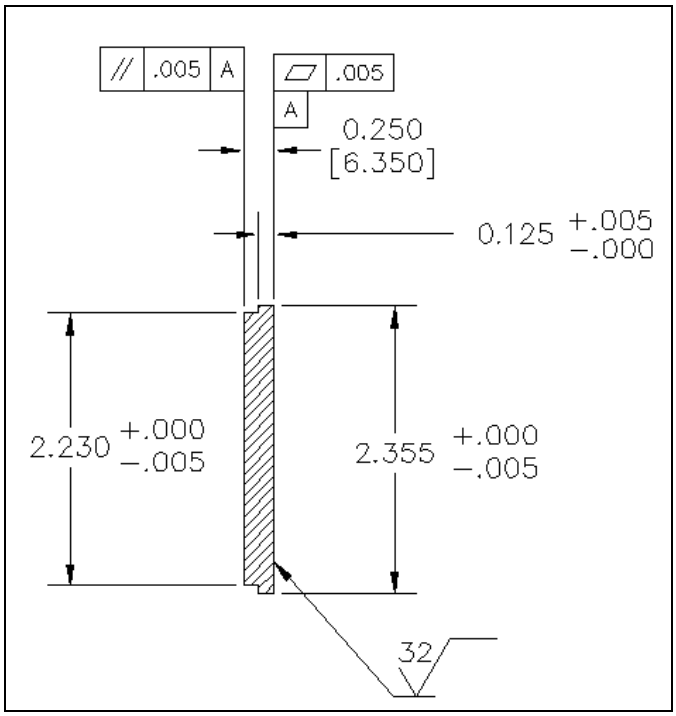
NOMINAL TARGET SIZE	[REFERENCE] (Combined Maximum Backing Plate and Target Thickness	BONDED AND CLAMPED TARGET	DIRECTLY WATER COOLED TARGETS
		Drawing No. 00000073	**Drawing No. 00000066**
2”	0.25”	0.125”	0.188”
		0.188”	0.250”
3”	0.310”	**Drawing No. 00000709**	**Drawing No. 00000708**
		Drawing No. 00000274	**Request Specific Target Size**
4”	0.375”	0.125”	0.188”
		0.188”	0.250”
		0.250”	0.375”
5” - 8”	0.625”	0.250”	0.250”
		0.375”	0.375”
		0.500”	0.500”
			0.625”

TOLERANCE AND FINISH REQUIREMENTS

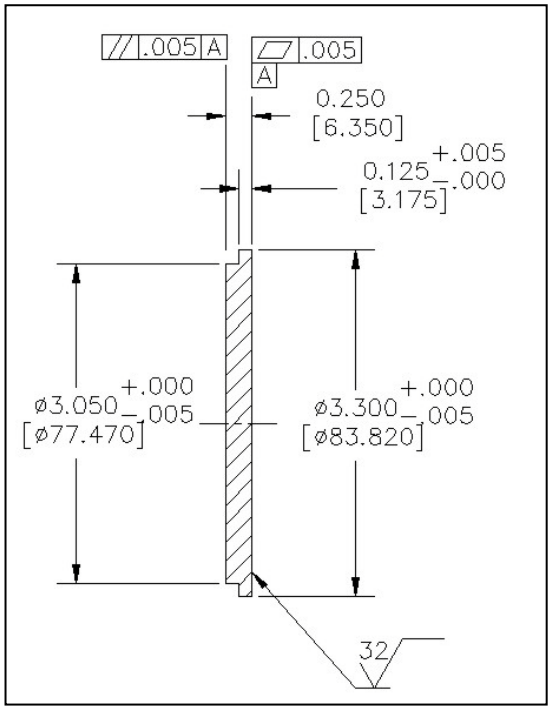
- Target O.D. tolerance: $^{+}$/- 0.005”.
- Target thickness tolerances: +0.030”, -0.020” relative to the specified thickness.
- Back and front surfaces must be parallel within 0.010” or less (except 2” and 3” targets which must be with 0.005” or less)..
- A 32 RMS finish is required on the o-ring sealing surface when the target is directly water cooled. Otherwise, all surfaces shall have a 63 RMS finish or better.



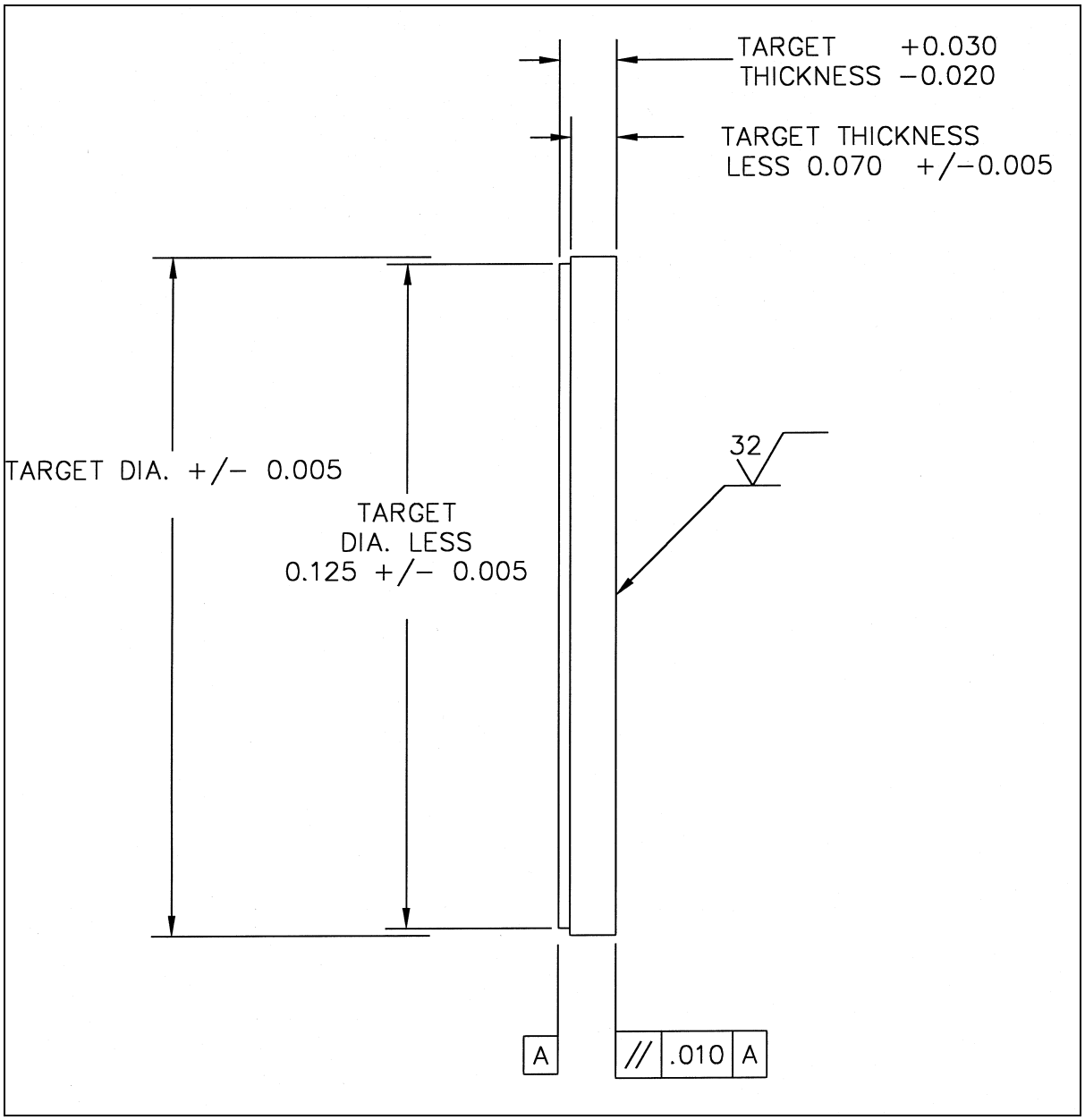
ROUND BONDED AND CLAMPED TARGET
FABRICATION DRAWING



2” INCH DIRECTLY WATER COOLED TARGET



3” INCH DIRECTLY WATER COOLED TARGET



5" AND LARGER DIRECTLY WATER COOLED TARGET

2.0 BACKING PLATE REQUIREMENTS

Note:

Individual backing plate drawings exist for each size cathode, calling out dimensions, material and tolerance requirements.

Fabricating New Backing Plates

- UNS C11000 Electrolytic Tough Pitch Copper (99.9% Cu) is normally used. UNS C10100 Oxygen Free Electronic Copper (99.99% Cu) and UNS C10200 Oxygen Free Copper (99.95% Cu) can also be used, but the additional expense is unnecessary. When targets are bonded to the backing plate, it's important to match the thermal expansion co-efficient of the backing plate and target material as closely as possible to prevent target cracking and delamination caused by different rates of expansion during sputtering and target bonding. The metallic bonding medium (typically indium) provides enough stress relief to accommodate differential rates of thermal expansion between a copper backing plate and virtually all materials, although there are exceptions. Specialty glasses, Sendust and certain magnetic alloys are examples of materials which may crack during the bonding process due to thermal expansion mismatch.

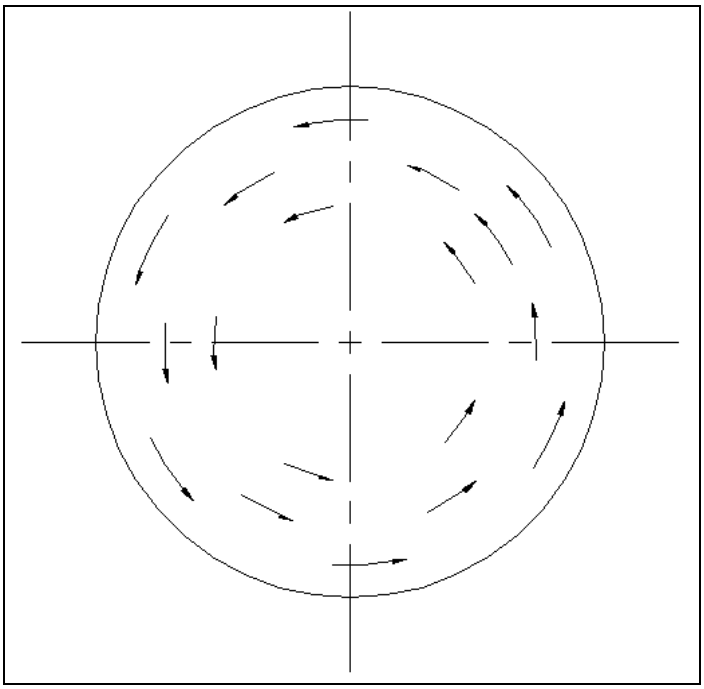
- When the user desires to use the thickest possible target for very brittle materials by using a thinner and structurally stronger backing plate material - Molybdenum or CRES 304 or 316 stainless steels may be used instead of copper.

- There must be no scratches, dents, marks or other surface imperfections on any area of the target bonding surface nor on the o-ring sealing surface (water cavity side) of the backing plate.

- Use soft jaws to hold material when machining copper backing plates.

- Use a soft plastic pad or similar device to protect the surface of the backing plate during set-up. Do not center scribe directly on the target side of the backing plate material when laying out the bolt circle, OD and other features of the backing plate. This produces an unacceptable depression in the center.

- The o-ring (water to vacuum sealing surface) must be 32 RMS or better. Operations which might result in contaminants becoming embedded in the material shall not be



RADIAL POLISHING OF O-RING SURFACE

used. These include grinding with resin bonded wheels and polishing with rouge, emery cloth, crocus cloth or similar abrasives. Hand polishing small radial scratches from the sealing surface with Scotchbrite is acceptable, providing the polishing motion follows the circumference (parallel to the o-ring). *See diagram for clarity.*

- Do not use an orbital sander to finish surfaces on the backing plate.

Re-using Debonded Backing Plates

- Backing plates which have been used with bonded targets can be re-used, as follows:

- The bonding and opposite surface must be parallel within 0.010" or less.

- The bonding surface flatness must be 0.015" per inch or less F.I.M.

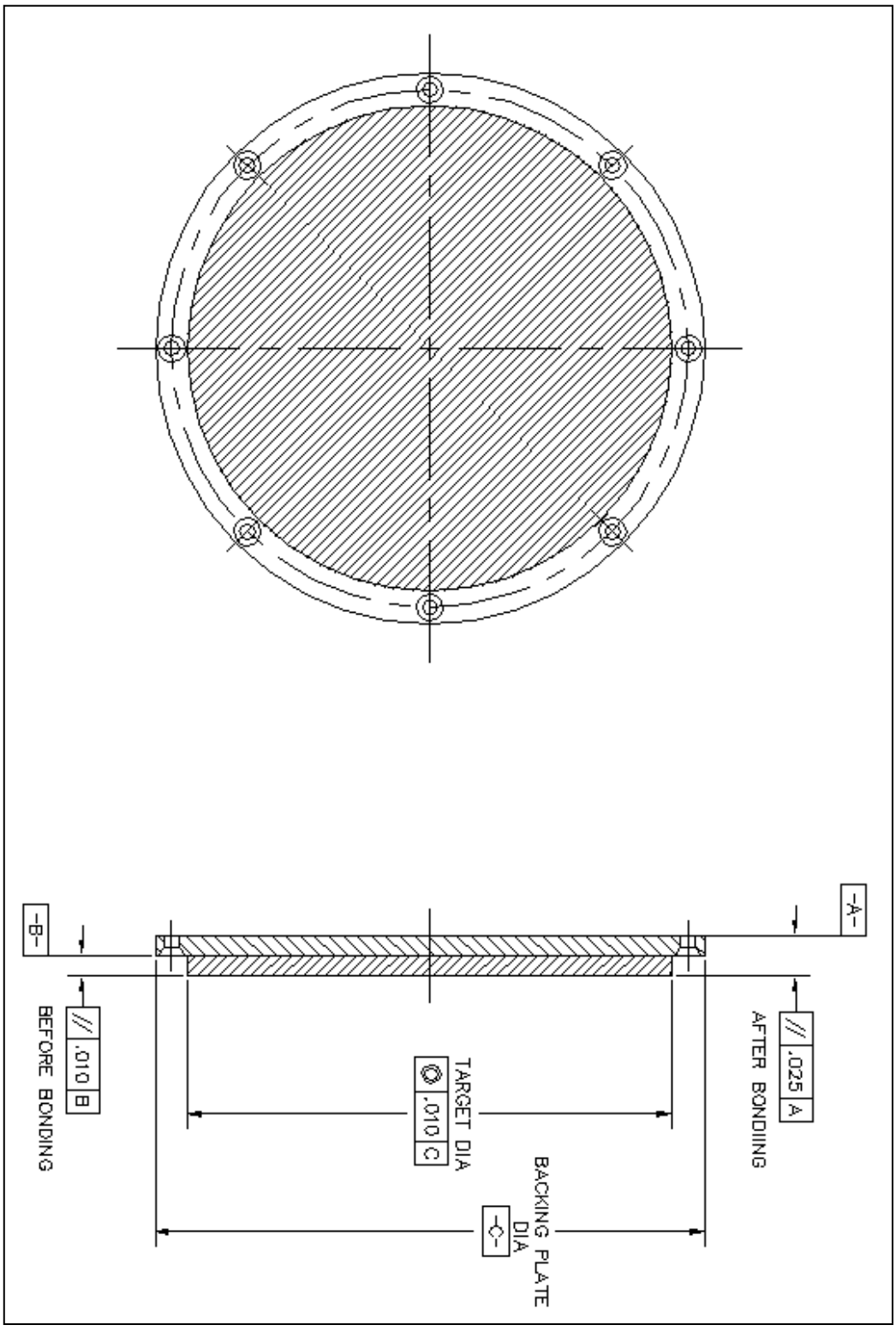
- Sputter burn-through into the bonding surface up to 0.030" is acceptable. Deeper voids require that the bonding surface be refinished as new.

- Backing plates may be re-used for their rated thickness until they become 0.060" undersized due to re-surfacing.

3.0 BONDING REQUIREMENTS

See Target Bonding Requirements Drawing, Round, No. 00000273

- The side of the backing plate *with countersinks* is the bonding surface.
- The target must be concentric relative to the backing plate diameter within 0.010".
- The target bonding and sputtering surfaces must be parallel to each other within 0.010" or less prior to bonding.
- After bonding, the target sputtering surface must be parallel to the backing plate vacuum sealing surface within 0.025" or better.
- Target thickness tolerances prior to bonding: +0.030", -0.020" relative to the specified thickness.
- Metallic solder bonding, using indium (minimum 90%) or silver alloys is preferred. Often it is necessary to deposit adhesion layers on the target and backing plate bonding surfaces prior to making the solder bond. Good adhesion of this layer is critical to achieving a good bond. Epoxy bonds are emphatically forbidden!
- There must be no voids in the solder edge at the target/backing plate interface. This junction must be smooth, continuous and completely filled with solder.
- Bond thickness should be 0.010" ± 0.003" for metals and 0.020" ±0.003" for ceramics.
- The entire bonding region must be completely filled with solder. Significant voids (0.010" diameter or larger) are unacceptable and should be completely eliminated whenvever possible as they lead to hot spots, spitting and melting of the solder bond causing partial or complete target delamination due to poor thermal transfer between the target and backing plate.
- Trim all excess solder from the edge of the target and backing plate surfaces after bonding.
- The bonded assembly should be bagged (sealed in plastic), filled with dry nitrogen, argon or other inert gas and labeled as sealed in inert gas or dry nitrogen atmosphere.



ROUND TARGET BONDING REQUIREMENTS

