MIRRORS FOR CO_2-LASER

DESCRIPTION

Coated copper and silicon substrates are mainly used as mirrors in CO_2 lasers. Additional material as aluminum is also available.
The differences and the specifications of copper and silicon mirrors are mentioned in this data sheet.

FEATURES / CHARACTERISTICS

One of the quality features of bending mirrors is a small scattering loss combined with a long life expectancy. With our special production technology we can offer the highest quality products.

APPLICATIONS

	Copper	Silicon
End mirrors	👍👍	👍👍
Bending mirrors	👍👍	👍👍
Focus mirrors	👍👍	👎
Scanning mirrors	👎	👍👍

COPPER / GOLD MIRROR

Nickel-copper mirrors are the most widely used of all the Cu mirror types. They consist of a copper substrate, precision-lapped to the required surface form, plated with a thin layer of nickel which is polished and gold plated.

Copper substrates are ideal for many laser applications due to the high thermal conductivity of the material. All copper used in the manufacture of these mirrors is high-specification, oxygen-free (OFHC) type.

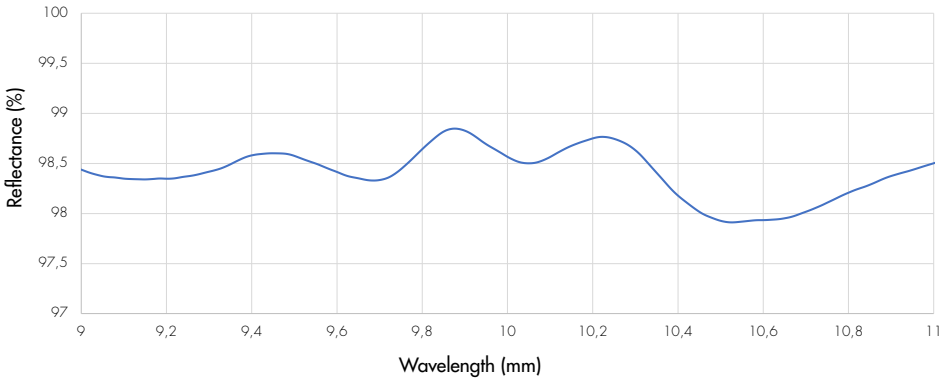
SMAX MIRROR

Smax is a dielectric coating on silicon or copper substrates. Those mirrors offer exceptional performance and broad, uncompromised versatility. With over 15 years of field proven performance, SMax mirrors have demonstrated their value to users in a variety of applications.

SPECIFICATIONS

Hard Gold Coated Copper Mirrors

Diameter tolerance [mm]	+0 /- 0.15
Thickness tolerance [mm]	±0.15
Surface form accuracy	< λ /20 (10.6 µm) over 90 % of diameter
Surface roughness [nm]	Typ. Ra < 5
Parallelism [mm]	ETV within 0.05
Clear aperture [%]	> 90 of diameter
Phase retardation (phase shift)	<1° (at 45° incidence)
Laser damage threshold	Measured values of CW LIDT for air-cooled, clean and unstressed NiCu mirrors are typically 4000 W/mm +/-12 %
Reflectivity	R > 97.9 % average for 2 – 11 µm, Rs, p (10.6 µm) >98.6% angle independent



Reflectance 9 – 11 mm

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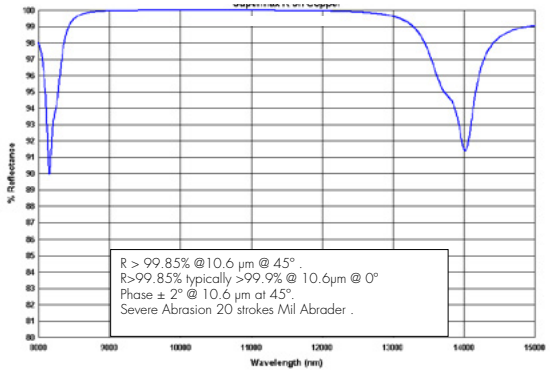
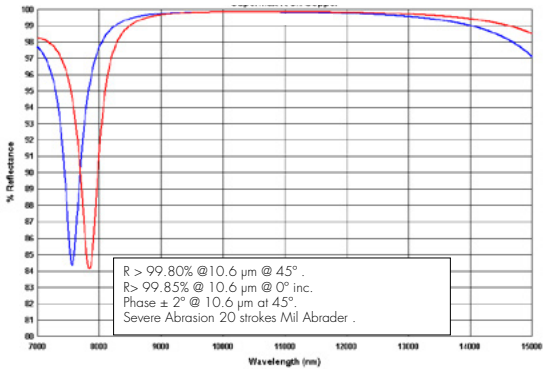
SPECIFICATIONS

Dielectrically Coated Si and Copper Mirrors (SMax)

Diameter tolerance [mm]	+0 /-0.15
Thickness tolerance [mm]	±0.15 mm
Surface form accuracy	< λ /20 (10.6 µm) over 90% of diameter
Surface roughness [nm]	Typ. Ra < 5
Parallelism [mm]	ETV within 0.05
Clear aperture [%]	>90 of diameter
Phase retardation (phase shift)	±2° from zero @45° AOI
Laser damage threshold	Copper: typ. 5 kW (cw) for Ø 10 mm (500 W/mm) Silicon: typ. 530 W/mm ±10%
Reflectivity	Typ. R(10.6) >99.8% (R633 >70%) at AOI = 0° Typ. Rs(10.6) >99.8% (R633 >70%) at AOI = 45° Typ. Rp(10.6) >99.7% (R633 >70%) at AOI = 45°
Absorption	0.11% at AOI = 0°



Supermax R on Copper



Supermax R on Copper

GOOD TO KNOW

	Ni-Cu	Silicon
Coating	Hard Gold SMax (dielectric)	SMax (dielectric)
Dimensions	5 – 100 mm (SMax) 5 – 250 mm (hard gold coated) (standards: 25, 50 mm)	5 – 150 mm (standards 0.75, 1.0, 1.5, 2.0 inch)
Form	Most common: round Customer designs are available upon request	Most common: round Customer designs are available upon request
Special shapes	✓	–
Water cooling (optional)	✓	–
LIDT	++	+
Hint	Good thermal properties for high power cw and pulsed lasers Achieves the highest damage thresholds with high reflectivity with gold or SMax coating	Light and thin with very good surface quality For small and medium power
Application	gold coated - external beam guidance SMax coated - external beam guidance and in the cavity λ/4 coated - circular polarization with CO_2 laser	SMax coated - external beam guidance and in the cavity λ/4 coated - circular polarization with CO_2 laser Due to the light weight preferred for scanner applications

Hard Gold Coated Copper Mirror

As copper is readily machinable, we offer a huge range of mirror shapes and sizes such as prisms, axicons, rectangular or square mirrors, chopper wheels, knife edge mirrors and shutter mirrors. By engineering in features such as dowel holes, tapped and helicoiled holes and flanges, a well-designed copper mirror can reduce costs for OEMs in mounting, assembly and laser alignment.

Customer designs are available upon request.

SMax (Dielectric Coated) Mirror

High Durability of the SMax coating withstands the MIL-Spec severe abrasion test making the mirrors highly durable and easily cleaned, leading to longer mirror lifetime.

SMax optics resist the harsh plasma UV intracavity environment making this coating the optimal choice.

Aiming beam: the mirrors can be optimized for 633 nm and 10.6 µm. Standard coating 633 > 70% or special coating 633 > 90% on request.

Customer designs are available upon request.

FOR INQUIRIES, WE NEED TO KNOW:

/ Material/ type of mirror
/ Diameter
/ Thickness
/ Form (flat, curved)
/ Cooling (optional)
/ Wavelength (laser and aiming beam)

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ORDERING CODE

Gold-plated Copper Mirror

		Diameter [in mm]		Thickness [in mm]		Radius [in m] (concave)		Water Cooling
MNC	-	**X**	-	**X**	-	**10x - convex**	-	**X**

Example: MNC-50-25-WC, NiCu mirror, Ø 50x25 mm, water cooled, Gold coated

Or without water cooling: MNC-25-6 (NiCu mirror dia 25 mm, 6 mm thick, flat)

Dielectrically Coated Copper Mirror

		Diameter [in mm]		Thickness [in mm]		Radius [in m] (concave)		Water Cooling
MMC	-	**X**	-	**X**	-	**10x - convex**	-	**X**

Example: MMC-50-10, (Ø 50 mm NiCu mirror, 10 mm thick, without curvature, without water cooling), SMax-coating

Silicon Mirror

		Diameter		Thickness		Coating
MSS	-	**inch x 10**	-	**in inch x 100**	-	**X**

Example: MSS-0511-SMax, (Si-mirror Ø 12.7 mm th.3 mm, SMax-coating)