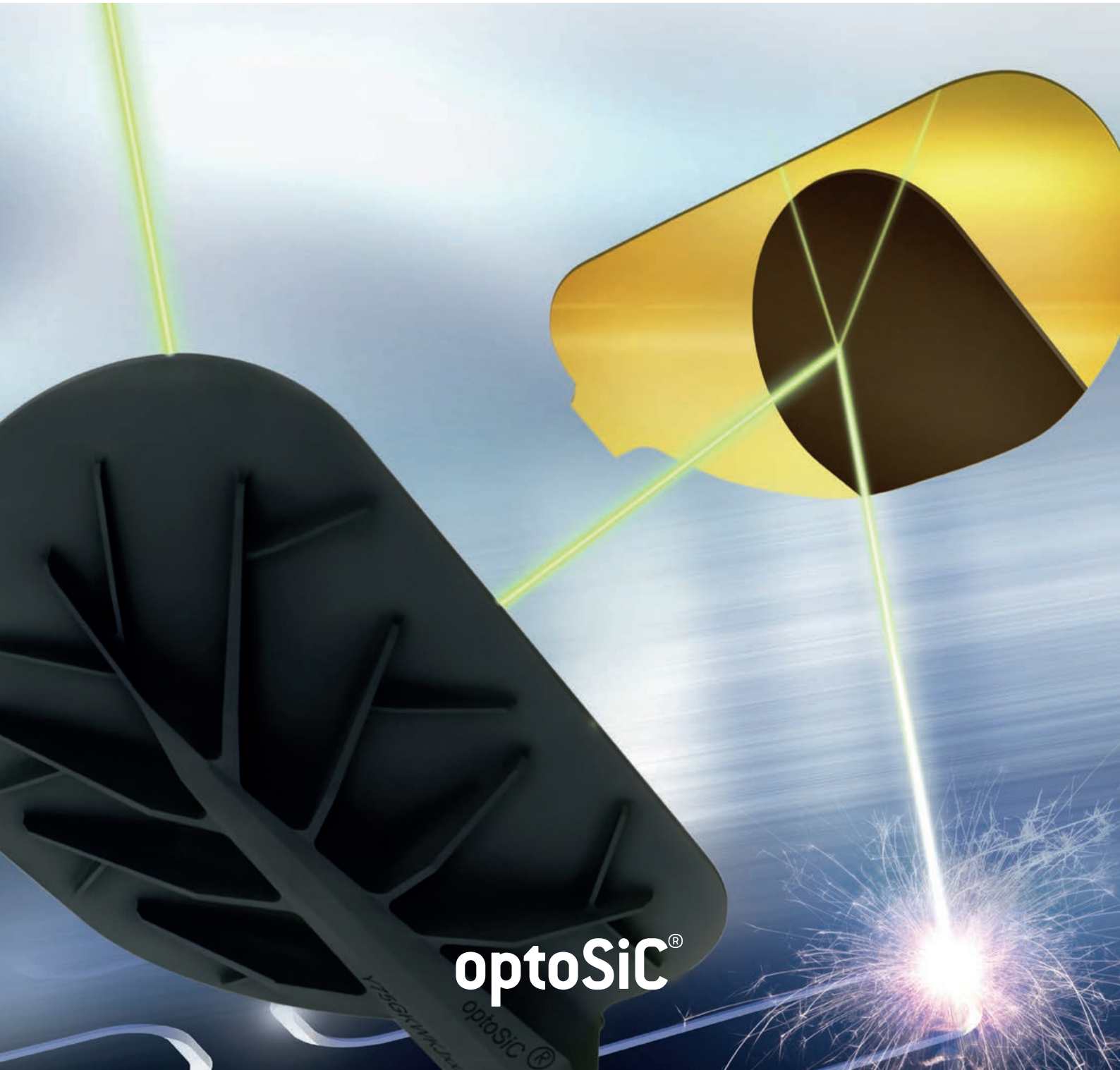
LASER GALVO SCANNING MIRRORS

MERSEN
Expertise, our source of energy

OPTOSIC®
SIC OPTICS FOR HIGH-END LASER PROCESSES



REFLECTING PERFORMANCE

We manufacture high-performance laser galvo scanning mirrors from 10mm to 500mm apertures for single pair consumption with a range of high reflective coatings.

THE ADVANTAGE OF OPTOSIC® OPTICS

- Low moment of inertia
- Low dynamic flatness Peak-to-Valley (PV)
- High resonance frequency
- Fast thermal stabilization
- Lightweight
- Integrated mechanical fasteners
- Standard and custom designs
- Corrosion and wear resistant
- Optically finished to state of the art surface specifications
- Outstanding optical surface quality
- Customized coating service

MARKET SEGMENTS FOR OPTOSIC® HIGH-END SCANNING MIRRORS

- High power laser material processing at UV – IR wavelengths
- Directed energy: ultra-high power laser system resonators
- Airborne and space scanning systems, avionic microsatellite mirrors for UVA's
- Bio / medical ophthalmology
- Streak camera-mirrors, targeting application, high-speed photography
- Security, reconnaissance, surveillance
- Sensing applications LIDAR
- Microlithography
- Kinematic mounts and optical benches

OPTOSIC® OPTICS FOR HIGH-END LASER PROCESSES

Mersen develops and produces innovative scanning with a galvanometer (galvo-scanning) mirror in a tailored optoSiC+ ceramic material (SiC = silicon carbide) for today's and future applications.

Mirror products made by optoSiC® are the enabling components for the high speed galvo-scanning technology as they are optimised in stiffness, light weight and dynamic performance in order to move the laser-beam in a fast, precise and reliable way.

Our highly qualified team can rely on numerous years of experience within the laser industry from design up to production; thus we are the internationally leading supplier in this technology.

WHY OPTOSIC+ MATERIAL FOR YOUR APPLICATION?

optoSiC+ silicon carbide is an advanced ceramic material developed for high end applications in the laser galvo-scanning industry. This unique material has the highest combination of thermal and mechanical stability of any material which can be optically polished making it perfect for high performance lightweight scan mirrors.

Other applications for this ceramic optics mounted on space and airborne systems for imaging like laser targeting and point to point communication.

THE ADVANTAGE OF OPTOSIC® MATERIAL:

- High stiffness
- High dimensional & thermal stability
- High thermal conductivity, low CTE
- Good radiation hardness
- Low intrinsic stress
- Uniform microstructure, dense
- Geometry near net shape
- Nontoxic (beryllium replacement)
- Vacuum and cryo usage

optoSiC+ is the material

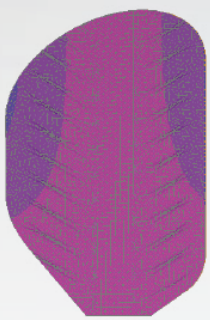
optoSiC® is the trademark of the company and the product

OPTOSIC+ MATERIAL FACTS

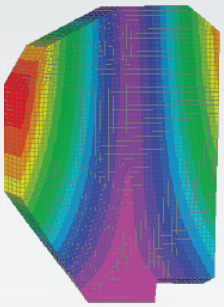
	OPTOSIC+ ®	BERYLLIUM
HEAT CAPACITY	Lower	Higher
THERMAL EXPANSION	Lower	Higher
DYNAMIC STIFFNESS	Higher Finished optical surfaces directly in the bulk material	Lower
COATABILITY	Many low stress coating choices Very good coatability	Adhesion critical/ peal-off Issue contact layer/ rejects
POSITIVE TRADEOFFS	Mechanically and thermally stable Unlimited availability No waste log Safety: RoHS conformity	Not thermal optimum Restricted availability and traceability of disposals Toxic particles when pulverized

BEST FIT MIRRORS IN DIFFERENT MATERIALS COMPARED AT STANDARD ANGLE-ACCELERATION RATE (5000 rad/s²)

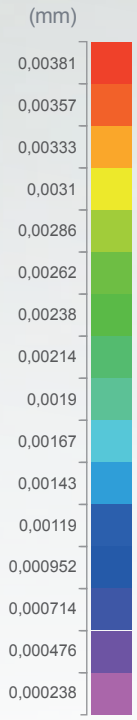
SiC optoSiC+
Deformation
± 0,32 µm



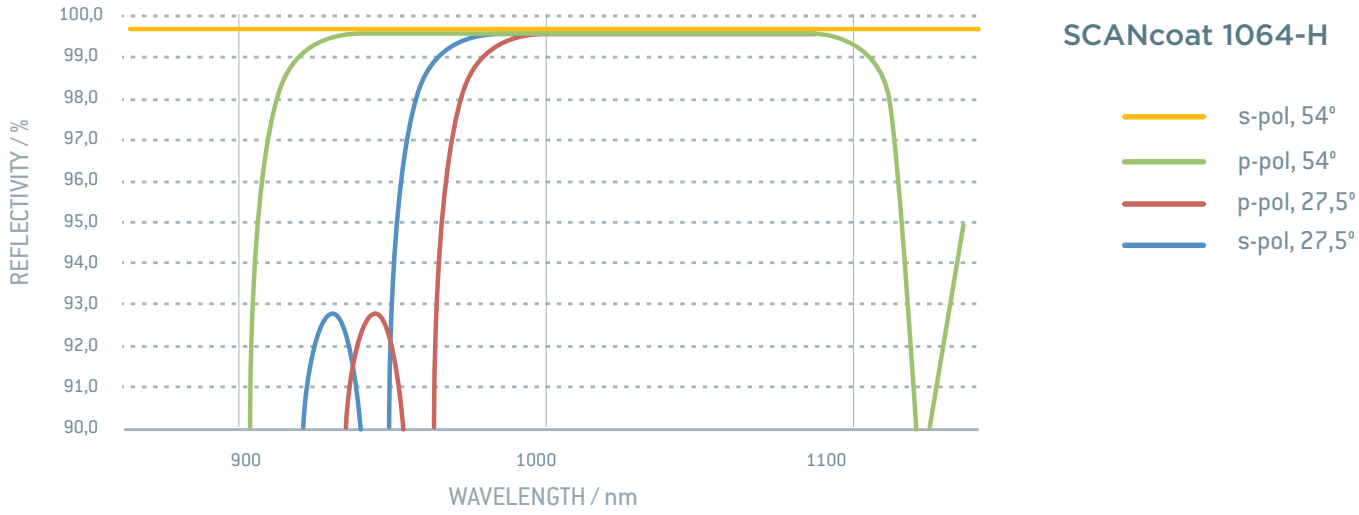
Beryllium
Deformation
± 0,51 µm



Fused silica
Deformation
± 3,79 µm



SPECIAL COATINGS PROVEN ON OPTOSIC+



Optosic® Coating Name	Nominal Wavelength	Spectral Range	Reflectivity / %	Scan Angle Range/°
SCANcoat UltraMAX® CO2- 10,6µm	10600	HR 10,6µm + TR632nm	HR> 99,7; TR> 45	45 ± 15
SCANcoat UltraMAX® CO2- HD	10600	HR 10,6µm + TR632nm ~	HR> 99,7; TR> 45	45 ± 15
SCANcoat 1064-M	920-1100	HR 920-1100	HR> 99,5	45 ± 10
SCANcoat Ag-M VIS-IR broadband	450-10000	HR 450 + HR 633 + HR 1000-9000	HR450> 93; HR633> 96; HR1000> 98	45 ± 10
SCANcoat VIS-M	450-15000	HR 450-750(VIS) + HR 1000-15000	HRvis> 98; TR> 96,5	45 ± 10
SCANcoat VIS/1550-D	380-750 + 1550	HR 380-750(VIS) + HR 1530-1570	HRvis> 97 ; HR1550> 99,5	45 ± 10
SCANcoat 1617-H	1617	HR 1617 + TR 633	HR> 99,5; TR> 80	45 ± 15
SCANcoat 1064/532-DBx	1064 + 532	HR 1064 + HR-532 + TR 633	HR1064> 99; HR532> 99; TR633> 40	45 ± 10,5
SCANcoat 1064/532-DBy	1064 + 532	HR 1064 + HR-532 + TR 633	HR1064> 99; HR532> 99; TR633> 40	37,5 ± 10,5
SCANcoat 1064-D	1064	HR 1064 + TR 633	HR> 99,5; TR> 70	41,5 ± 14
SCANcoat 1064-H	1020-1070	HR 1020-1070 + TR 630-670	HR> 99,5; TR> 70	41 ± 13
SCANcoat 990-H	900-1080	HR 900-1080	HR> 99,5; TR> 70	41 ± 16
SCANcoat 960-H	870-1050	HR 870-1050	HR> 99,5; TR> 70	41 ± 16
SCANcoat 532-Dx	525-540	HR 532 + TR 633	HR> 99,5; TR> 50	45 ± 10
SCANcoat 532-Dy	525-540	HR 532 + TR 633	HR> 99,5; TR> 50	37,5 ± 10
SCANcoat 532-H	515-535	HR 515-535 + TR 633	HR> 99,5; TR> 50	41 ± 13
SCANcoat VIS-D durable	400-700	HR 400-700 VIS - protected surface	HR> 95	45 ± 30
SCANcoat 355-Dx	355	HR 355 + TR 633	HR> 99,5; TR> 50	45 ± 10
SCANcoat-355-Dy	355	HR 355 + TR 633	HR> 99,5; TR> 50	37,5 ± 10
SCANcoat 355-H	347-367	HR 347-367 + TR 633	HR> 98,5; TR> 50	45 ± 10

HR = High Reflectivity TR = Partly Reflective

Proven SiC standard coating types are available and paired with stock availability from single parts for tests up to large quantities for OEM-supplies

BECAUSE OF

- low surface tension coating type H
- customer specific requirements
- approved package for shipment
- implemented quality assurance

YOUR BENEFITS

- minimal surface deformation
- OEM-developed tailored specifications
- optic secured, visible and identifiable
- customer satisfaction

OPTOSIC® MIRRORS
FOR STANDARD LASER APPLICATIONS

Mersen manufactures standard Generic “one-size-fits-all” XY laser galvo scanning mirrors from 10mm to 100mm apertures for single pair consumption with a range of high quality reflective coatings. Our customers have the option to get the mirrors with and without a glued mount in all standard shaft sizes. Furthermore, we are able to manufacture in accordance to customer specifications. OEM products in different grades of SiC up to 1000mm and more in geometry are available on request.

Standard Products G=Generic	Application CA mm	Standard polished WF	Standard mount shaft sizes					
			3mm	5mm	6mm	7mm	8mm	12mm
XY 10G	10mm	λ/8 PV 1064nm λ/4 PV 10600nm	✓					
XY 15G	15mm	λ/8 PV 1064nm λ/4 PV 10600nm		✓	✓	✓		
XY 20G	20mm	λ/8 PV 1064nm λ/4 PV 10600nm		✓	✓	✓		
XY 25G	25mm	λ/4 PV 1064nm λ/2 PV 10600nm				✓		
XY 30G	30mm	λ/4 PV 1064nm λ/2 PV 10600nm				✓		
XY 40G	40mm	λ/4 PV 1064nm λ/2 PV 10600nm				✓	✓	✓
XY 50G	50mm	λ/4 PV 1064nm λ/2 PV 10600nm				✓	✓	✓
XY 66G	62mm	λ/2PV 1064nm 1 L PV 10600nm						✓
XY 75G	75mm	λ/2PV 1064nm 1 λ PV 10600nm						✓
XY 100G	100mm	λ/2PV 1064nm 1 λ PV 10600nm						✓

other WF specifications on request

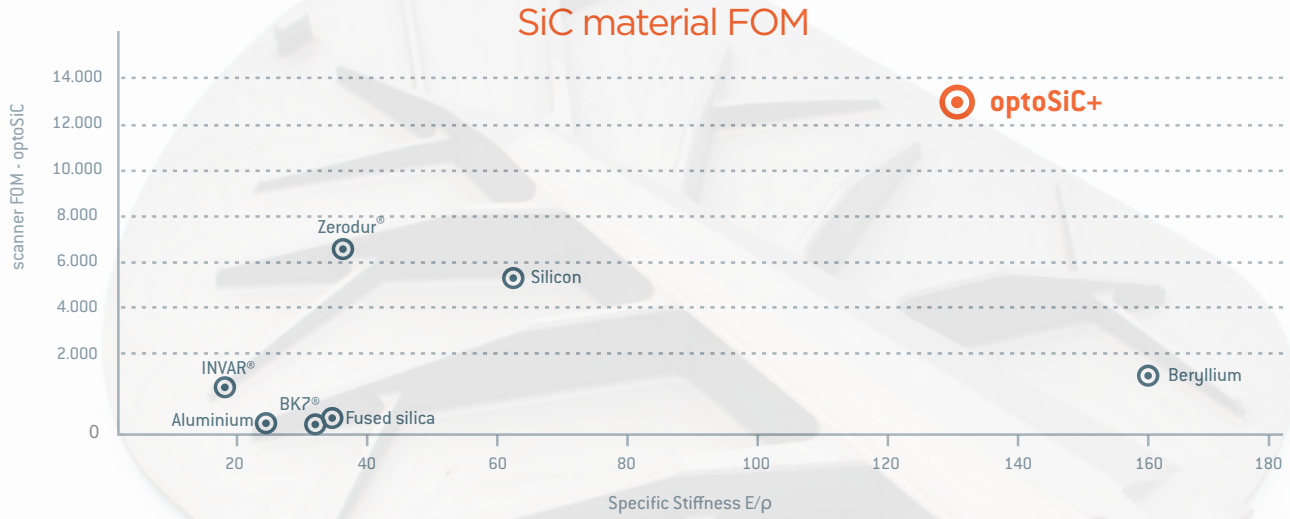
Flat no backside ribs	Application CA mm	Standard polished WF	Standard mount shaft sizes					
			3mm	5mm	6mm	7mm	8mm	12mm
XY 10 Flat	10mm	λ/4 PV 1064nm λ/2 PV 10600nm		✓		✓		
XY 15 Flat	15mm	λ/4 PV 1064nm λ/2 PV 10600nm		✓		✓		
XY 20 Flat	20mm	λ/4 PV 1064nm λ/2 PV 10600nm				✓		✓
XY 30 Flat	30mm	λ/4 PV 1064nm λ/2 PV 10600nm				✓		✓
XY 50 Flat	50mm	λ/4 PV 1064nm λ/2 PV 10600nm				✓		
XY 75 Flat	75mm	λ/2 PV 1064nm 1 λ PV 10600nm						

CA = Clear Aperture WF = Wavefront error PV = Peak to Valley

WHY OPTOSIC+ IN OPTICAL SYSTEMS?

MATERIAL COMPARISON WITH FOM (figure of merit)

		Diamond	Beryllium S-200FH	Silicon	Aluminium AlZnMg-Cu0,5	INVAR® 6061-T6 32-45Ni	Zerodur® DKO	BK7® -Glas N-BK7	Fused-silica FS	optoSiC+ SiC-ceramic
Bulk Density / ρ	g/cm³	3,52	1,85	2,33	2,78	8,00	2,53	2,51	2,20	3,17
Young's Modulus / E	GPa	1141	295	148	70	148	90,3	82	72	420
Fract. Toughness / KiC	(MPa-m1/2)		12	1,5	20		0,9	1,3	1,2	4
Flexural strength 3pt-bend / σb	MPa	750	261	65	270	455	490		90	510
mean specific heat at 20° C / Cp	J/[g*K]	0,52	1,95	0,685	0,86	0,5	0,8	0,86	0,79	0,6
Thermal conductivity / k	W/m*K	2000	216	150	120	13	1,46	1,11	1,31	150
CTE 2 (25-100°C) / ρ	ppm/K	1	11,4	2,6	27	0,5	0,01	7	0,5	2,5
FOM (optoSiC) = k * E / (α * ρ * Cp)	Rel units	1,248,495	1,549	5,350	130	962	6,514	6	109	13,249
Specific Stiffness	E / ρ	324,6	159,5	63,5	25,2	18,5	35,7	32,7	32,7	132,5
Thermal Stability	k / α	2000,0	18,9	57,7	4,4	26,0	146,0	0,2	2,6	60,0



MERSEN QUALITY CONTROL

Mersen products are quality controlled at three separate stages:

- Post-sintering aspect ratio tolerance and micro-crack inspection. Inspected parts are traceable with unique ID markings for product type and serial number.
- Post-polishing metrology and interferometry
- Post-coating reflection, environmental, abrasion and adhesion tests

We do provide every product with a unique ID number to ensure the traceability in our quality control system.

Архангельск (8182)63-90-72
Астана (7172)727-132
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Брянск (4832)59-03-52
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Киров (8332)68-02-04
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Красноярск (391)204-63-61
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