

**INFRARED
IMAGING
OPTICS**



CVI MELLES GRIOT
MISSION

... Be *the* Preferred Strategic Supplier of Precision Infrared Imaging Optics Worldwide

CVI Melles Griot Leicester was originally founded by the Vinten Group plc in Leicester England in 1983. The business is now a wholly owned subsidiary of CVI Laser, LLC.

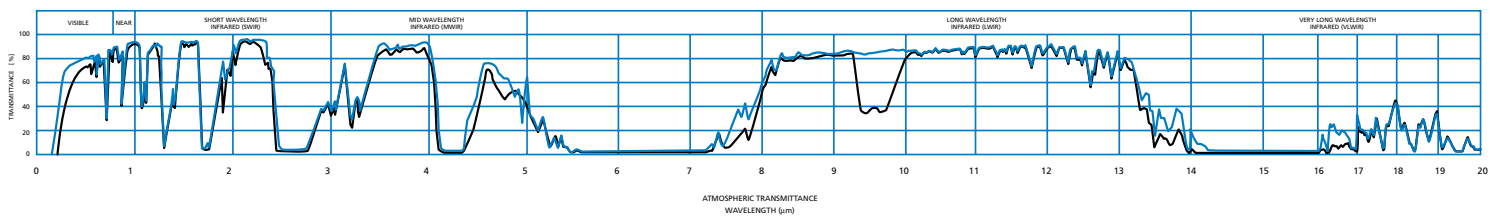
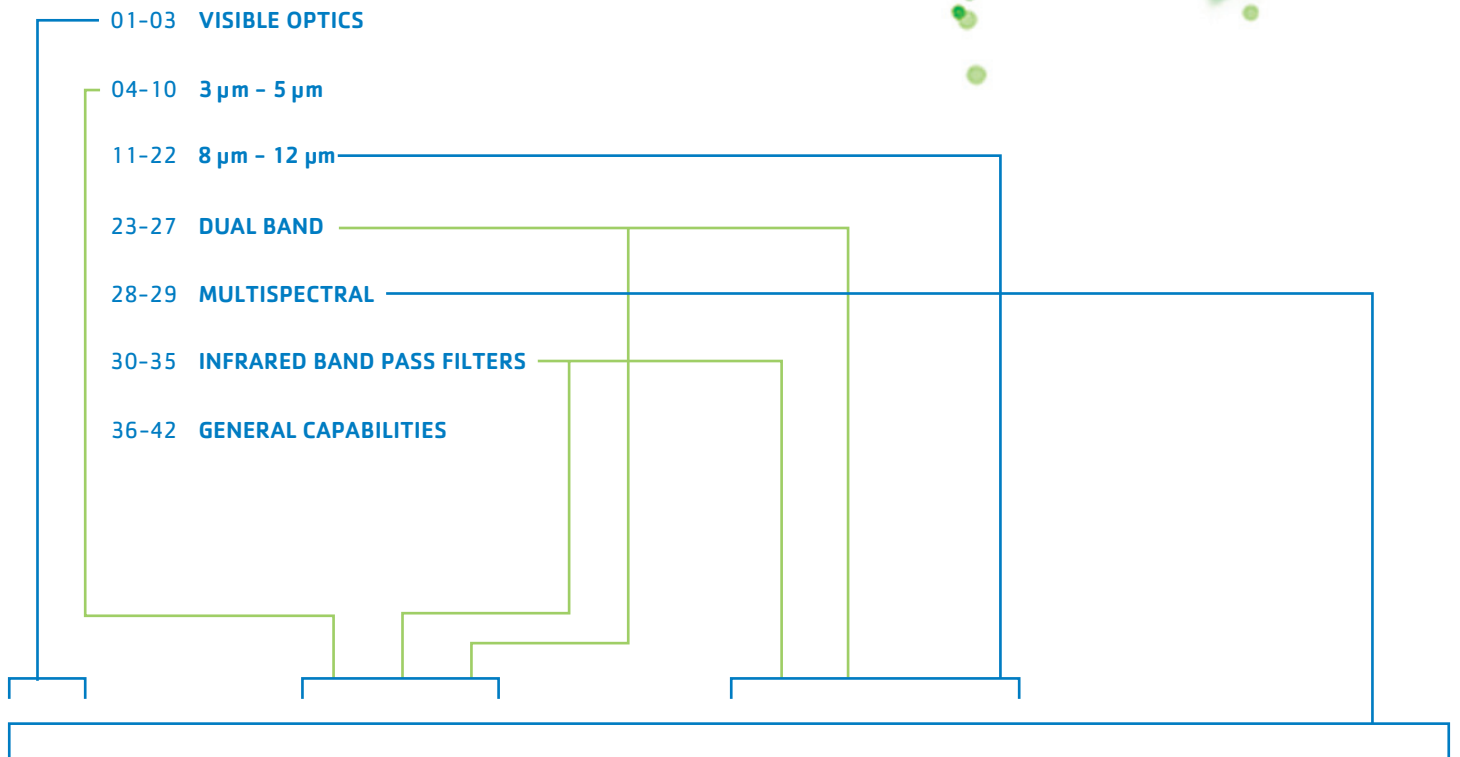
Early in its 25-year trading history the business established itself as a key manufacturer and supplier of precision custom optical components serving mainly the European and US Defence industries. The principal focus for CVI Melles Griot Leicester has been the design, manufacture and supply of optical components critical to the performance of Thermal Imaging Systems. In satisfying the requirements of major Imaging Systems OEM's the company has developed key enabling technologies and unique capabilities in optical thin film design and manufacture, precision optical fabrication and opto-mechanical assembly & test.

The company's mainstream capabilities include mid-volume, high mix production manufacture of Ge, Si, ZnSe, ZnS, and Chalcogenide glasses. Products manufactured by CVI Melles Griot Leicester define the industry standard for spectral and environmental performance for components manufactured in these materials. Complex critical infrared components and sub-assemblies are a speciality as are the manufacture of optics exposed to the most severe operational environments in hazardous Defence, Safety and Security applications.



DATASHEETS

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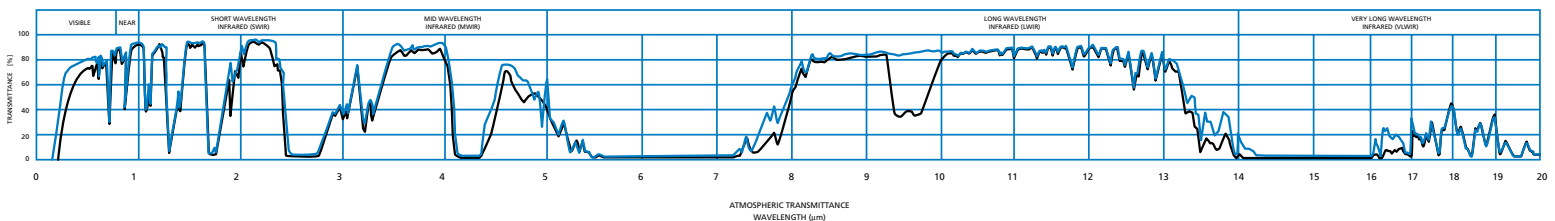
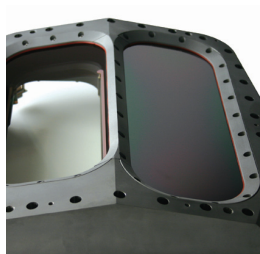


Applications and Markets

CVI Melles Griot is a valued supplier of critical infrared optical components for advanced thermal imaging and other electro-optic systems. Our focus is the development of high durability optics — able to withstand the rigours of the most severe environments in defence and industrial applications.

Advanced optical fabrication and coating capabilities and skills, as well as a variety of deposition technologies and assembly capabilities enables the company to offer an array of optical components, including windows, lenses, prisms, filters, domes, beamsplitters and subassemblies.

DEFENSE. AIRBORNE • GROUND • NAVAL
INDUSTRIAL. IR SENSORS • THERMOGRAPHY



Visible Conductive Coating

CO CCO1 Without Anti-reflection coating

CO CCO2 Including Anti-reflection coating

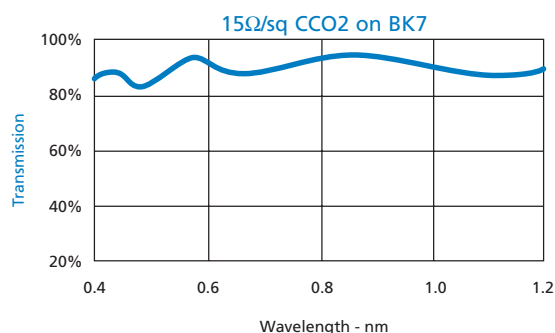
DESCRIPTION

This coating is designed to have high conductivity and transmission over the 0.4 - 1.2 μm range. It is suitable for use in aircraft instrumentation windows, CRT displays, anti-static, heating and EMC screening applications. L.C.D. Displays.

SPECTRAL PERFORMANCE

Spectral performance of a typical coating is shown below. (NB. No anti-reflection coating on back surface).

Ω/sq	%T on 1 mm thick BK7	
	CC01	CC02
008	82	88
010	84	88
020	87	91
050	84	92
100	85	93



ELECTRICAL PERFORMANCE

Sheet resistance in the range 5 Ω to 5K Ω per square can be achieved with tolerances of 10 to 15%, depending on resistivity requirements. This is achieved by varying the thickness of the Indium Tin Oxide (ITO) layer. The optical performance can then be achieved by adjusting the design of the anti-reflection coating.

BUSBARS

CVI Melles Griot can also provide busbar technology, required for Electromagnetic Interference (EMI) and heating applications.

EMC SCREENING PROPERTIES

Ω/sq	Shielding effectiveness (300-1000 MHz)
100	15 dB
020	36 dB
010	42 dB

ENVIRONMENTAL PERFORMANCE

The coating will pass the following tests:

Adhesion	MIL-C-48497	para 4.5.3.1
Humidity	MIL-C-48497	Para 4.5.3.2
Abrasion	MIL-C-48497	Para 4.5.3.3
Salt Solution	MIL-C-48497	Para 4.5.5.2

Visible Conductive Coating CO CCO3 Low reflectivity conductive coating

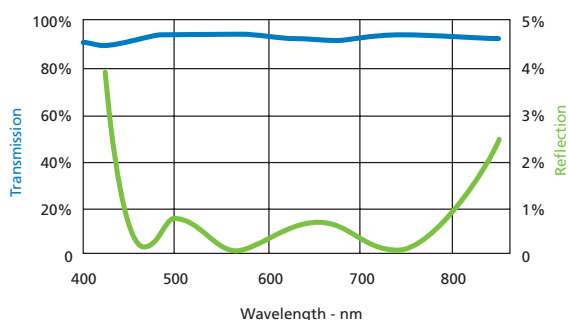
DESCRIPTION

This coating has been designated to have extremely low reflectivity in the visible region, combined with excellent electro enhancement properties.

The coating can be used in cockpit lighting, or any environment where stray light and electromagnetic frequencies give problems, to provide contrast enhancement and E.M.C. screening.

SPECTRAL PERFORMANCE

Typical spectral performance is shown below.



T ≥ 95% average, 450 nm to 800 nm, 1 mm thick
T = 35% ± 2% 450 nm to 800 nm on NG5, 2.5 mm thick
R ≥ 1.5% Average, 450 nm to 700 nm

SHIELDING CHARACTERISTICS

Typical shielding performance is as follows.

KHz		MHz			GHz		
10	100	01	10	100	01	10	Frequency
140	125	100	85	60	45	30	Shielding (dB)

EARTHING OF COATING

This is achieved using a conductive busbar around the perimeter of the substrate, the size of which can be made to your exact requirements. If desired, earthing leads can be soldered to the busbars.

CEMENT / LAMINATION

The coating is compatible with optical cements and PVB to enable polarisers/dyed glass to be incorporated into constructions.

ENVIRONMENTAL PERFORMANCE

The coating will pass the following tests:

Adhesion	MIL C-48497	Para 4.5.3.1
Humidity	MIL C-48497	Para 4.5.3.2
Abrasion	MIL C-48497	Para 4.5.3.3
Salt Solution	MIL C-48497	Para 4.5.5.2

Visible Conductive Coating

CO CC04

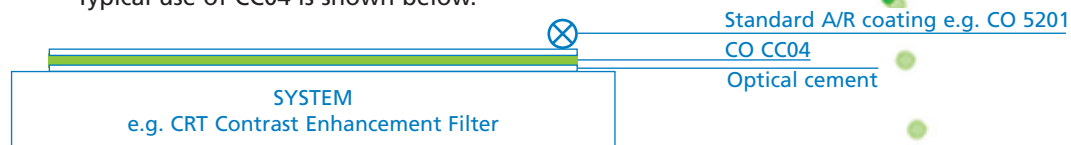
Low reflectivity conductive coating

DESCRIPTION

This coating is designed for systems to give EMC protection, where contrast enhancement and low reflectivity are also required.

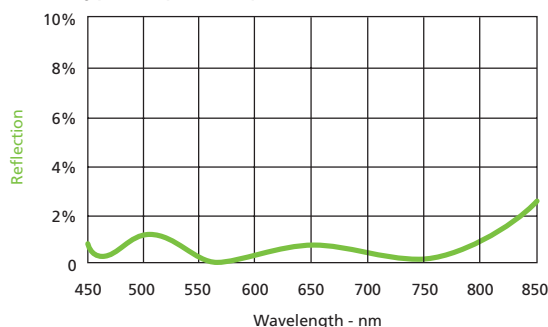
It can be cemented to an existing system to give EMC protection.

Typical use of CC04 is shown below.



SPECTRAL PERFORMANCE

Typical spectral performance is shown below.



SHIELDING CHARACTERISTICS

Typical shielding performance is as follows.

KHz		MHz			GHz		
10	100	01	10	100	01	10	Frequency
140	125	100	85	60	45	30	Shielding (dB)

EARTHING OF COATING

This is achieved using a conductive busbar around the perimeter of the substrate, the size of which can be made to your exact requirements.

If desired, earthing leads can be soldered to the busbars.

ENVIRONMENTAL PERFORMANCE

The coating will pass the following tests:

Adhesion	MIL C-48497	Para 4.5.3.1
Humidity	MIL C-48497	Para 4.5.3.2
Abrasion	MIL C-48497	Para 4.5.3.3
Salt Solution	MIL-C-48497	Para 4.5.5.2

CO 2207 ZnS 3-5

High efficiency antireflection coating
for Zinc Sulphide
3 - 5 μm

DESCRIPTION

This coating is designed for internal surface (I.S.) applications and offers maximum transmission combined with low reflection. Typically used in thermal imaging systems. This coating does not contain any radioactive materials.

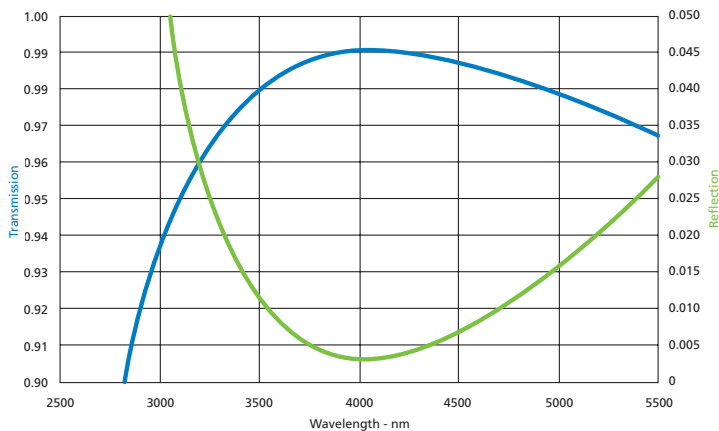
SPECTRAL PERFORMANCE

Transmission values are for a 2 mm thick Zinc Sulphide substrate which has been coated on both surfaces with CO 2207.
TRANSMISSION > 98% (average) from 3.2 - 5 μm

Reflection values are for a single Zinc Sulphide surface coated with CO 2207.
REFLECTION < 0.5% (average) from 3.2 - 5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1

CO 3404 Si 3-5

Hard Carbon antireflection coating
for Silicon
3 - 5 μm

DESCRIPTION

This coating is designed for outer surface (O.S.) applications where severe environmental conditions are likely to be encountered. Optimised for the nominal 3 - 5 μm waveband, transmission is peaked at a specific wavelength within this band, normally specified by the end user.

The coating will operate undamaged under conditions such as:
exposed optical surfaces of hand-held or vehicle mounted thermal imaging systems,
exposed optical surfaces of airborne or naval FLIR systems,
exposed window surfaces where windscreen wiper or chemical attack is to be endured.

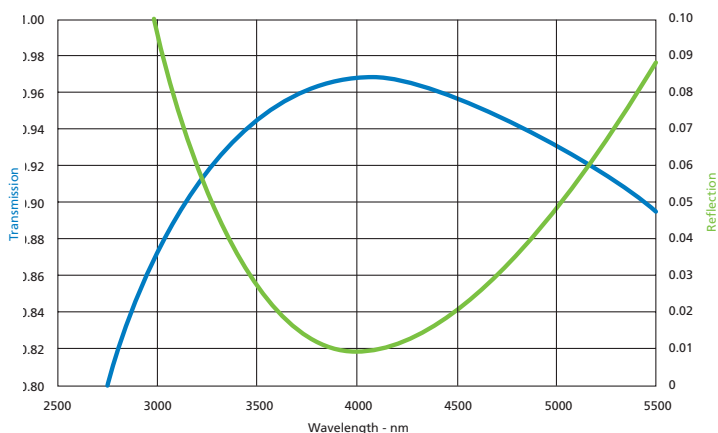
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Silicon substrate which has been coated on one surface with CO 3404 and on the second surface with CO 3429 (High Efficiency coating).
TRANSMISSION > 92% (average) from 3 - 5 μm
TRANSMISSION > 96% (at peak wavelength) within the 3 - 5 μm band

Reflection values are for a single Silicon surface coated with CO 3404.
REFLECTION < 3.0% (average) from 3 - 5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY 7 days	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION windscreen wiper	TS1888 (O.S)	para 5.4.3
SALT FOG For 24 hours	MIL-STD-810C	para 509.1

CO 3429 Si 3-5

High efficiency radioactive free antireflection coating for Silicon
3 - 5 μm

DESCRIPTION

This coating is designed for internal surface (I.S.) applications and offers maximum transmission combined with low reflection. Typically used in thermal imaging systems. The coating does not contain any radioactive materials.

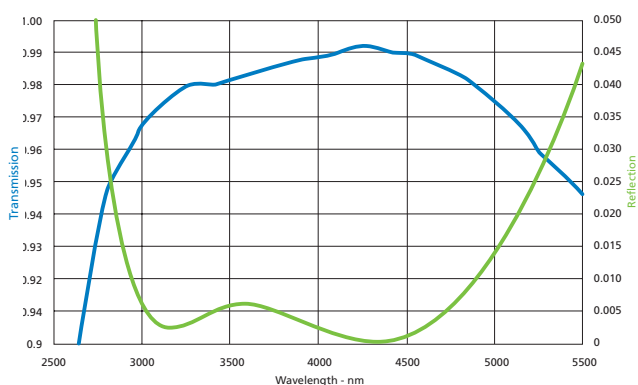
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Silicon substrate which has been coated on both surfaces with CO 3429.
TRANSMISSION > 98% (average) from 3 - 5 μm

Reflection values are for a single Silicon surface coated with CO 3429.
REFLECTION < 0.5% (average) from 3 - 5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1

CO 3435 STAR Si 3-5

High durability antireflection coating
for Silicon
3 - 5 μm

DESCRIPTION

This coating is designed for use on the external surface of lenses and windows that are exposed to harsh (in particular, marine) environments, in those cases where the residual reflectance and lower transmittance of hard carbon (CO 3404) is undesirable. In addition the coating can be designed to match the response curve of particular detectors in order to minimise narcissus.

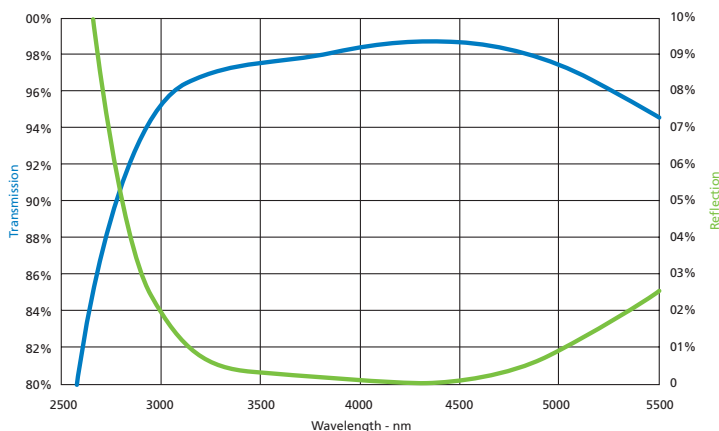
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Silicon substrate which has been coated on one surface with CO 3435 and on the second surface with CO 3429 (High Efficiency Coating)
TRANSMISSION > 97.5% (average) from 3 - 5 μm , or > 98% (average) from 3.5 - 5 μm

Reflection values are for a single Silicon surface coated with CO 3435
REFLECTANCE < 0.5% (average) from 3 - 5 μm , or < 0.3% (average) from 3.5 - 5 μm

ENVIRONMENTAL PERFORMANCE

This coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
SOLUBILITY	MIL-C-48497 TS1888	para 4.5.5.2 para 5.2.1.1
ABRASION	MIL-C-48497 TS1888	para 4.5.5.1 para 5.4.2
SALT FOG 10 days continuous	MIL-STD-810F	method 509.4

CO 4010 Ge 3-5

Hard Carbon antireflection coating
for Germanium
3 - 5 μm

DESCRIPTION

This coating is designed for outer surface (O.S.) applications where severe environmental conditions are likely to be encountered. Optimised for the nominal 3 - 5 μm waveband, transmission is peaked at a specific wavelength within this band, normally specified by the end user.

The coating will operate undamaged under conditions such as:
exposed optical surfaces of hand-held or vehicle mounted thermal imaging systems,
exposed optical surfaces of airborne or naval FLIR systems,
exposed window surfaces where windscreen wiper or chemical attack is to be endured.

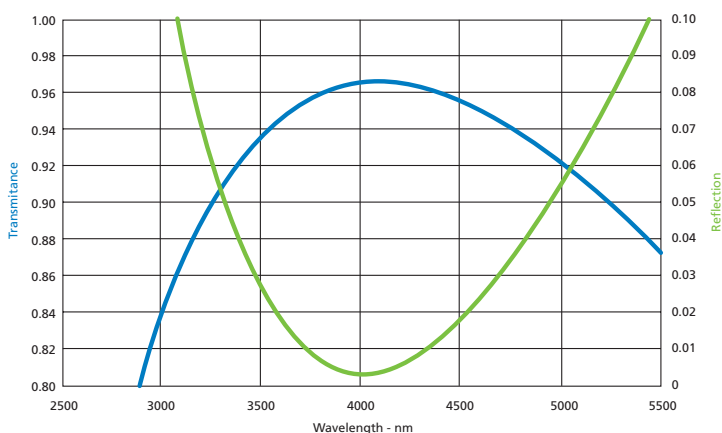
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate which has been coated on one surface with CO 4010 and on the second surface with CO 4029 (High Efficiency coating).
TRANSMISSION > 92% (average) from 3 - 5 μm
TRANSMISSION > 96% (at peak wavelength) within 3 - 5 μm

Reflection values are for a single Germanium surface coated with CO 4010.
REFLECTION < 3.0% (average) from 3 - 5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY 7 days	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION windscreen wiper	TS1888 (O.S.)	para 5.4.3
SALT FOG For 24 hours	MIL-STD-810C	para 509.1

CO 4010E Ge 3-5

Enhanced Hard Carbon antireflection coating
for Germanium
3 - 5 μm

DESCRIPTION

This enhanced form of the Hard Carbon coating is designed to satisfy the increased demands for durability required for external surface (O.S) applications. It is particularly suitable for naval applications

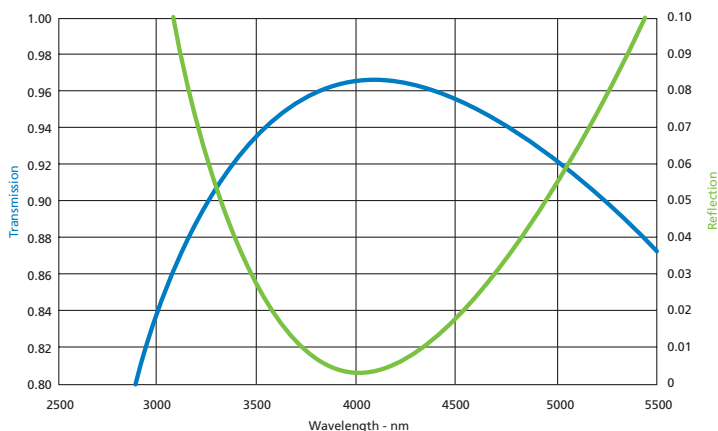
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate which has been coated on one surface with CO 4010 and on the second surface with CO 4029 (High Efficiency coating).
TRANSMISSION > 92% (average) from 3 - 5 μm
TRANSMISSION > 96% (at peak wavelength) within 3 - 5 μm

Reflection values are for a single Germanium surface coated with CO 4010.
REFLECTION < 3.0% (average) from 3 - 5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY 7 days	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION windscreen wiper	TS1888 (O.S)	para 5.4.3
SALT Fog For 90 days	MIL-STD-810C	

CO 4029 Ge 3-5

High efficiency radioactive free
antireflection coating for Germanium
3 - 5 μm

DESCRIPTION

This coating is designed for internal surface (I.S.) applications and offers maximum transmission in the MWIR band. Typically used in thermal imaging systems. The coating does not contain any radioactive materials.

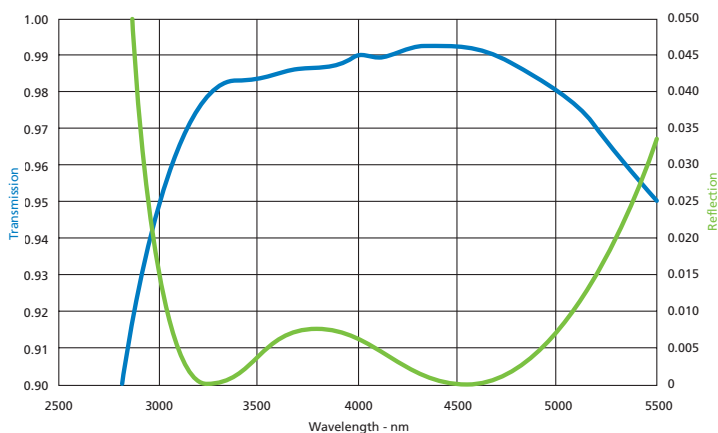
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate which has been coated on both surfaces with CO 4029.
TRANSMISSION > 98% (average) from 3 - 5 μm

Reflection values are for a single Germanium surface coated with CO 4029.
REFLECTION < 0.5% (average) from 3 - 5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1

CO 2209 ZnS 8-12

High efficiency radioactive free antireflection coating on Zinc Sulphide 8 - 11.5 μm

DESCRIPTION

This coating is designed to maximise transmission for applications in the thermal spectral band. This coating does not contain any radioactive materials.

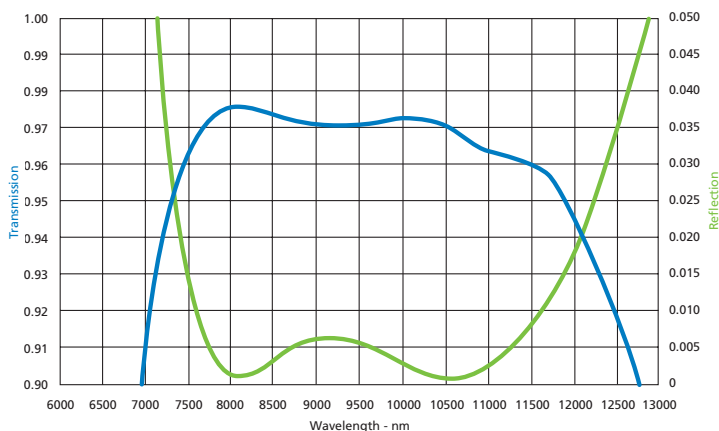
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Zinc Sulphide substrate which has been coated on both surfaces with CO 2209. TRANSMISSION > 97% (average) from 8 - 11.5 μm

Reflection values are for a single Zinc Sulphide surface coated with CO 2209. REFLECTION < 0.5% (average) from 8 - 11.5 μm

ENVIRONMENTAL PERFORMANCE

This coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.2 para 5.4.1

CO 2214EN ZnS 8-12

Non-radioactive rain erosion resistant antireflection coating for Zinc Sulphide 8 - 12 μm

DESCRIPTION

An improved rain erosion resistant coating for external surfaces, offering high transmission in the 8 - 12 μm waveband. It is particularly suitable for dome applications, where the same coating is applied to both faces. This coating does not contain any radioactive materials.

SPECTRAL PERFORMANCE

Transmission values are for a 6 mm thick Zinc Sulphide substrate which has been coated on both surfaces with CO 2214EN.

TRANSMISSION > 91% (average) from 7.8 - 10.2 μm

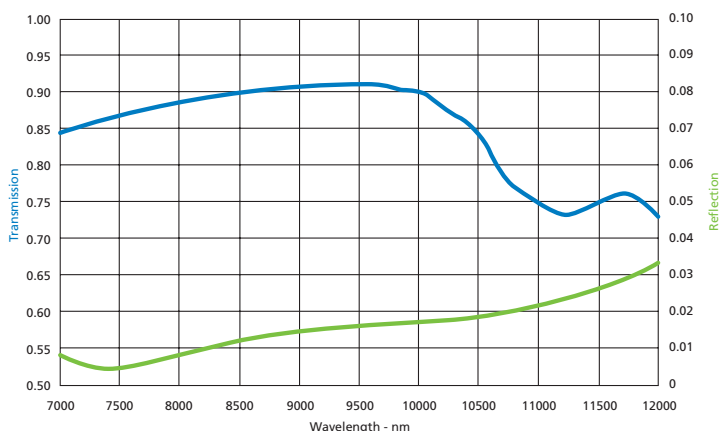
TRANSMISSION \geq 87% (absolute) from 7.8 - 10.2 μm

TRANSMISSION > 73% (average) from 10.2 - 12.1 μm

TRANSMISSION > 65% (absolute) from 10.2 - 12.1 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION MIL-C-48497 para 4.5.3.1
TS1888 para 5.1

HUMIDITY MIL-C-48497 para 4.5.3.2
TS1888 para 5.2.1.2

SALT SOLUTION MIL-C-48497 para 4.5.5.2
TS1888 para 5.2.1.1

WIPER ABRASION TS1888 para 5.4.3
5000 wipes

Rain Erosion Resistance
TRANSMISSION LOSS < 4% (average) from 8.0-11.5 μm
Under the following test conditions:

PERIOD OF EROSION: 1 hour
RAIN DROPS: 2 mm mean diameter
IMPACT ANGLE: 60° to the surface
SPEED: 500 mph/223 m/s
RATE OF RAIN: 25 mm/hour

CO 2409 ZnSe 8-12

High efficiency radioactive free antireflection coating for Zinc Selenide 8 - 12 μm

DESCRIPTION

This coating is designed for internal surface (I.S.) applications and offers maximum transmission combined with minimum reflection. Typically used in thermal imaging systems. This coating does not contain any radioactive materials.

SPECTRAL PERFORMANCE

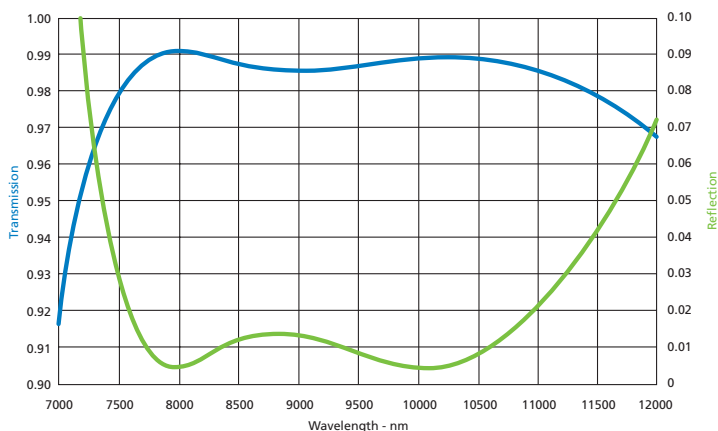
Transmission values are for a 1 mm thick Zinc Selenide substrate which has been coated on both surfaces with CO 2409.
TRANSMISSION > 98% (average) from 8 - 12 μm

Reflection values are from a single Zinc Selenide surface coated with CO 2409.
REFLECTION < 0.5% (average) from 8 - 11 μm

This coating can be produced to meet any other "industry standard" spectral specification for the 7.5 - 12.0 μm band.

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1

This coating is also unaffected by the following environmental tests which will be performed upon request.

SALT SOLUTION	MIL-C-48497 TS1888	para 4.5.5.2 para 5.2.1.1
TEMPERATURE CYCLE	MIL-M-13508C	para. 4.4.4

CO 2411 ZnSe 8-12

Antinarciussus antireflection coating
for Zinc Selenide
8 - 12 μm

DESCRIPTION

This coating is designed for internal surface (I.S.) applications and offers maximum transmission combined with extremely low reflection. Typically used in thermal imaging systems. The coating does not transmit in the visible part of the spectrum and does not therefore facilitate laser alignment. This coating does not contain any radioactive materials.

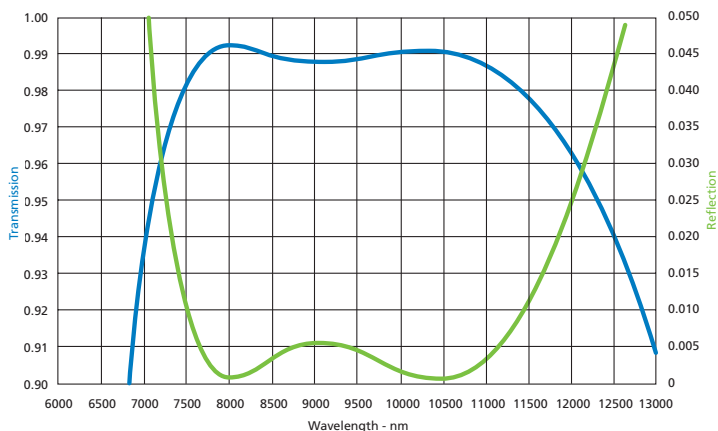
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Zinc Selenide substrate which has been coated on both surfaces with CO 2411.
TRANSMISSION > 98% (average) from 7.5 - 11.5 μm
TRANSMISSION > 96% (absolute) from 7.5 - 11.5 μm

Reflection values are for a single Zinc Selenide surface coated with CO 2411.
REFLECTION < 0.3% (average) from 7.5 - 11.5 μm
REFLECTION < 0.2% (average weighted to typical system response) from 7.5 - 11.5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1
SALT SOLUTION	MIL-C-48497 TS1888	para 4.5.5.2 para 5.2.1.1

CO 2609 GASIR™ 8-12

High efficiency antireflection coating
on GASIR™
8 - 12 μm

DESCRIPTION

This coating is designed for internal surface (I.S.) applications and offers maximum transmission combined with minimum reflection. Typically used in thermal imaging systems. This coating does not contain any radioactive materials.

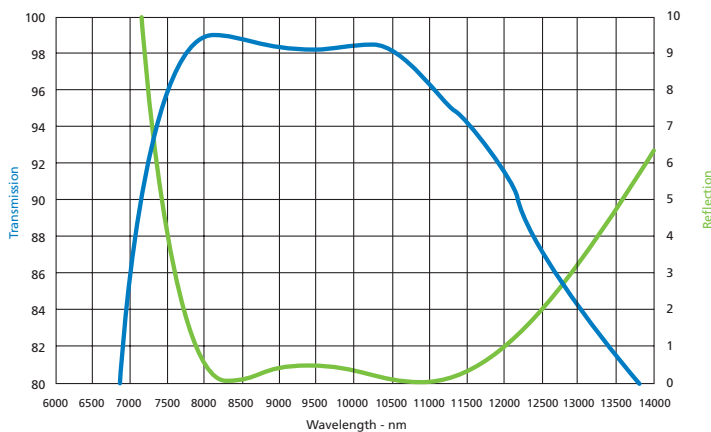
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick GASIR™ substrate which has been coated on both surfaces with CO 2609
TRANSMISSION > 97.5% (average) for 7.5 to 11.5 microns
TRANSMISSION > 91.0% (average) for 11.5 to 12.3 microns

Reflection values are from a single GASIR™ surface coated with CO 2609
REFLECTION < 0.4% (average) for 8.0 to 12.0 microns

ENVIRONMENTAL PERFORMANCE

This coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1

CO 3209 GaAs 8-12

High efficiency radioactive free antireflection coating for Gallium Arsenide 8 - 12 μm

DESCRIPTION

This coating is designed for internal surface (I.S.) applications and offers maximum transmission combined with low reflection. Typically used in thermal imaging systems. The coating does not contain any radioactive materials.

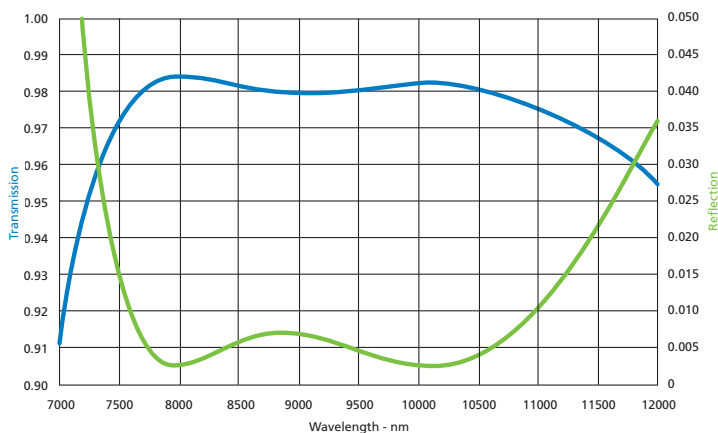
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick GaAs substrate which has been coated on both surfaces with CO 3209
TRANSMISSION > 98% (average) from 8 - 11.5 μm

Reflection values are for a single GaAs surface coated with CO 3209
REFLECTION < 0.5% (average) from 8 - 11.5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1

CO 4004 Ge 8-12
 Hard Carbon antireflection coating
 for Germanium
 8 - 12 μm

DESCRIPTION

This coating is designed for outer surface (O.S.) applications where severe environmental conditions are likely to be encountered.

The coating will operate undamaged under conditions such as:
 exposed optical surfaces of hand-held or vehicle-mounted thermal imaging systems;
 exposed optical surfaces of airborne or naval FLIR systems;
 exposed window surfaces where windscreen wiper or chemical attack is to be endured.

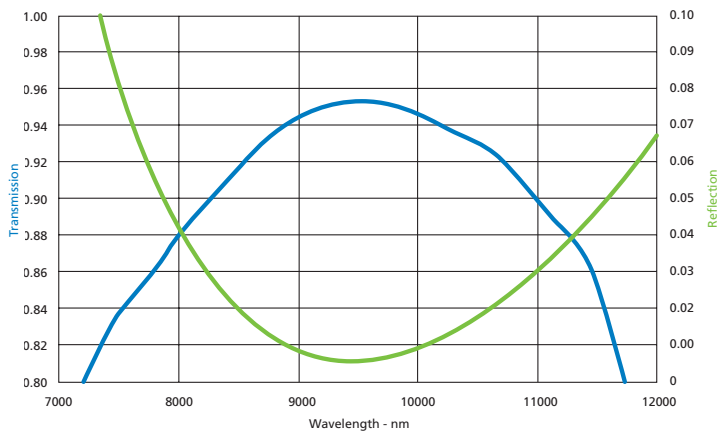
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate which has been coated on one surface with CO 4004 and on the second surface with CO 4009 (High Efficiency coating).
 TRANSMISSION > 90% (average) from 8 - 11.5 μm

Reflection values are for a single Germanium surface coated with CO 4004.
 REFLECTION < 3% (average) from 8 - 11.5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY 7 days	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION windscreen wiper	TS1888 (O.S)	para 5.4.3
SALT FOG For 24 hours	MIL-STD-810C	para 509.1

CO 4004C Ge 8-12

'Covert' Hard Carbon coating
for Germanium
8 - 12 μm

DESCRIPTION

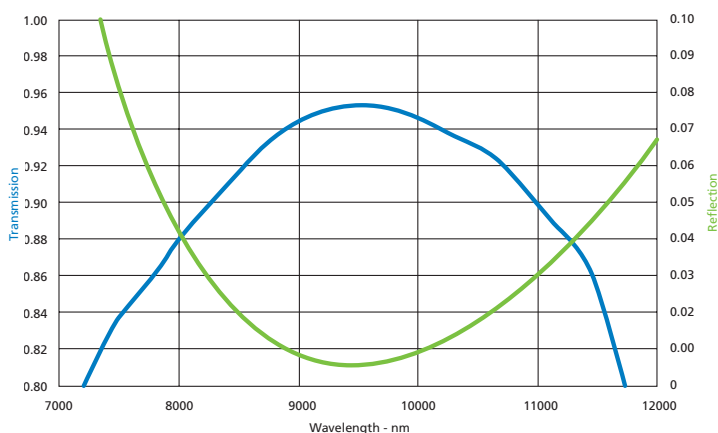
The standard hard carbon coating (CO 4004) is post-treated with a visible antireflection process. This reduces visible reflectance from around 17% average to < 2% average. This coating is applicable in situations where glint would be disadvantageous.

SPECTRAL PERFORMANCE

Infrared performance is as specified for CO 4004. Additionally REFLECTION is < 2% from 400 - 700 nm.

ENVIRONMENTAL PERFORMANCE

Performance of the basic hard carbon coating is as specified for CO 4004. The overcoat will not fully pass the windscreen wiper test so this process is not indicated for applications in which wiper blades are used to clean the window.



An overcoated witness piece will be tested to the following specifications:

ADHESION	MIL-C-48497	para 4.5.3.1
HUMIDITY	MIL-C-48497	para 4.5.3.2
ABRASION	MIL-C-48497	para 4.5.5.1

Additionally, an untreated hard carbon coated witness piece will be tested per CO 4004.

CO 4004E Ge 8-12

Hard Carbon antireflection coating with enhanced salt resistance for Germanium 8 - 12 μm

DESCRIPTION

This coating is designed for outer surface (O.S.) applications where severe environmental conditions, particularly salt spray and salt fog, are likely to be encountered.

The coating is designed for such applications as:
exposed optical surfaces of hand-held or vehicle-mounted thermal imaging systems;
exposed optical surfaces of airborne or naval FLIR systems;
exposed window surfaces where windscreen wiper or chemical attack is to be endured.

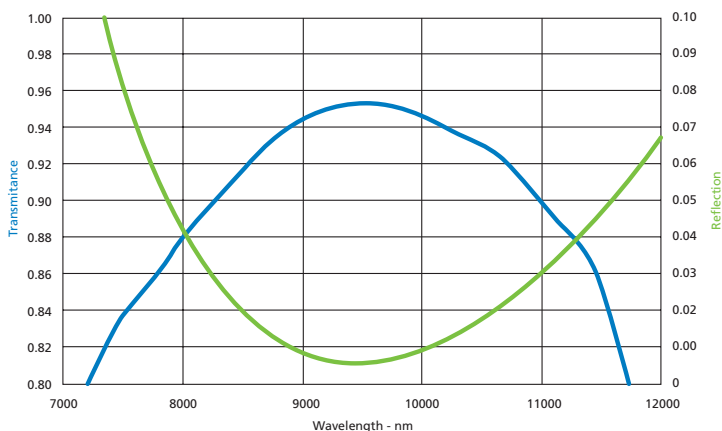
SPECTRAL PERFORMANCE

Transmission values are for 1 mm thick Germanium substrate which has been coated on one surface with CO 4004 and on the second surface with CO 4009 (High Efficiency coating).
TRANSMISSION > 90% (average) from 8 - 11.5 μm

Reflection values are for a single germanium surface coated with CO 4004.
REFLECTION < 3% (average) from 8 - 11.5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY 7 days	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION windscreen wiper	TS1888 (O.S.)	para 5.4.3 para 5.4.3
SALT FOG For 90 days	MIL-STD-810C	para 509.1

CO 4047 Ge 8-12

Hard Carbon multi-Layer antireflection coating for Germanium
8 - 12 μm

DESCRIPTION

This coating is designed for outer surface (O.S.) applications where severe environmental conditions are likely to be encountered.

Durability is equal to that of the single layer Hard Carbon coating (CO 4004), but this variant offers the added advantages of lower reflectance and higher transmittance. The lower reflectance is useful in reducing potential narcissus effects.

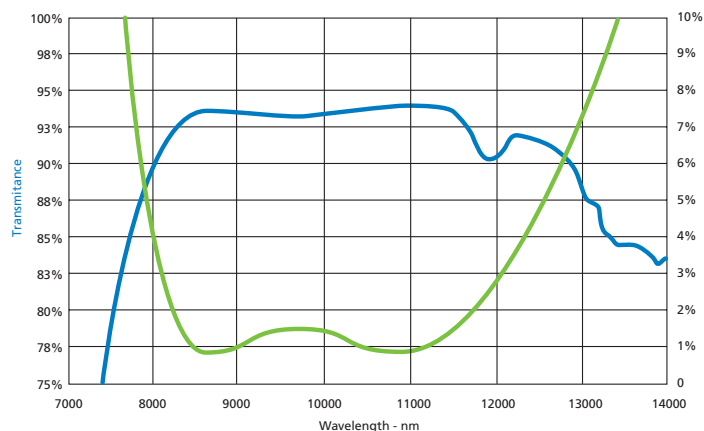
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate, which has been coated on one surface with CO 4047 and on the second surface with CO 4009 (High Efficiency Coating).
TRANSMISSION $\geq 93\%$ (average) from 8.0 - 11.5 μm (vs 90% for CO 4004).

Reflectance values are from a single Germanium surface coated with CO 4047.
REFLECTION $\leq 1.25\%$ (average) from 8.0 - 11.5 μm (vs 3% for CO 4004).

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497	para 4.5.3.2
ABRASION	TS1888 (O.S.)	para 5.4.3
SALT FOG For 24 hours	MIL-STD-810C	para 509.1

CO 4009 Ge 8-12

High efficiency radioactive free antireflection coating for Germanium 8 - 12 μm

DESCRIPTION

This coating is designed for internal surface (I.S.) applications and offers maximum transmission combined with low reflection. Typically used in thermal imaging systems. This coating does not contain any radioactive materials.

SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate which has been coated on both surfaces with CO 4009.

TRANSMISSION > 98% (average) from 7.5 - 11.5 μm

TRANSMISSION > 96% (absolute) from 7.5 - 11.5 μm

TRANSMISSION > 94% (average) from 11.5 - 12.3 μm

Reflection values are for a single Germanium surface coated with CO 4009.

REFLECTION < 0.9% (average) from 7.5 - 8 μm

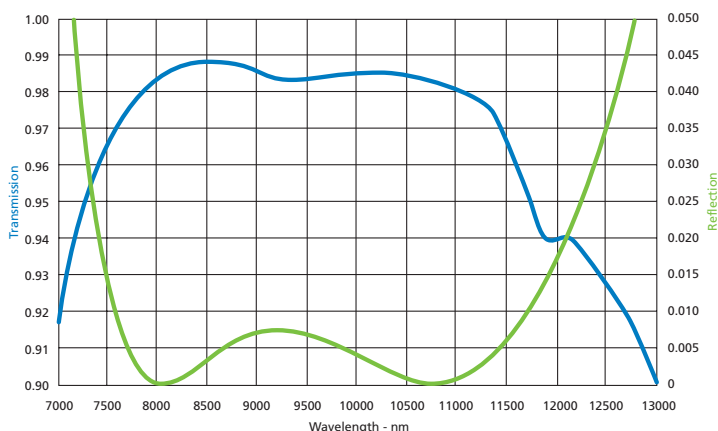
REFLECTION < 0.3% (average) from 8 - 11.5 μm

REFLECTION < 1.3% (average) from 11.5 - 12.3 μm

This coating can be produced to meet any other "industry standard" spectral specification in the 7.5 - 12 μm band.

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1
This coating is also unaffected by the following environmental tests which will be performed upon request.		
SALT SOLUTION	MIL-C-48497 TS1888	para 4.5.5.2 para 5.2.1.1
TEMPERATURE CYCLE	MIL-M-13508C	para. 4.4.4

CO 4019 Ge 8-12

High durability radioactive free antireflection coating for Germanium 8 - 12 μm

DESCRIPTION

This coating is designed for modular interface surface (M.I.S.) applications where maximum durability is required whilst maintaining high transmission. This coating does not contain any radioactive materials.

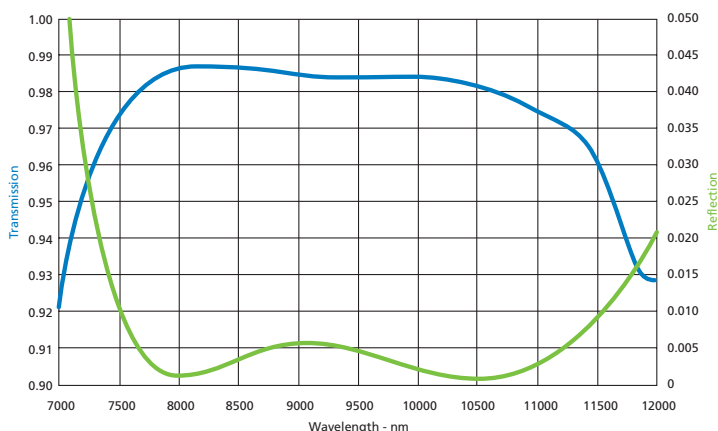
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate which has been coated on one surface with CO 4019 and on the second surface with CO 4009 (high efficiency coating). TRANSMISSION > 98% (average) from 8 - 11.5 μm

Reflection values are for a single Germanium surface coated with CO 4019. REFLECTION < 0.5% (average) from 8 - 11.5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.5.1 para 5.4.2
SALT SOLUTION	MIL-C-48497 TS 1888	para 4.5.5.2 para 5.2.1.1
TEMPERATURE CYCLE	MIL-M-13508C	para 4.4.4

CO 2204 ZnS Dual band

Dual band antireflection coating
for Zinc Sulphide
3 - 5 μm and 7.5 - 11 μm

DESCRIPTION

This coating is designed for applications requiring transmission in both thermal imaging spectral bands.
This coating does not contain any radioactive materials.

SPECTRAL PERFORMANCE

Transmission values are for a 2 mm thick Zinc Sulphide substrate which has been coated on both surfaces with CO 2204.

TRANSMISSION > 96% (average) from 3 - 5 μm

TRANSMISSION > 95% (average) from 7.5 - 11 μm

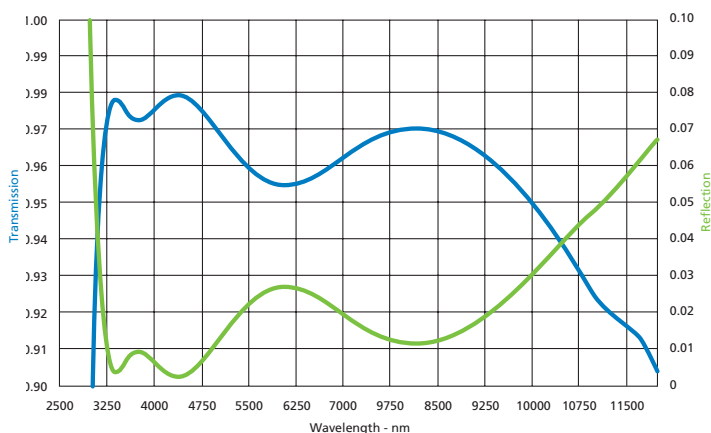
Reflection values are for a single Zinc Sulphide surface coated with CO 2204.

REFLECTION < 2% (average) from 3 - 5 μm

REFLECTION < 2% (average) from 7.5 - 11 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.5.1 para 5.4.2
SALT SOLUTION	MIL-C-48497 TS1888	para 4.5.5.2 para 5.2.1.1

CO 2204E ZnS Dual band

Wiper Resistant dual band antireflection coating for Zinc Sulphide
3 - 5 μm and 7.5 - 11 μm

DESCRIPTION

An improved abrasion resistant coating for external surfaces, offering high transmission in both thermal imaging spectral bands. The specification is similar to that of CO 2204, except that this coating offers windscreen wiper resistance. This coating does not contain any radioactive materials.

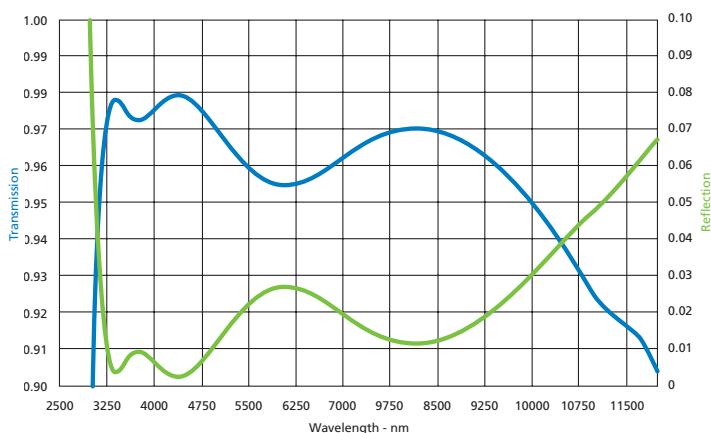
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Zinc Sulphide substrate which has been coated with on one surface with CO 2204E and on the second surface with CO 2204.
TRANSMISSION > 95% (average) from 3 - 5 μm
TRANSMISSION > 95% (average) from 7.5 - 11 μm

Reflection values are for a single Zinc Sulphide surface coated with CO 2204E.
REFLECTION < 3% (average) from 3 - 5 μm
REFLECTION < 2% (average) from 7.5 - 11 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
SALT SOLUTION	MIL-C-48497 TS1888	para 4.5.5.2 para 5.2.1.1
WIPER ABRASION 5000 wipes	TS1888	para 5.4.3

CO 2404 ZnSe Dual band

Dual band antireflection coating
for Zinc Selenide
3 - 5 μm and 8 - 12 μm

DESCRIPTION

This coating is designed for applications requiring transmission in both thermal imaging spectral bands.
This coating does not contain any radioactive materials.

SPECTRAL PERFORMANCE

Transmission values are for a 2 mm thick Zinc Selenide substrate which has been coated on both surfaces with CO 2404.

TRANSMISSION > 95% (average) from 3 - 5 μm

TRANSMISSION > 96% (average) from 8 - 12 μm

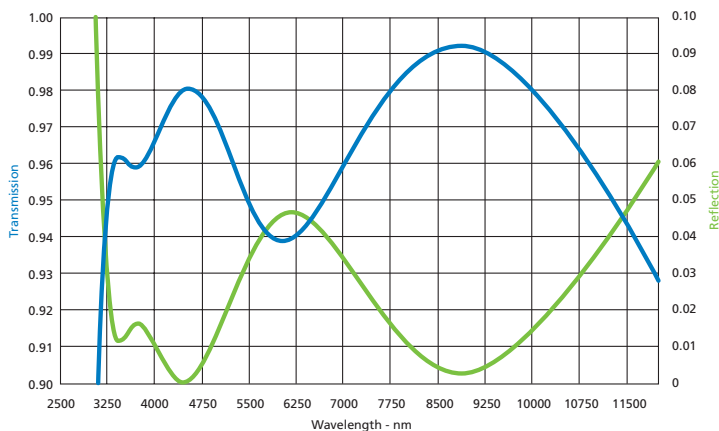
Reflection values are for a single Zinc Selenide surface coated with CO 2404.

REFLECTION < 2% (average) from 3 - 5 μm

REFLECTION < 2% (average) from 8 - 12 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.5.1 para 5.4.2
SALT SOLUTION	MIL-C-48497 TS1888	para 4.5.5.2 para 5.2.1.1

CO 2404E ZnSe Dual band

Wiper Resistant Dual band
antireflection coating for Zinc Selenide
3 - 5 μm and 8 - 12 μm

DESCRIPTION

An improved abrasion resistant coating for external surfaces, offering high transmission in both thermal imaging spectral bands. The specification is similar to that of CO 2404, except that this coating offers windscreen wiper resistance. This coating does not contain any radioactive materials.

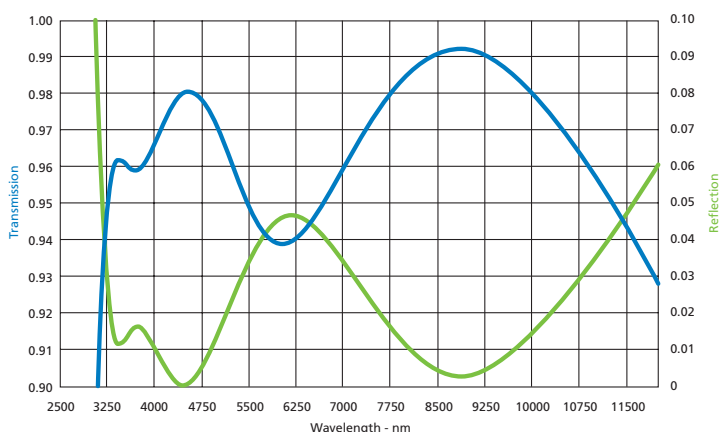
SPECTRAL PERFORMANCE

Transmission values are for a 2 mm thick Zinc Selenide substrate which has been coated on one surface with CO 2404E and on the second surface with CO 2404.
TRANSMISSION > 95% (average) from 3 - 5 μm
TRANSMISSION > 96% (average) from 8 - 12 μm

Reflection values are for a single Zinc Selenide surface coated with CO 2404E.
REFLECTION < 2% (average) from 3 - 5 μm
REFLECTION < 2% (average) from 8 - 12 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.5.1 para 5.4.2
SALT SOLUTION	MIL-C-48497 TS1888	para 4.5.5.2 para 5.2.1.1
WIPER ABRASION 5000 wipes	TS1888	para 5.4.3

CO 4008 Ge Dual band

Dual band antireflection coating
for Germanium
3 - 5 μm and 8 - 12 μm

DESCRIPTION

This coating is designed for applications requiring transmission in both thermal imaging spectral bands.
This coating does not contain any radioactive materials.

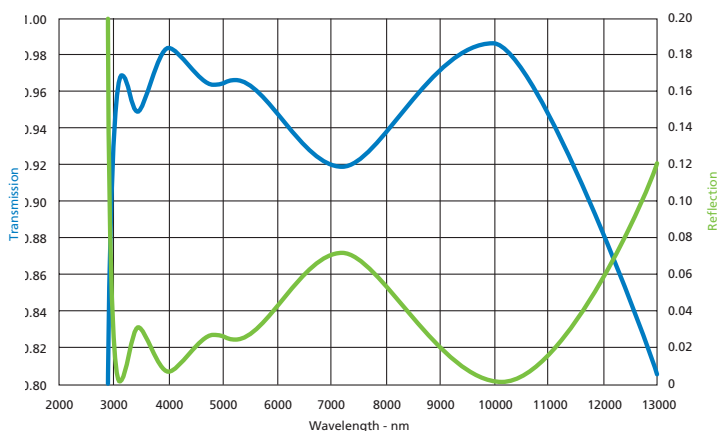
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate which has been coated on both surfaces with CO 4008
TRANSMISSION > 95% (average) from 3 - 5 μm
TRANSMISSION > 94% (average) from 8 - 12 μm

Reflection values are for a single Germanium surface coated with CO 4008.
REFLECTION < 2% (average) from 3 - 5 μm
REFLECTION < 2% (average) from 8 - 12 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1

CO 2202 ZnS Multispectral

Durable Antireflection coating
for multispectral Zinc Sulphide
visible - 12 μm

DESCRIPTION

This coating is designed to give maximum transmission at wavelengths in the visible - 12 μm region.
Typically used in optical systems operating at more than one wavelength region and is suitable for external surfaces.

SPECTRAL PERFORMANCE

Transmission values are for a 2 mm thick multispectral Zinc Sulphide substrate which has been coated on both surfaces with CO 2202.

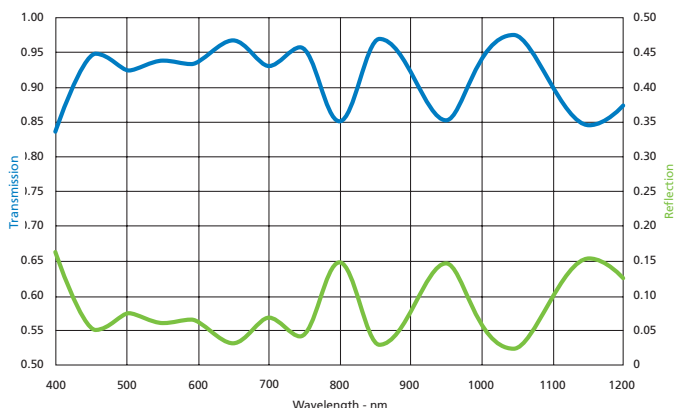
TRANSMISSION > 92% (average) from 450 - 650 nm

TRANSMISSION > 95% (absolute) at 1064 or 1540 nm

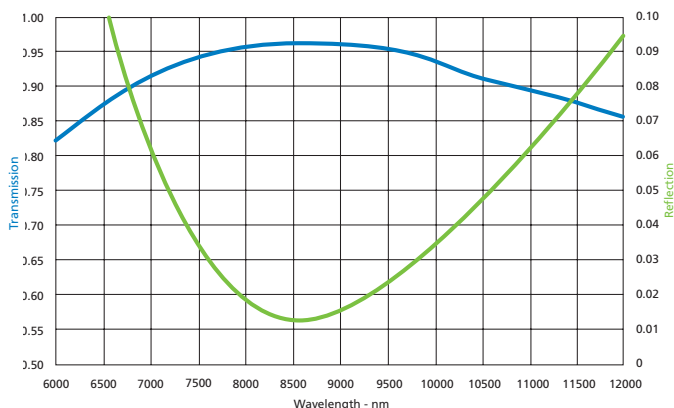
TRANSMISSION > 93% (average) from 8 - 11.5 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.5.1 para 5.4.2
SALT SOLUTION	MIL-C-48497 TS1888	para 4.5.5.2 para 5.2.1.1



CO 2202E ZnS Multispectral

Wiper Resistant multispectral antireflection coating for Zinc Sulphide visible - 12 µm

DESCRIPTION

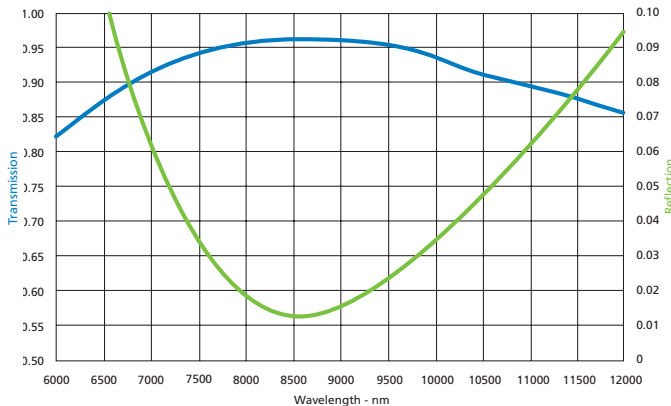
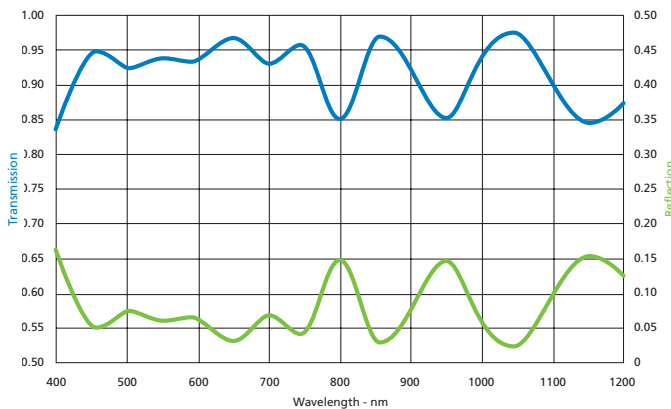
An improved abrasion resistant coating for external surfaces, for use at wavelengths in the visible - 12 µm region. The specification is similar to that of CO 2202, except that this coating offers windscreen wiper resistance.

SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Zinc Sulphide substrate which has been coated on one surface with 2202E and on the second surface with CO 2202.
 TRANSMISSION > 90% (average) from 450 - 650 nm
 TRANSMISSION > 95% (absolute) at 1064 or 1540 nm
 TRANSMISSION > 93% (average) from 8 - 11.5 µm
 Performance can be re-optimized to meet specific customer requirements.

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



As CO 2202 with the following additional tests

WIPER ABRASION TS1888 para 5.4.3
 5000 wipes

Rain Erosion Resistance will meet the following values as a minimum:
 TRANSMISSION LOSS < 4% (average) from 8.0-11.5 µm
 Under the following test conditions:

PERIOD OF EROSION: 1 hour
 RAIN DROPS: 2 mm mean diameter
 IMPACT ANGLE: 60° to the surface
 SPEED: 500 mph/223 m/s
 RATE OF RAIN: 25 mm/hour

CO OM12

Wideband IR mirror for oblique incidence

DESCRIPTION

This coating is designed to retain high reflectivity in the IR over a wide angular range.

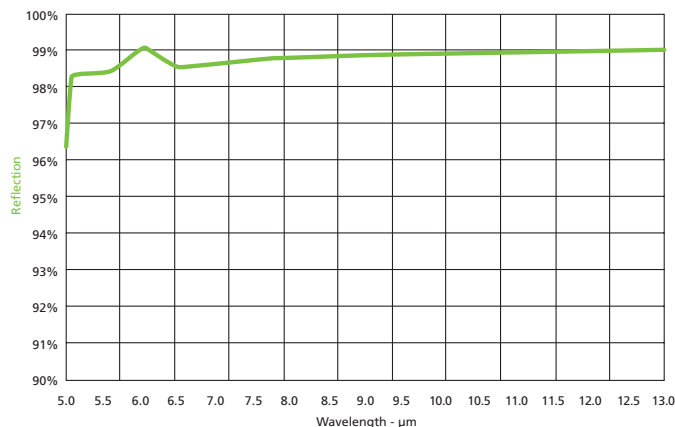
The mirror uses gold as the medium for high reflectivity, and the protective overlayers have been chosen so as to eliminate the reflectivity problems suffered by conventional protected mirrors when used in the IR at oblique incidence.

SPECTRAL PERFORMANCE

Measured at 45° angle of incidence
REFLECTION >98% (average) 3 - 5 μm
REFLECTION >98% (average) 8 - 12 μm

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1

CO 40BP-C4

Band-pass filter for Germanium
3.6 - 4.2 μm

DESCRIPTION

This coating is designed for thermal imaging applications and offers maximum transmission combined with wide blocking bands. This coating can operate at 77K and does not contain any radioactive materials.

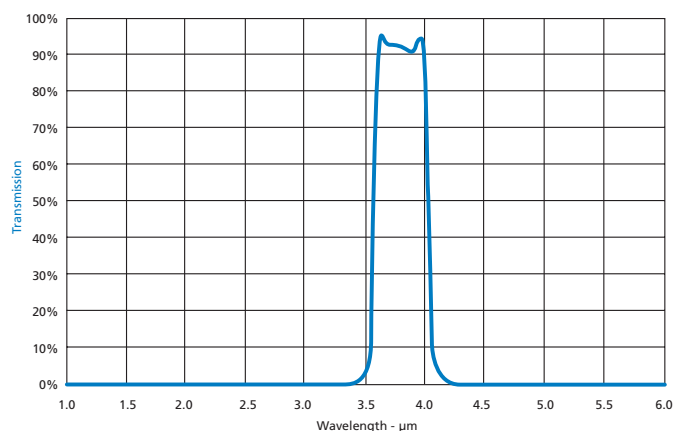
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate.
TRANSMISSION > 90% (average) from 3.6 – 4.0 μm .
TRANSMISSION > 85% (absolute) from 3.6 – 4.0 μm
TRANSMISSION < 0.1% (absolute) from Visible – 3.4 μm
TRANSMISSION < 0.1% (absolute) from 4.3 - 6.0 μm

This coating is representative of our coating technology and multiple variations can be designed to cover the 1 - 7 μm band.

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION MIL-C-48497 para 4.5.3.1
TS1888 para 5.1

HUMIDITY MIL-C-48497 para 4.5.3.2
TS1888 para 5.2.1.2

ABRASION MIL-C-48497 para 4.5.3.3
TS1888 para 5.4.1

This coating is also unaffected by the following environmental tests which will be performed upon request.

SALT SOLUTION MIL-C-48497 para 4.5.5.2
TS1888 para 5.2.1.1

TEMPERATURE CYCLE MIL-M-13508C para 4.4.4

CO 34LWP-C1

Longwave-pass filter for Silicon
2.1 - 5 μm

DESCRIPTION

This coating is designed for thermal imaging applications and offers maximum transmission combined with wide blocking bands. This coating can operate at 77K and does not contain any radioactive materials.

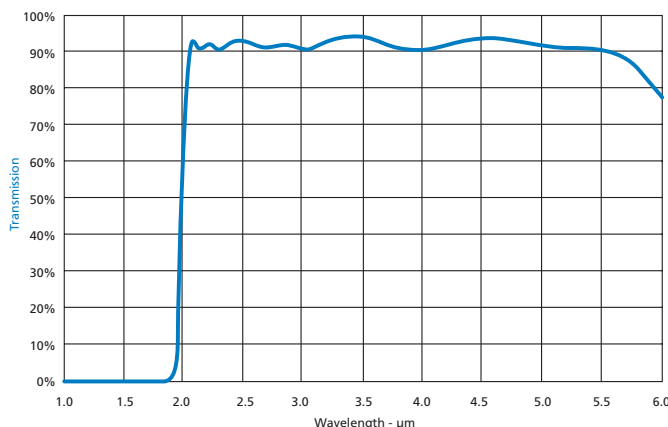
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Silicon substrate.
TRANSMISSION > 90% (average) from 2.1 – 5.5 μm .
TRANSMISSION > 85% (absolute) from 2.1 – 5.5 μm
TRANSMISSION < 0.1% (absolute) from Visible – 1.9 μm

This coating is representative of our coating technology and multiple variations can be designed to cover the 1 - 7 μm band.

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	para 4.5.3.1 para 5.1
HUMIDITY	MIL-C-48497 TS1888	para 4.5.3.2 para 5.2.1.2
ABRASION	MIL-C-48497 TS1888	para 4.5.3.3 para 5.4.1

This coating is also unaffected by the following environmental tests which will be performed upon request.

SALT SOLUTION	MIL-C-48497 TS1888	para 4.5.5.2 para 5.2.1.1
TEMPERATURE CYCLE	MIL-M-13508C	para 4.4.4

CO 40LWP-C1

Longwave-pass filter for Germanium
8 - 11 μm

DESCRIPTION

This coating is designed for thermal imaging applications and offers maximum transmission combined with a wide blocking band. This coating can operate at 77K and does not contain any radioactive materials.

SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate.

TRANSMISSION > 90% (average) from 8.0 - 11.0 μm

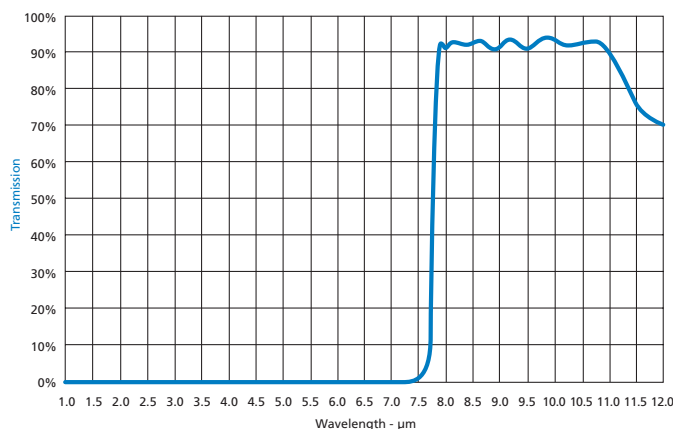
TRANSMISSION > 85% (absolute) from 8.0 - 11.0 μm

TRANSMISSION < 0.1% (absolute) from Visible - 7.2 μm

This coating is representative of our coating technology and multiple variations can be designed to cover the 6 - 16 μm band.

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION MIL-C-48497 para 4.5.3.1
TS1888 para 5.1

HUMIDITY MIL-C-48497 para 4.5.3.2
TS1888 para 5.2.1.2

ABRASION MIL-C-48497 para 4.5.3.3
TS1888 para 5.4.1

This coating is also unaffected by the following environmental tests which will be performed upon request.

SALT SOLUTION MIL-C-48497 para 4.5.5.2
TS1888 para 5.2.1.1

TEMPERATURE CYCLE MIL-M-13508C para 4.4.4

CO 40WBP-C2

Wideband-pass filter for Germanium
7.5 - 9.5 μm

DESCRIPTION

This coating is designed for thermal imaging applications and offers maximum transmission combined with wide blocking bands. This coating can operate at 77K and does not contain any radioactive materials.

SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate.

TRANSMISSION > 90% (average) from 7.7 - 9.3 μm .

TRANSMISSION > 85% (absolute) from 7.7 - 9.3 μm

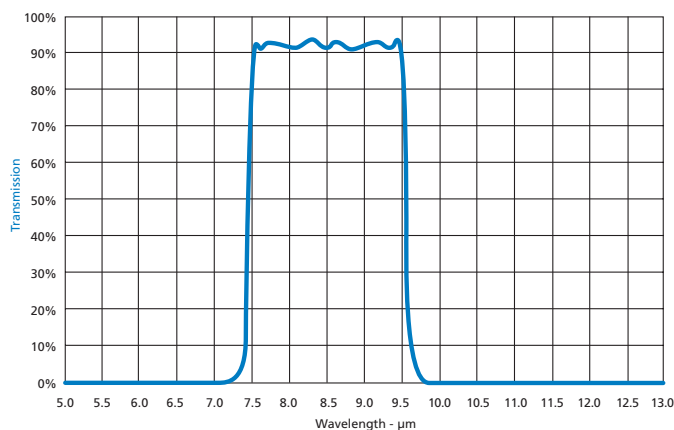
TRANSMISSION < 0.1% (absolute) from Visible - 7.0 μm

TRANSMISSION < 0.1% (absolute) from 10.0 - 14.0 μm

This coating is representative of our coating technology and multiple variations can be designed to cover the 6 - 16 μm band.

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION	MIL-C-48497 TS1888	PARA 4.5.3.1 PARA 5.1
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HUMIDITY	MIL-C-48497 TS1888	PARA 4.5.3.2 PARA 5.2.1.2
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ABRASION	MIL-C-48497 TS1888	PARA 4.5.3.3 PARA 5.4.1
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This coating is also unaffected by the following environmental tests which will be performed upon request.

SALT SOLUTION	MIL-C-48497 TS1888	PARA 4.5.5.2 PARA 5.2.1.1
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TEMPERATURE CYCLE	MIL-M-13508C	PARA 4.4.4
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CO 40WBP-C3

Wideband-pass filter for Germanium
3.6 - 5 μm

DESCRIPTION

This coating is designed for thermal imaging applications and offers maximum transmission combined with wide blocking bands. This coating can operate at 77K and does not contain any radioactive materials.

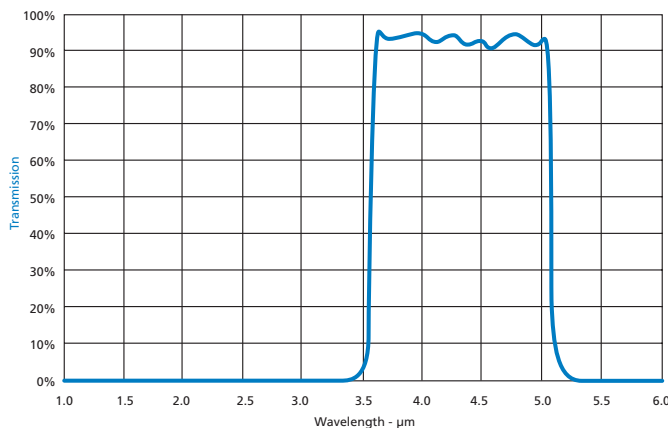
SPECTRAL PERFORMANCE

Transmission values are for a 1 mm thick Germanium substrate.
TRANSMISSION > 90% (average) from 3.6 – 5.0 μm .
TRANSMISSION > 85% (absolute) from 3.6 – 5.0 μm
TRANSMISSION < 0.1% (absolute) from Visible – 3.4 μm
TRANSMISSION < 0.1% (absolute) from 5.3 - 6.0 μm

This coating is representative of our coating technology and multiple variations can be designed to cover the 1 - 7 μm band.

ENVIRONMENTAL PERFORMANCE

The coating will withstand the following environmental tests which will be carried out on a representative witness piece coated in the same batch.



ADHESION MIL-C-48497 para 4.5.3.1
TS1888 para 5.1

HUMIDITY MIL-C-48497 para 4.5.3.2
TS1888 para 5.2.1.2

ABRASION MIL-C-48497 para 4.5.3.3
TS1888 para 5.4.1

This coating is also unaffected by the following environmental tests which will be performed upon request.

SALT SOLUTION MIL-C-48497 para 4.5.5.2
TS1888 para 5.2.1.1

TEMPERATURE CYCLE MIL-M-13508C para 4.4.4

Environmental Testing Capabilities

All tests, where applicable, are carried out per MIL specifications and on a representative witness piece coated in the same batch.

STATIC HUMIDITY TEST

A standard test typically performed over 24 hours in 98% Relative Humidity at 49°C. This can be varied for customer specific requests. For Hard Carbon coatings and STAR coatings, this test would be performed for 7 and 10 days respectively.

CYCLING HUMIDITY TEST

This test is performed only by specific request from a customer. Typically performed at 98% Relative Humidity between 35°C and 65°C. This test can be performed at other temperatures and Relative Humidity by request.

WATER IMMERSION TEST

A standard test typically performed over 24 hours.

SALT SOLUTION TEST

A standard test typically performed over 24 hours. By customer request this can be extended up to 7 days.

SALT SPRAY (FOG) TEST

This test is typically performed over 24 hours at 47°C. By customer request this can be extended up to 90 days.

TEMPERATURE TEST

A standard test which cycles between hot and cold temperatures, typically between -62°C and +71°C for 5 hours each. The temperature and duration can be varied to customer's specific requirements. We also have the capability to perform Thermal Shock Tests upon request.

ABRASION TEST

A standard test varying from Moderate Abrasion with cheesecloth to Severe Abrasion with an eraser at a known pressure. Other Abrasion tests that can be carried out include Sand Abrasion and Windscreen Wiper Abrasion.

ADHESION TEST

A standard test performed using adhesive tape to a known specification.

SOLUBILITY & CLEANABILITY TEST

This test is performed only by specific request from a customer. Typical chemicals used would be Acetone, IPA or AG101.

CHEMICAL DEGRADATION TEST

This test is performed only by specific request from a customer. A coated witness sample would be subjected to chemical attack using customer specified chemicals.

Coating Specifications

Durability and Environmental Test Classification

CLASS 1

1.1 ADHESION	MIL-C-48497 para 4.5.3.1 TS 1888 Section 5.1
1.2 HUMIDITY	MIL-C-48497 para 4.5.3.2 TS 1888 Section 5.2.1.2
1.3 ABRASION (MODERATE)	MIL-C-48497 para 4.5.3.3 TS 1888 Section 5.4.1

NOTES

Tests will be carried out sequentially unless otherwise specified.
Tests will be performed on 25 mm diameter witness pieces, nominally 1 mm thick.

Coating Specifications

Durability and Environmental Test Classification

CLASS 2

1.1 ADHESION	MIL-C-48497 para 4.5.3.1 TS 1888 Section 5.1
2.2 HUMIDITY	MIL-C-48497 para 4.5.3.2 TS 1888 Section 5.2.1.2
2.3 SALT SOLUBILITY	MIL-C-48497 para 4.5.5.2 TS 1888 Section 5.2.1.1
2.4 ABRASION (SEVERE)	MIL-C-48497 para 4.5.5.1 TS 1888 Section 5.4.2

NOTES

Tests will be carried out sequentially unless otherwise specified.
Tests will be performed on 25 mm diameter witness pieces, nominally 1 mm thick.

Coating Specifications

Durability and Environmental Test Classification

CLASS 3

3.1 ADHESION	MIL-C-48497 para 4.5.3.1 TS 1888 Section 5.1
3.2 SALT FOG	MIL-STD-810C Method 509.1
3.3 HUMIDITY 7 Days	MIL-C-48497 para 4.5.3.2 TS 1888 Section 5.2.1.2
3.4 ABRASION (EXTREME) Windscreen Wiper	TS 1888 Section 5.4.3

NOTES

Tests will be carried out sequentially unless otherwise specified.
Tests will be performed on 25 mm diameter witness pieces, nominally 1 mm thick.

Heating / De-Frosting & EMC Shielding windows

CVI Melles Griot has the capability to offer de-misting/defrosting windows by means of heating. This is typically used in systems that are likely to encounter variances in temperature or weather conditions.

There are two different ways of heating a window:

DIRECT

By using the bulk resistivity of Semiconductor materials such as Germanium and Silicon, a current can be passed directly through the material by means of busbar technology. Busbars can be manufactured to fit most thicknesses of window.

INDIRECT

Indirect heating is suitable for use where non-conducting materials are required in a system such as Zinc Sulphide. Heating can be achieved using insulated foil heaters. Foil heaters can be manufactured to a minimum width of approx. 6 mm.

POWER REQUIREMENTS

It is best to consider requirements for a system at an early stage. This way, CVI Melles Griot can offer advice on the power required and the best method for delivering heat into a window. Options to consider would be whether a current limiter or temperature control are required. Current/Voltage combinations should also be considered.

As each individual system has different requirements, we would recommend discussing your requirements with us prior to finalizing design.

CNC Twin Lapping Capabilities

High Speed Lapping and Polishing Capability

Lapping and Polishing of plano / plano optics is considered one of our core competencies.

MATERIALS WORKED INCLUDE

Germanium,
Silicon,
Zinc Sulphide (including Multi-spectral),
Zinc Selenide,
BK7,
Fused Silica,
Filter Glass.

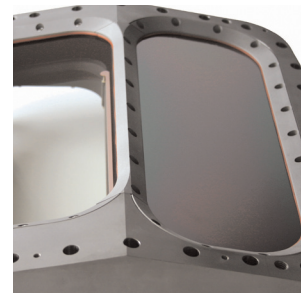
TYPICAL WINDOW SPECIFICATIONS ACHIEVABLE

Parallelism: < 5 arc Seconds
Transmitted Wave Front: $0.03 \lambda @ 10.6 \mu\text{m} - 0.5 \lambda @ 633 \text{ nm}$
Flatness: < 5 fringes / 1 Irregularity
Standard Diameters: from 25 mm up to 300 mm
Standard Thickness: from 2 mm up to 55 mm

PRODUCT HIGHLIGHTS

CARBON XT

This coating is designed for outer surface (O.S.) applications where severe environmental conditions are likely to be encountered and high transmission and low reflection are required. Durability is equal to that of our existing Hard Carbon coating (CO 4004), but the average transmission is 3% higher. The lower reflectance is useful in reducing potential narcissus effects. This coating is designed for use on germanium in the 8 – 12 μm range, but variants for other infrared materials and other wavelengths are under development.



INFRARED FILTERS

CVI Melles Griot now offers a complete infrared filter capability, from design through to volume production. The company carries out substrate fabrication, coating, edge metallising and dicing. Products include narrow band pass, wide band pass, long wave pass and short wave pass filters. Typical substrate materials are germanium, silicon and sapphire, depending on the wavelength and application.



EDGE METALLISATION

For applications where filters or windows need to be bonded to a detector can, CVI Melles Griot offers metallisation of the rim of the component. The types of metals used, the coating method and the evaporation sequence vary, depending on the temperature and pressure applied in the soldering process. As a result, customers can procure filters and windows for delivery straight to the production line.



BUILD-TO-PRINT MANUFACTURING COMPETENCIES

OPTICS

CVI Melles Griot has an unparalleled range of capabilities to meet your unique requirements. We will either design new products to meet your particular requirements or adapt existing designs to meet new specifications.

Our world-class manufacturing centers are located in seven geographic locations: Albuquerque, NM; Covina, California; Rochester, NY; Boochun-si, Korea; Tamagawa, Japan; the Isle of Man, British Isles; and Leicester, United Kingdom. These advanced facilities work in unison to guarantee our global clients receive the most advanced and comprehensive optical, hardware, electro-optical and opto-mechanical subassembly solutions.

Cost-effective manufacturing and an extensive range of product performance characterization tools result in proven, tested, and documented solutions that help you compete in the marketplace. We have unique manufacturing methods which enable us to offer the distinct combination of quality, flexibility, and affordability. Our unique combination of services will help you manage your WIP, inventory levels, time to market, and final product quality.



LASERS

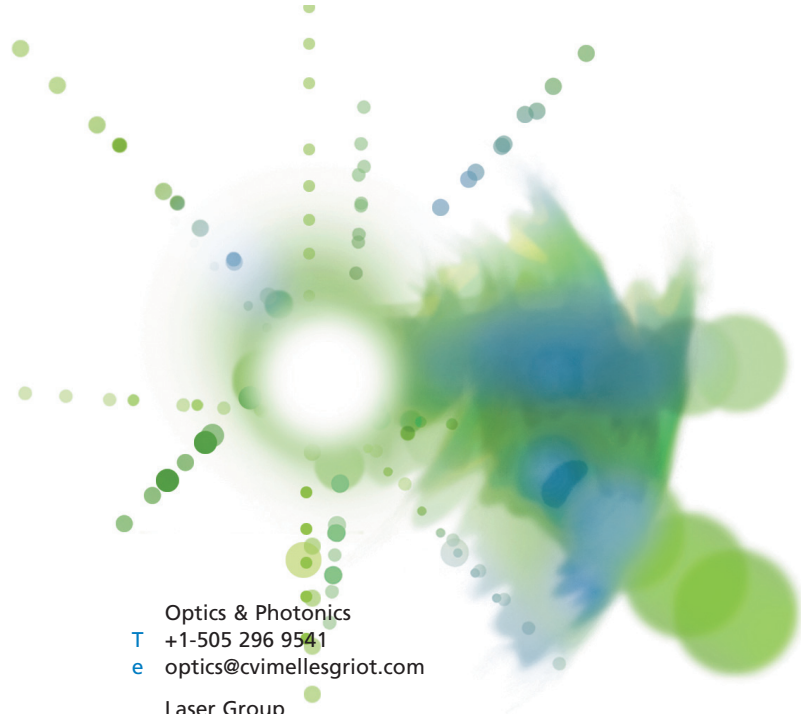
From its beginnings in 1979, CVI Melles Griot Laser Group established itself as a premier manufacturer of laser-based light sources. This was accomplished through a customer-centric philosophy that delivered the exact solution our customer needed – rather than the rigidly defined set of products other companies offered.

This approach quickly catapulted the company to a leadership position in gas lasers. Twenty-nine years and nearly 2.8 million units later, CVI Melles Griot is widely known as a stable, reliable source for laser-based components and subsystems to the global marketplace.

The technologies used to generate laser light have changed considerably since 1979 and so have we. Our product portfolio now encompasses over thirty-six discrete laser wavelengths with technologies ranging from gas lasers to the latest developments in semiconductor laser technology.

With a strong core of engineering and development expertise, CVI Melles Griot maintains an ongoing commitment to technology development, state-of-the-art equipment, and world-class manufacturing processes and management systems. Combined with our long history and customer-centric culture, CVI Melles Griot provides the solutions you need to outperform your competition.





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