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Viewports and Fibre Optics for HV and UHV

7.1 STANDARD SERIES GLASS VIEWPORTS -> Page 7.3

Standard Glass Viewports for UHV and HV
Standard Glass Viewports, O-Ring Sealed ISO-K types
Standard Glass Viewports with Broad Band Anti-Reflective coating

7.2 SAPPHIRE VIEWPORTS -> Page 7.4

- UV GRADE Sapphire Viewports
- DUV GRADE Sapphire Viewports
- REGULAR GRADE Sapphire Viewports
- Large versions up to 137mm View Diameter
- High Vacuum Versions

7.3 FUSED SILICA (QUARTZ) VIEWPORTS -> Page 7.5

Fused Silica Viewports UV grade
Fused Silica Viewports DUV grade
Fused Silica Viewports EXCIMER grade

7.4 BBAR COATED VIEWPORTS -> Page 7.7

Broad Band Anti-Reflection coated Quartz
DUV Base material
40CF and 63CF sizes

7.5 LASER VIEWPORTS -> Page 7.8

Laser Viewports with AR coating
40CF and 63CF sizes

7.6 NON-MAGNETIC AND CRYSTAL QUARTZ -> Page 7.9

Non-magnetic Fused Silica Viewports
UV and DUV Quality
Crystal Quartz Viewports

7.7 SPECIAL MATERIALS VIEWPORTS -> Page 7.10

Calcium-Fluoride/ Magnesium Fluoride/ Zinc Selenide
BBAR Coated Zinc Selenide

7.7 SPECIAL PURPOSE VIEWPORTS -> Page 7.11

Re-Entrant Windows
Differentially pumped Geo-Chronolagy Zinc Selenide
X-Ray Beryllium Viewports

7.8 VIEWPORT ACCESSORIES -> Page 7.12

Viewport Shutter
Lead Glass Radiation Protection Screen
External Viewport Door for Radiation Protection

7.9 FIBRE OPTICS (SUBSECTION) -> Page 7.13 - 7.17

High Vacuum Fibre Optic Feedthroughs O-Ring sealed
UHV Fibre Optic All Metal sealed Feedthroughs
Fibre Optic Cables for UHV and High Vacuum

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Standard Series Glass Viewports

Standard Glass Viewports are available on CF, KF and ISO-K Flanges. The glass material is Kodial (Boro-Silicate glass). These viewports are for normal visible light. For more demanding applications, Fused Silica (Quartz) is recommended.

Specification Standard Series Viewports

Vacuum	UHV	
Material	Glass	Kodial
	Transition	Kovar
	Flange	SS grade 304
Bakeable	400°C (CF) / 150°C (KF)	
Max. Gradient	5°C/ min	
Transmission	ca. 300 - 2500 nm	

Annealed gaskets or Allectra W type gaskets should be used for CF types.

Metal sealed Glass Viewports UHV

FLANGE	VIEW DIAM.	PART NUMBER
16CF	16	120-VPG-C16
40CF	38	120-VPG-C40
63CF	63	120-VPG-C63
100CF	90	120-VPG-C100
160CF	135	120-VPG-C160
200CF	135	120-VPG-C200

Flanges made out of Glass or Quartz as well as glass components are offered by EVAC (Page 138). Please ask for a copy of the EVAC catalogue.

Metal sealed Glass Viewports High Vacuum KF Types

FLANGE	VIEW DIAM.	PART NUMBER
16KF	16	120-VPG-K16
25KF	16	120-VPG-K25
40KF	32	120-VPG-K40
50KF	32	120-VPG-K50

Specification O-Ring Sealed ISO-K Viewports

Material	S/S holder
	Viton O-Ring
	Kodial glass

The O-Ring sealed viewports are an alternative to the metal sealed types. One O-Ring is used to seal the flange as well as the viewport. A significantly enlarged view diameter is obtained.

O-Ring sealed Glass Viewports ISO-K Types

FLANGE	VIEW DIAM.	PART NUMBER
63 ISO	72	120-VPGO-ISO63
100 ISO	104	120-VPGO-ISO100
160 ISO	152	120-VPGO-ISO160
200 ISO	210	120-VPGO-ISO200

Specification Anti-Reflective (BBAR) coating

Vacuum	UHV
Temperature	400°C
Coating	multi-layer coating
Transmission	typ. >99.5% in the visible range
Surface quality	60/40 scratch/dig

Standard Series Glass Viewports with Broad Band Anti-Reflective coating

FLANGE	VIEW DIAM.	PART NUMBER
16CF	16	120-VPG-C16-BBAR
40CF	38	120-VPG-C40-BBAR
63CF	63	120-VPG-C63-BBAR

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...Viewport Shutters and Lead Glass: Page 7.12...Quartz viewports: Page 7.5...

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Sapphire Viewports

Sapphire has high transmission over wavelengths from 180nm up to 5500nm. It is a very rigid material with high bakeout temperatures. This makes Sapphire an ideal material for a lot of demanding applications.

- Three qualities are available: Regular Grade, UV and DUV
- Sizes up to 136mm View Ø
- Broad band or single band Coated versions available on request

General Specification UHV Sapphire Viewports

Vacuum	UHV
Material	Sapphire, 90° Orientation
Bakeable	400°C (CF Flange)
Max. Gradient	5°C/min

These Viewports should be installed with annealed copper gaskets.

Specification UV Grade Sapphire Viewports

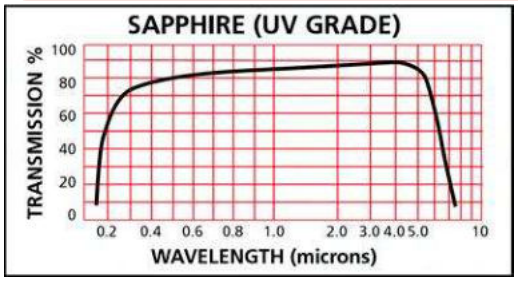
Parallelism	< 3 arc min
Surface finish	50-20 Scratch-Dig
Transmission	~ 180 – 5500nm
	>50% at 250nm

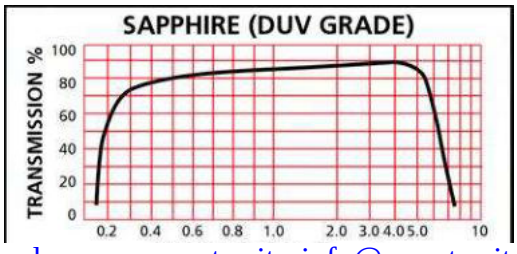
Specification DUV Grade Sapphire Viewports

Parallelism	< 3 arc min
Surface finish	20-10 Scratch-Dig
Transmission	~ 180 – 5500nm
	>70% at 250nm

Specification Regular Grade Sapphire Viewports

Paralellism	not specified
Surface finish	60-40 Scratch-Dig
Transmission	~ 250 – 5500nm





UV GRADE Sapphire Viewports UHV - no coating

REDUCED

FLANGE	VIEW Ø	THICKN.	PART NUMBER
16CF	15	1.6	130-VPS-C16-15
40CF	24	2.0	130-VPS-C40-24
40CF	36	2.0	130-VPS-C40-36
63CF	49	2.4	130-VPS-C63-49

Note: also available on KF flanges or as weld adaptors

DUV GRADE Sapphire Viewports UHV - no coating

REDUCED

FLANGE	VIEW Ø	THICKN.	PART NUMBER
40CF	17.5	2.0	130-VPSDUV-C40-17
40CF	23.8	2.0	130-VPSDUV-C40-24
63CF	36	2.0	130-VPSDUV-C63-36
63CF	49	2.4	130-VPSDUV-C63-49

Note: also available as weld adaptors

Regular Grade Sapphire Viewports UHV - no coating

FLANGE	VIEW Ø	THICKN.	PART NUMBER
16CF	16	1.5	131-VPS-C16-16
40CF	32	1.5	131-VPS-C40-32
40CF	38	1.5	131-VPS-C40-40
63CF	63	2.0	131-VPS-C63-63
100CF	89	3.0	131-VPS-C100-89
160CF	136	4.0	131-VPS-C160-136

non-magnetic versions are available on request

Regular Grade Sapphire Viewports HIGH VACUUM - no coating

FLANGE	VIEW Ø	THICKN.	PART NUMBER
25 KF	20	1.5	131-VPS-K25-20
40 KF	38	1.5	131-VPS-K40-38
50 KF	38	1.5	131-VPS-K50-38
100 ISO-K	63	2.0	131-VPS-ISO100-63

Note: also available with BBAR or VAR coating

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Fused Silica (Quartz) Viewports

Fused Silica is an isotropic material with no crystal orientation. It has an almost flat transmission curve from UV to near IR with more than 90% transmission in the visible range.
Three qualities are offered:

- UV grade - 200nm to 2µm
- DUV grade - 200nm to 2µm- high purity
- EXCIMER grade 185nm to 2.2µm

General Specification Fused Silica Viewports

Vacuum	UHV
Leak rate	<2x 10^{-10} mbar l /s
Temperature	-100 ... 200°C
Gradient	<5K/min
Transmission	>90% in visible range

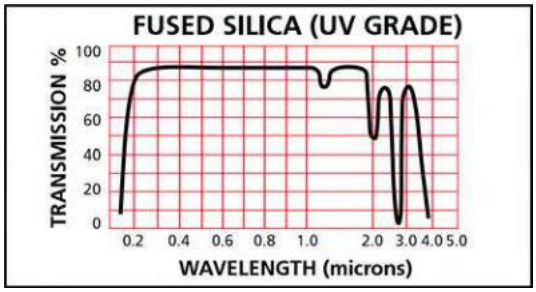
Specification UV Grade Fused Silica

Parallelism	<30 arc sec
Surface Finish	40-20 scratch/dig
Transmission	>90% @ 250nm
Usable range	200 ... 2000nm
Inclusions	max. 0.25mm²/100cm³ (class 2)
Isotropy	2D Material
Homogenity	Grade F

Fused Silica (Quartz) Viewports UV grade UHV 0.2 to 2 microns - NO coating

REDUCED

FLANGE	VIEW DIAM.	PART NUMBER
16CF	16	110-VPQZ-C16-UV
40CF	35	110-VPQZ-C40-UV
63CF	68	110-VPQZ-C63-UV
100CF	98	110-VPQZ-C100-UV
160CF	137	110-VPQZ-C160-UV
200CF	198	110-VPQZ-C200-UV



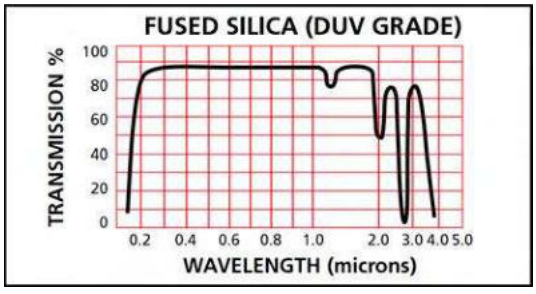
Specification DUV Grade Fused Silica

Parallelism	<10 arc sec
Surface Finish	20-10 scratch/dig
Flatness	λ/4 @ 632nm
Transmission	>99,8% @ 248nm (internal)
Usable range	200 ... 2000nm
Inclusions	max. 0.03mm²/100cm³ (class 0)
Isotropy	3D Material
Homogenity	Grade A

Fused Silica (Quartz) Viewports DUV grade UHV 0.2 to 2 microns - NO coating

REDUCED

FLANGE	VIEW DIAM.	PART NUMBER
16CF	16	110-VPQZ-C16-DUV
40CF	35	110-VPQZ-C40-DUV
63CF	68	110-VPQZ-C63-DUV
100CF	98	110-VPQZ-C100-DUV
160CF	137	110-VPQZ-C160-DUV
200CF	198	110-VPQZ-C200-DUV



Fused Silica (Quartz) Thickness:

16CF	2.5mm	40CF	3.3mm
63CF	6.4mm	100CF	6.4mm
160CF	9.4mm	200CF	6.4mm

Coated Quartz Viewports are available:
See pages 7.7 and 7.8 for details of broad band coatings and single line coatings for laser applications.

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...Lead Glass Shields: Page 7.12.....BBAR coated Viewports: Page 7.7.....

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Excimer Grade Quartz Viewports

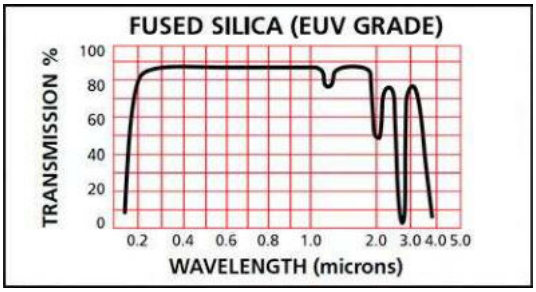
Designed for use with ArF based Excimer lasers (193nm) a high quality Fused Silica (Quartz) material is offered, which gives an internal transmission at this wavelength of more than 99.5%. These windows can also be used for other demanding applications in the UV region.

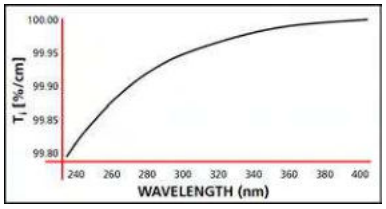
Specification	EXCIMER (EUV) GRADE Fused Silica
Parallelism	<10 arc sec.
Surface Finish	20-10 scratch/dig
Flatness	λ/4 @ 632nm
Transmission	>99,5% @ 193nm (internal)
Usable range	180 ... 2000nm
Inclusions	max. 0.03mm²/100cm³ (class 0)
Isotropy	3D Material
Homogenity	Grade A

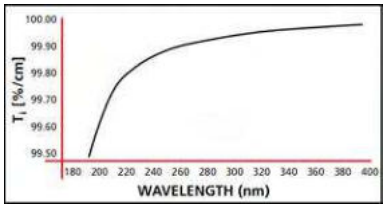
Fused Silica Viewports - EXCIMER grade
UHV 0.18 to 2 microns - NO coating

REDUCED

FLANGE	VIEW DIAM.	PART NUMBER
40CF	35	110-VPQZ-C40-EX
63CF	68	110-VPQZ-C63-EX







Internal transmission curves for DUV and Excimer grade material.

Fused Silica (Quartz) Viewports on KF Flanges

The UV-Quartz quality is offered for use with KF flanges. Other Fused Silica grades are available on request. Please ask the Sales Office for a quote.

Specification for Quartz KF-Viewports	
Vacuum	10 $^{-9}$ mbar
Temperature	-100 to 200°C <5K/min
Transmission	200 ... 20000nm
Inmclusions	max 0.25mm²/100cm³
Isotropy	2D Material

Fused Silica Viewports
Versions on KF Flanges

REDUCED

FLANGE	VIEW DIAM.	PART NUMBER
25KF	16	110-VPQZ-K25
40KF	35	110-VPQZ-K40
50KF	35	110-VPQZ-K50

Weldable versions are available as well in all three different qualities! Please ask for a quote

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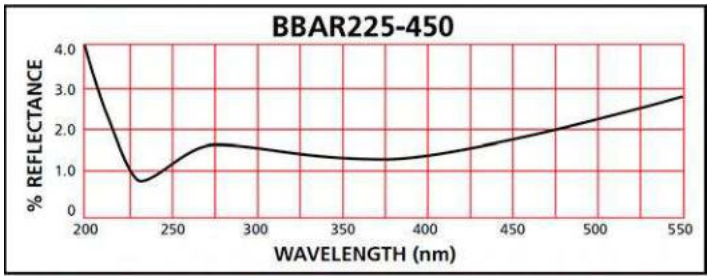
Fused Silica (Quartz) Viewports with BBAR coating

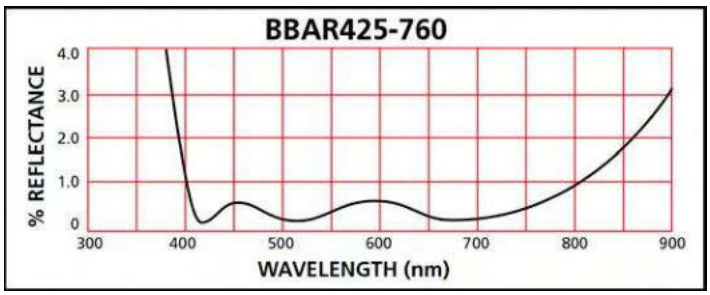
Three types of broad band anti-reflection coatings are offered as standard for 40CF and 63CF Flanges:

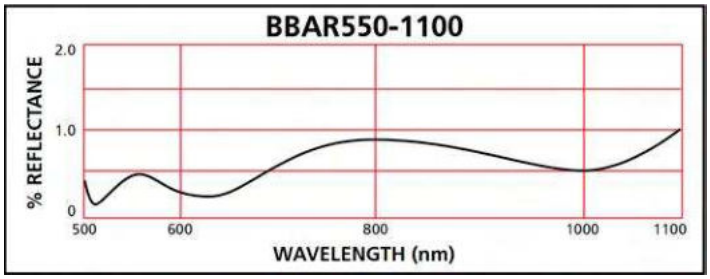
- UV Coating 225nm to 450nm
- Visible Spectra Coating 425 to 760nm
- Near IR Coating 550 to 1100nm

Specification BBAR Coated Fused Silica

Vacuum	UHV
Leak rate	<2x 10^{-10} mbar l /s
Temperature	-100 ... 200°C
Gradient	<5K/min
Reflectance	see graphs, max. 2% in given range
Parallelism	<10 arc sec.
Surface Finish	20-10 scratch/dig
Flatness	λ/4 at 632nm
Inclusions	max. 0.03mm²/100cm³ (class 0)
Isotropy	3D Material
Homogenity	Grade A







Reflectance versus wavelength for the 3 different types of standard broad band coating.
Top: UV-range
Middle: Visible range
Bottom: IR range

Fused Silica (Quartz) Viewports with BBAR coating
UV Range 225 - 450nm REDUCED

FLANGE	View ø	PART NUMBER
40CF	35 mm	110-QZ-UV-C40
63CF	68 mm	110-QZ-UV-C63

Fused Silica (Quartz) Viewports with BBAR coating
Visible Range 425 - 760nm REDUCED

FLANGE	View ø	PART NUMBER
40CF	35 mm	110-QZ-VIS-C40
63CF	68 mm	110-QZ-VIS-C63

Fused Silica (Quartz) Viewports with BBAR coating
IR Range 550 - 1100 nm REDUCED

FLANGE	View ø	PART NUMBER
40CF	35 mm	110-QZ-IR-C40
63CF	68 mm	110-QZ-IR-C63

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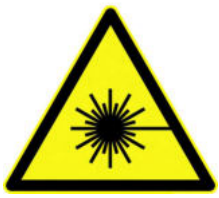
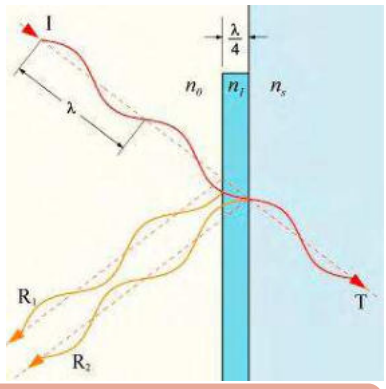
Laser Viewports with AR coating

For Laser applications Allectra offers high quallity Quartz viewports with optimized coatings. All viewports have more than 99.5% transmission / surface at the given wavelength. A high quality 20/10 surface finish and a flatness of λ /4 allow high performance. They are offered on DN40CF flanges with 35mm view diameter and on DN63CF with 68mm view diameter.





Specification for UHV Laser Viewports

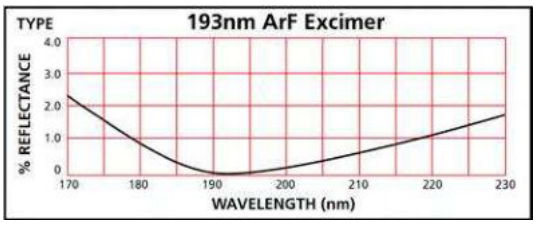
Vacuum	UHV
Temperature	-100 to 200°C
Parallelism	<10 arc sec
Flatness	λ/4 @ 632nm
Surface finish	20/10 Scratch/Dig
Homogenity	Grade A
Inclusion class	0
Coating	V-Coat with <0.25% Reflection/surf.
Material	
ArF (193nm)	Excimer Grade
KrF (248nm)	DUV Grade
Diode (780nm)	UV Grade
YAG (1064nm)	IR Grade
Laser Damage Threshold	
ArF	1 J/cm² for 10ns Pulse
KrF	10 J/cm² for 10ns Pulse
Diode	10 J/cm² for 10ns Pulse
YAG	10 J/cm² for 10ns Pulse

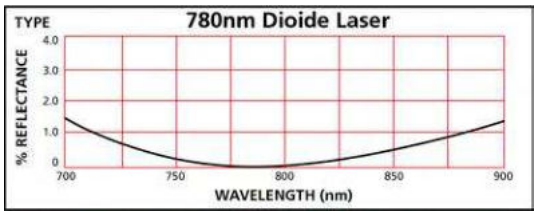
Laser Viewports with AR coating 40CF and 63CF flanges

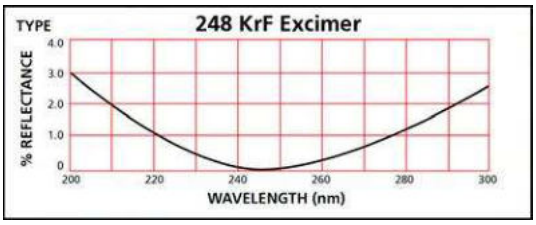
REDUCED

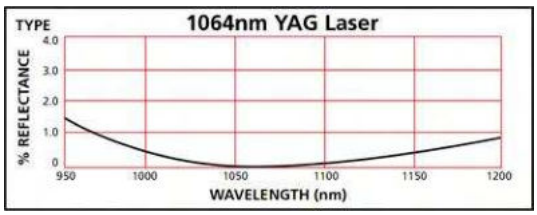
FLANGE	WAVELENGTH	PART NUMBER
40CF	193 nm	110-ARF-C40
63CF	193 nm	110-ARF-C63
40CF	248 nm	110-KRF-C40
63CF	248 nm	110-KRF-C63
40CF	780 nm	110-DIODE-C40
63CF	780 nm	110-DIODE-C63
40CF	1064 nm	110-YAG-C40
63CF	1064 nm	110-YAG-C63

Coatings for other wave lengths are possible. Please ask for a quote!
Also V-coats for 2 different wave lengths are available.









Reflectance versus wavelength for the different coatings:
Top left: for ArF Excimer Laser
Bottom left: for KrF Excimer Laser
Top right: for 780nm Diode Laser
Bottom right: For YAG Laser

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Non-magnetic Fused Silica Viewports

Standard Fused Silica viewports have very low magnetic permeability, as no Kovar or other magnetic materials are used. For very demanding applications, Allectra offers UV and DUV viewports with Titanium sleeves, mounted in 316LN Flanges. The sizes 16CF and 40CF are offered as standard.

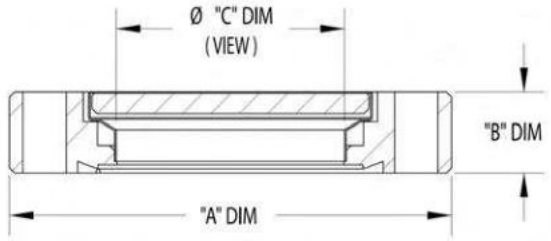
Specification Non-Magnetic Fused Silica

Vacuum	UHV, 10^{-10} mbar
Temperature	-100 to 200°C
Material	Flange 316LN SS
	Sleeve Titanium
	Window Fused Silica, UV / DUV

For UV/DUV specification see page 7.5

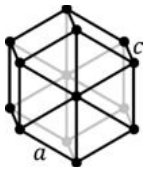
Non-Magnetic Fused Silica Viewports UV and DUV Quality REDUCED

FLANGE	TYPE	PART NUMBER
16CF	UV Grade	110-QZ-NM-C16-UV
40CF	UV Grade	110-QZ-NM-C40-UV
16CF	DUV Grade	110-QZ-NM-C16-DUV
40CF	DUV Grade	110-QZ-NM-C40-DUV



Viewport dimensions:
DN16CF: A= 34mm, B= 8.9mm, C= 16mm
DN40CF: A= 70mm, B=12.7mm, C= 35.5mm

Crystal Quartz Viewports



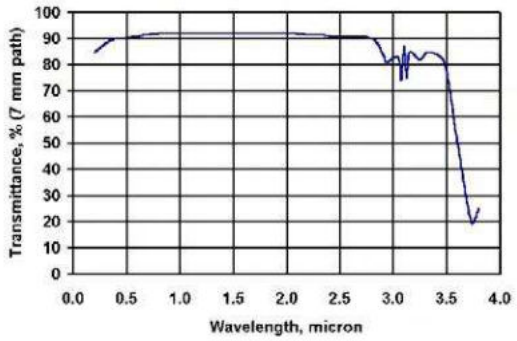
Optical Quality Crystalline Quartz features high transmittance in ultraviolet, visible and infrared spectrum from 190 to 2900 nm, birefringence, ability to rotate plane polarized light, high damage threshold and resistance to scratching. Optical quality material is virtually bubble and inclusion free, grade A.

Crystal Quartz Viewports UHV

FLANGE	VIEW ø	PART NUMBER
40CF	22.8mm	110-QZ-C40-CRYST
63CF	48.2mm	110-QZ-C63-CRYST
100CF	48.2mm	110-QZ-C100-CRYST

Specification Crystal Quartz

Vacuum	UHV, 10^{-10} mbar
Temperature	-100 to 200°C
Orientation	Z-Cut
Parallelism	<10 arc sec
Surface Finish	20/10 scratch/dig
Flatness	λ/2 @ 632nm



Transmission spectrum of Crystal Quartz

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...Standard Fused Silica Viewports: Page 7.5.....316LN CF Flanges: Sec. 11.....

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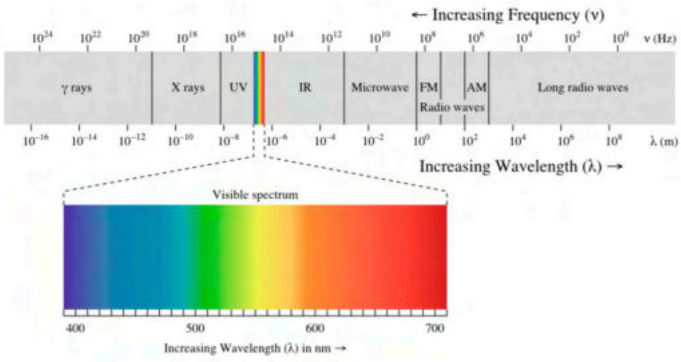
Special Materials Viewports

UHV Viewports made of Special Materials are available when other wavelengths than standard glass or quartz are needed. Calcium-Fluoride and Magnesium-Fluoride cover a wide transmission range from UV to Infrared down to 20μm (see the transmission curves below).
With the optional AR coating higher transmission can be reached.



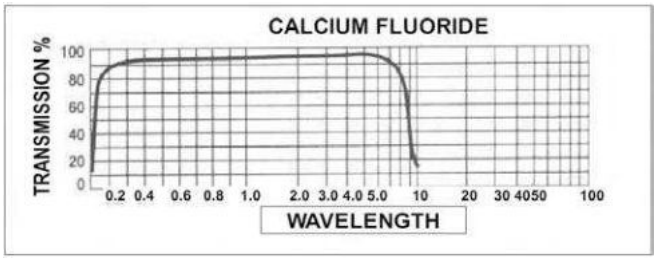
Specification Special Material Viewports

Vacuum	UHV, 10^{-10} mbar
Temperature	200°C (150°C for coated ZnSe)
Transmission:	
CaF2	150nm ... 9μm
MgF2	180nm ... 8μm
ZnSe	600nm ... 20μm
View Diameters	40CF: 23mm
	63CF: 48mm
Flatness:	λ /4
Surface finish	20/10 (CaF2 , MgF2)
	40/20 (ZnSe)

Special Materials Viewports - NO COATING UHV

REDUCED

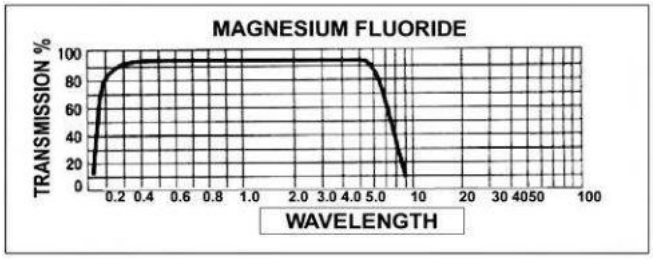
FLANGE	TYPE	PART NUMBER
40CF	CaF2	130-CAF-23-C40
63CF	CaF2	130-CAF-48-C63
40CF	MgF2	130-MGF-23-C40
63CF	MgF2	130-MGF-48-C63
40CF	ZnSe	130-ZNSE-23-C40
63CF	ZnSe	130-ZNSE-48-C63



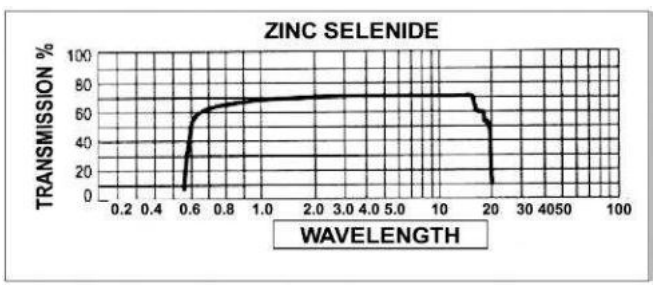
Special Materials Viewports ZnSe - AR COATED UHV

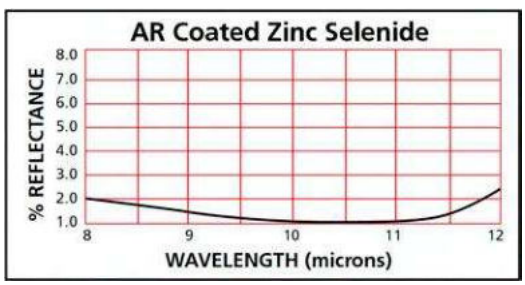
REDUCED

FLANGE	TYPE	PART NUMBER
40CF	ZnSe	130-ZNSE-23-AR-C40
63CF	ZnSe	130-ZNSE-48-AR-C63



The standard coating for ZnSe is a Broad Band AR (for 8 - 12 μm); the reflection loss is <0.5% per surface.
Please note that coated viewports are bakeable to 150°C only.





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...Beryllium X-Ray Windows: Page 7.11.....Standard Glass Viewports: Page 7.3.....

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Special purpose Viewports:
- Re-Entrant Windows

Re-Entrant Windows allow optical systems or cameras to be inserted "inside" the vacuum system.
Other tube lengths can be offered on request.

Specification Re-Entrant Windows

Vacuum	UHV, $<10^{-10}$ mbar	
Temperature	200°C	
Material	Fused Silica UV or DUV grade (see p. 82 for full spec)	
Basic dimensions	63CF	100CF
View Diameter	35.5mm	68mm
In-Vacuum length	89mm	89mm
Tube ID	48mm	72mm
Tube OD	51mm	76.5mm

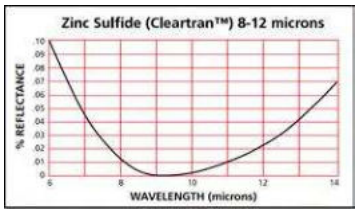
Re-Entrant Windows 63CF /100CF with Fused Slilca

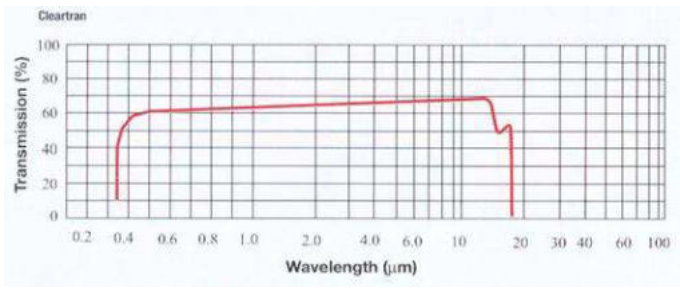
REDUCED

FLANGE	TYPE	PART NUMBER
63CF	UV	110-REQZ-C63-UV
100CF	UV	110-REQZ-C100-UV
63CF	DUV	110-REQZ-C63-DUV
100CF	DUV	110-REQZ-C100-DUV

Special purpose Viewports:
- Differentially pumped XHV

These special windows are used typically for Geo-chronology measurements. Two UHV windows are sealed together and can be differentially pumped. Coated Cleartran gives good transmission from ~350nm to the far IR.





Specification for Geo-Chronology Viewport

Vacuum	XHV, $<10^{-11}$ mbar (2 UHV sealed viewports, differentially pumped)
Temperature	200°C
Material	Cleartran® (Zinc Sulfide), AR coated 8 - 12µm
Transmission	350nm - 15µm
View Diameter	40CF: 23.6mm 63CF: 48mm
Flatness	λ /4
Surface finish	40/20

Please ask the sales office for a quote for these special components! Thank you

Special Purpose Viewports:
- Beryllium X-Ray Viewports

A Beryllium Viewport acts as a barrier between the vacuum or inert gas environment inside an X-ray source tube or detector and atmospheric conditions external to the device, while at the same time allowing X-rays to pass through. Standard size is 40CF with a thickness of 130µm and a view diameter of 39mm.

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...Standard Glass Viewports: Page 7.3.....Fused Silica: Page 7.5.....

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Viewport Accessories

Allectra offer Accessories for Viewports:

- Viewport Shutter
- Lead Glass Radiation Protection Screen
- External Viewport Door for Radiation Protection

Specification for Viewport Shutter

Vacuum	to 10^{-10} mbar
Construction	All Metal
Bakeable	to 250°C
Mechanism	Shutter plate with rotary drive Drive with position lock
Flange	Double sided wih through holes

Viewport Shutter UHV and High Vacuum

FLANGE	TYPE	PART NUMBER
63CF	MANUAL	140-VPSH-C63
100CF	MANUAL	140-VPSH-C100
160CF	MANUAL	140-VPSH-C160
63 ISO	MANUAL	140-VPSH-ISO63F
100 ISO	MANUAL	140-VPSH-ISO100F

140-VPSH-ISO100F

140-VPSH-C100

Specification Lead Glass Kit

Thickness	5.6 mm
Lead Equivalent	1.6 mm (to 110kV) 1.4 mm (to 200kV)

The Lead Glass Screen is offered as a kit comprising the Lead Glass, a Retaining Ring and a Set of Long Bolts which hold the retaining ring onto the front of the viewport. The Viewport is not included.

Lead Glass Radiation Protection Screen ~1.5 mm lead equivalent

FLANGE	TYPE	PART NUMBER
16CF	KIT	140-LG-C16
40CF	KIT	140-LG-C40
63CF	KIT	140-LG-C63
100CF	KIT	140-LG-C100
160CF	KIT	140-LG-C160

140-LG-C63

External Viewport Door for Radiation Protection with microswitch for interlock circuit

FLANGE	TYPE	PART NUMBER
63CF	MANUAL	140-VPXD-C63
100CF	MANUAL	140-VPXD-C100
160CF	MANUAL	140-VPXD-C160

Specification External Viewport Door

Use	External closure for Viewports for X-Ray or Laser light protection
Thickness	6mm SS door
Micro-Switch	included for Interlock Circuits

The External Viewport Door fits over the profile of a CF flange using extra long bolts or studding (not included). The microswitch can be fitted into a Safety Interlock circuit so that the 6mm Stainless Steel door can only be opened when a Laser or other device is switched off.
The External Viewport Door does not make a Vacuum Seal.

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