

The image features a large, complex industrial assembly on the left, possibly a high-pressure chamber or reactor, with a metallic, golden-brown finish and various ports and seals. To the right, three individual ceramic seal components are shown, each highlighted with a bright yellow glow. These components include a flat circular seal, a flanged seal with a central opening, and another flanged seal with a different internal profile. The background is a vibrant, abstract pattern of orange and yellow curved lines.

c Ceramaseal
A division of **CeramTec**

VIEWPORT

Description

A viewport, sometimes referred to as a window, is an optical component that provides a means for visual, optical or broad-band energy transmission in and out of a vacuum system.

There are two types of viewports offered, zero-length and tubulated. A zero-length viewport has a thickness no larger than that of its mounting flange. This makes it easier to protect from accidental damage as there are no parts protruding from the mounting flange. It also allows for the best angle of view.

Ceramaseal's precision-engineered standard viewports are available with a choice of two viewport materials: sapphire or fused silica. Other viewport materials are available upon request.

Ceramaseal offers a UV grade fused silica viewport with a 1.37" view diameter that can be used for cryogenic applications.

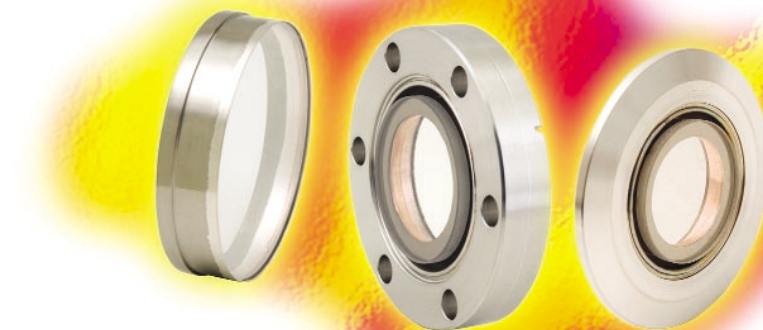
Sapphire should be used in the most demanding applications, as this material provides extended transmission, temperature, pressure and wear resistance.

To select the right window for your applications, you should consider size, transmission requirements, temperature, pressure, and aggressiveness of environment.

Standard Specifications

Sapphire:

- Bakeout to 450° C
- Operating Temperature -269° C to 350° C
- Standard transmission range 0.25 to 4 microns
- Internal Pressure 1 x 10⁻¹⁰ torr to 400 psig
- Viewing diameters from .55" to 1.94"



Fused Silica:

- Bakeout to 200° C
- Operating Temperature -65° C to 150° C
- Standard Transmission Range 0.25 to 2 microns
- Internal Pressure 1 x 10⁻¹⁰ torr to 115 psig
- Viewing diameters from 1.13" to 3.81"

Extreme / Custom Design

- UV grade viewports
- Double viewports
- Viewing diameters exceeding 7 inches
- Internal pressures to 80,000 psig
- RF applications and special configuration requirements

Installation

Standard installation mountings include:

- Braze (sapphire only)
- Weld (Pulse-TIG, TIG, Laser, E-Beam)
- ConFlat flange
- ISO KF flange

Applications

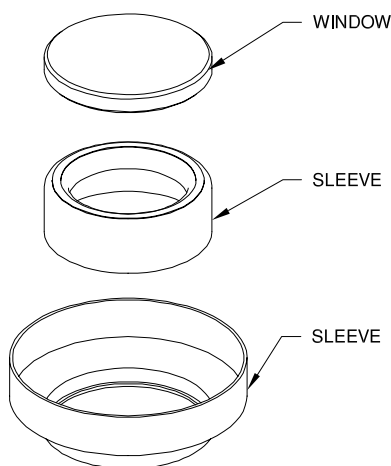
A few of the many applications in which these viewports are commonly used are:





- Semiconductor processing equipment
- Accelerators
- Furnaces
- Instrumentation
- Analytical test and measurement equipment

New Products

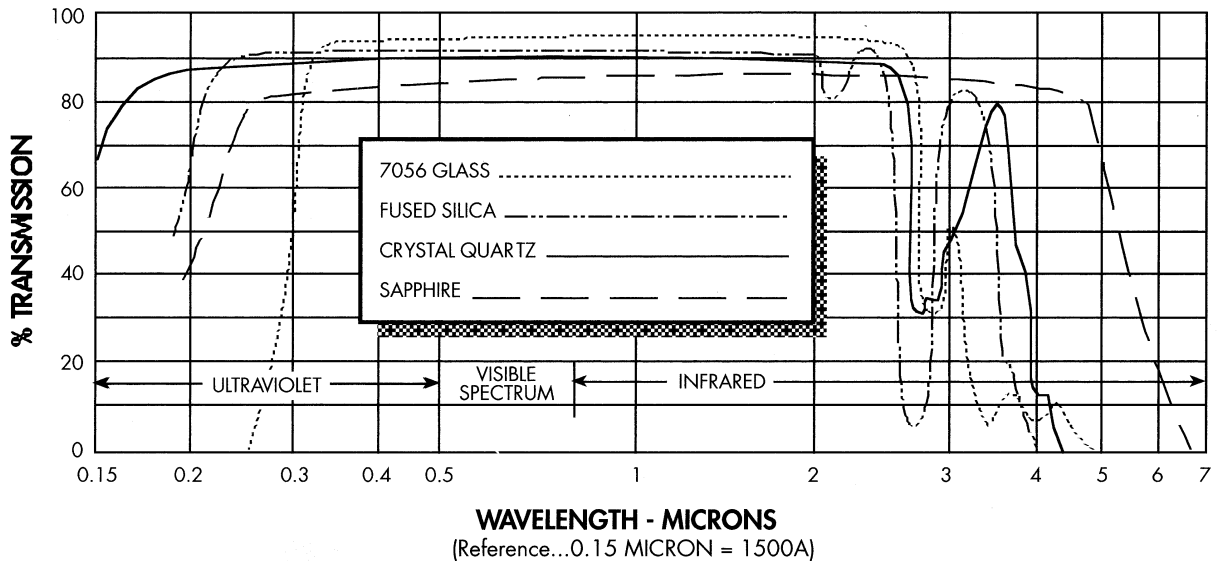
- Zero-length sapphire viewports

Typical Viewport Construction

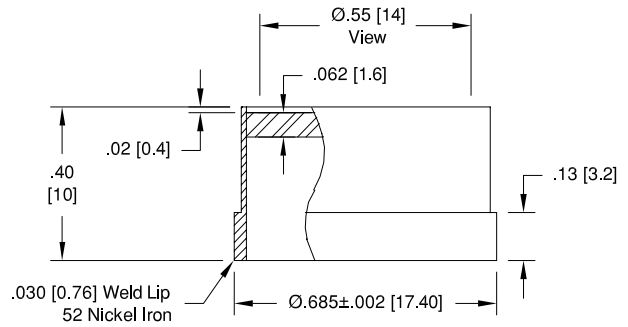


Type	View Dia. (in inches)	Internal Pressure Rating (@ 20 °C)	Temperature Range	Transmission Range	Sub-section	Pages
	0.55 to 1.94	to 400 psig	-269° C to 450° C	0.25 to 4 Microns	Sapphire	F4 - F7
	1.13 to 3.81	to 115 psig	-269° C to 200° C	0.25 to 2 Microns	Fused Silica	F8 - F12
	0.56 or 1.10	—	8° C to 204° C	0.12 to 18 Microns	Extended Range	F13 - F15
	1.10	—	8° C to 204° C	10.6 Microns	Differentially Pumped	F16 - F17

OPTICAL TRANSMISSION CURVES



*The 7056 Glass, Fused Silica, and Crystal Quartz transmission curves are based on a thickness of 1 cm. The sapphire transmission curve is based on a thickness of 1 mm.

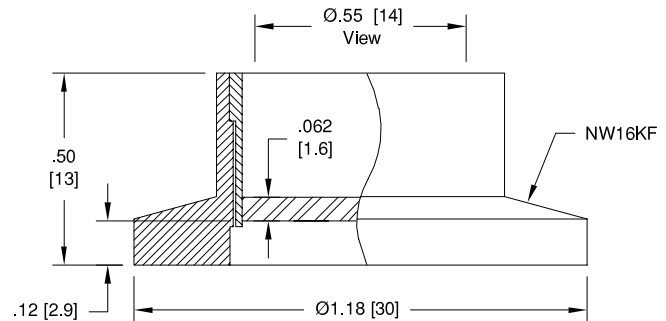


View Diameter: .55 [14]

Installation: Weld

Pressure @ 20°C PSIG Bar	Temperature °C Min Max	Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
400 27.6	-269 450	0.25 to 4 Microns	Yes	17105-01-W	\$165

For optical transmission curves see page F3. For welding instructions see page L23.



View Diameter: .55 [14]

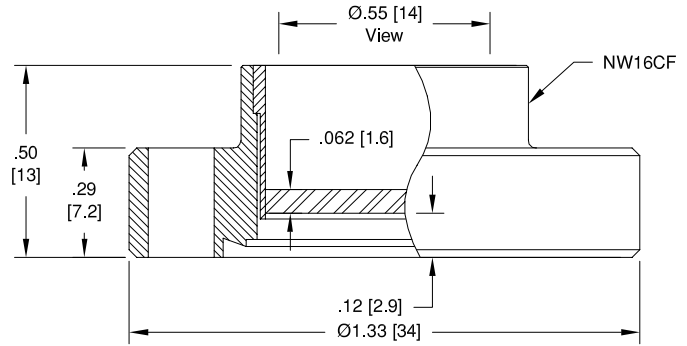
Installation: NW16KF

Pressure @ 20°C PSIG* Bar*	Temperature °C Min Max	Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
0 0	-25 205	0.25 to 4 Microns	Yes	17106-01-KF	\$205

For optical transmission curves see page F3. For flange assembly instructions see page L26. *An overpressure ring is required for internal pressurized use from 5 to 100 psig [0.3 to 7 bar].

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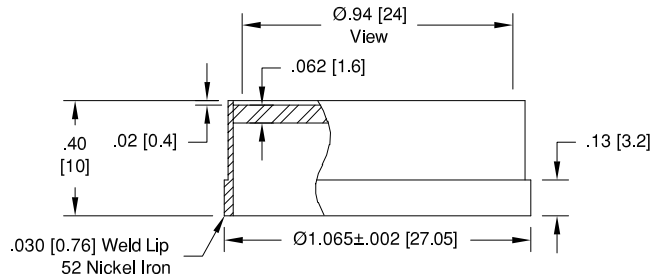
Feedthrough
 Multipin Connector
 Coaxial
 Thermocouple
 Isolator
 Viewport
 Pressure
 Baseplate
 Crystal Sensor
 Heater
 Accessories



View Diameter: .55 [14]
 Installation: 1 1/3" ConFlat (NW16CF)

Pressure @ 20°C		Temperature °C		Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
PSIG	Bar	Min	Max				
400	27.6	-269	450	0.25 to 4 Microns	Yes	9547-04-CF	\$205

For optical transmission curves see page F3. For flange assembly instructions see pages L24 - L25.



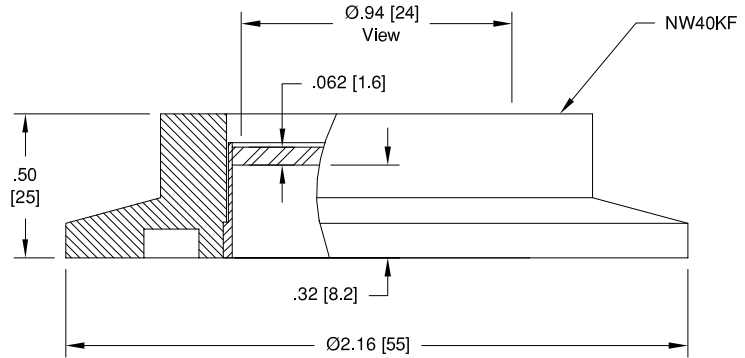
View Diameter: .94 [24]
 Installation: Weld

Pressure @ 20°C		Temperature °C		Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
PSIG	Bar	Min	Max				
160	11	-269	450	0.25 to 4 Microns	Yes	17105-02-W	\$195

For optical transmission curves see page F3. For welding instructions see page L23.

- Feedthrough
- Multipin Connector
- Coaxial
- Thermocouple
- Isolator
- Viewport
- Pressure
- Baseplate
- Crystal Sensor
- Heater
- Accessories

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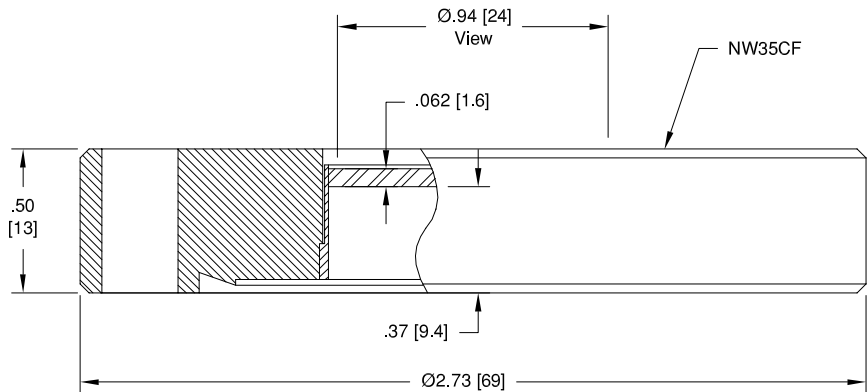


View Diameter: .94 [24]

Installation: NW40KF

Pressure @ 20°C PSIG* Bar*	Temperature °C Min Max	Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
0 0	-25 205	0.25 to 4 Microns	Yes	17106-02-KF	\$240

For optical transmission curves see page F3. For flange assembly instructions see page L26. *An overpressure ring is required for internal pressurized use from 5 to 100 psig [0.3 to 7 bar].



View Diameter: .94 [24]

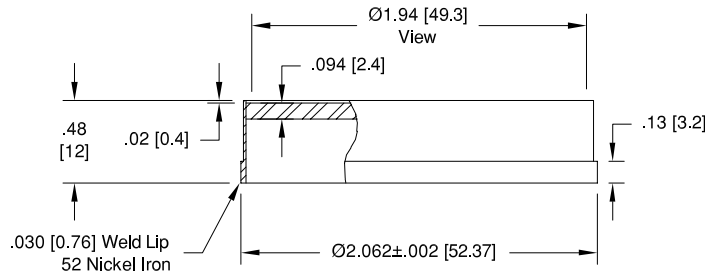
Installation: 2 3/4" ConFlat (NW35CF)

Pressure @ 20°C PSIG Bar	Temperature °C Min Max	Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
160 11	-269 450	0.25 to 4 Microns	Yes	18617-01-CF	\$240

For optical transmission curves see page F3. For flange assembly instructions see pages L24 - L25.

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Accessories



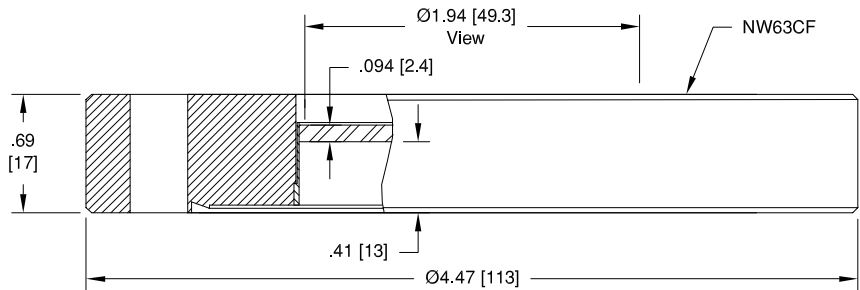
View Diameter: 1.94 [49.3]

Installation: Weld

Pressure @ 20°C PSIG Bar	Temperature °C Min Max	Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
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50 3.4	-269 450	0.25 to 4 Microns	Yes	17105-03-W	\$502
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For optical transmission curves see page F3. For welding instructions see page L23.



View Diameter: 1.94 [49.3]

Installation: 4 1/2" ConFlat (NW63CF)

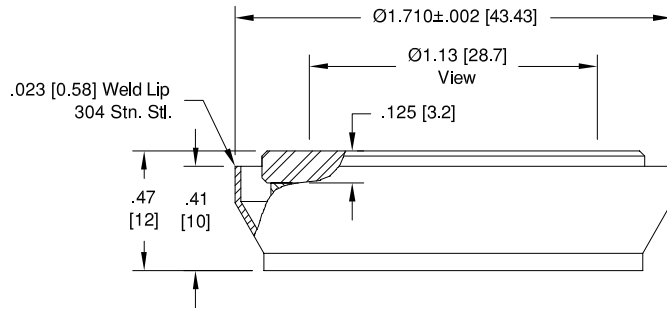
Pressure @ 20°C PSIG Bar	Temperature °C Min Max	Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
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50 3.4	-269 450	0.25 to 4 Microns	Yes	18617-02-CF	\$665
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For optical transmission curves see page F3. For flange assembly instructions see pages L24 - L25.

- Feedthrough
- Multiple Connector
- Coaxial
- Thermocouple
- Isolator
- Viewport
- Pressure
- Baseplate
- Crystal Sensor
- Heater
- Accessories

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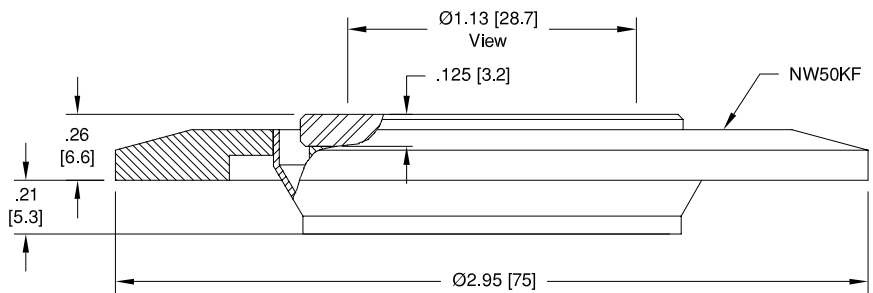


View Diameter: 1.13 [28.7]

Installation: Weld

Pressure @ 20°C		Temperature °C		Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
PSIG	Bar	Min	Max				
115	7.9	-65	200	0.25 to 2 Microns	No	11466-09-W	\$194

For optical transmission curves see page F3. For welding instructions see page L23.



View Diameter: 1.13 [28.7]

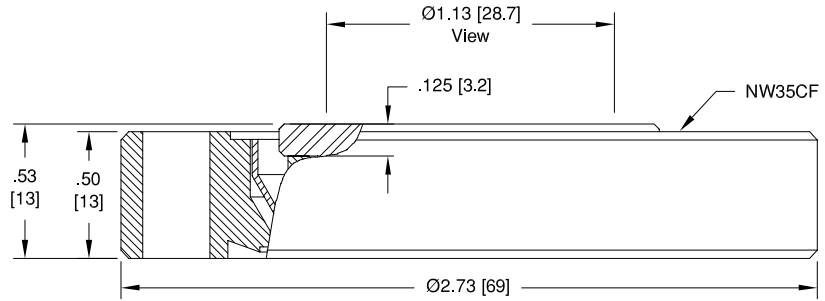
Installation: NW50KF

Pressure @ 20°C		Temperature °C		Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
PSIG*	Bar*	Min	Max				
0	0	-25	200	0.25 to 2 Microns	No	17109-01-KF	\$254

For optical transmission curves see page F3. For flange assembly instructions see page L26. *An overpressure ring is required for internal pressurized use from 5 to 100 psig [0.3 to 7 bar].

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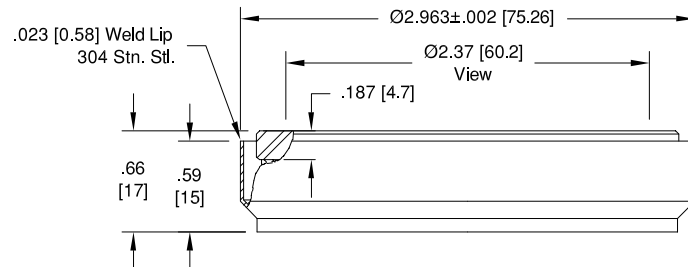
View Diameter: 1.13 [28.7]

Installation: 2 3/4" ConFlat (NW35CF)

Pressure @ 20 °C		Temperature °C		Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
PSIG	Bar	Min	Max				

115	7.9	-65	200	0.25 to 2 Microns	No	11466-01-CF	\$288
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For optical transmission curves see page F3. For flange assembly instructions see pages L24 - L25.



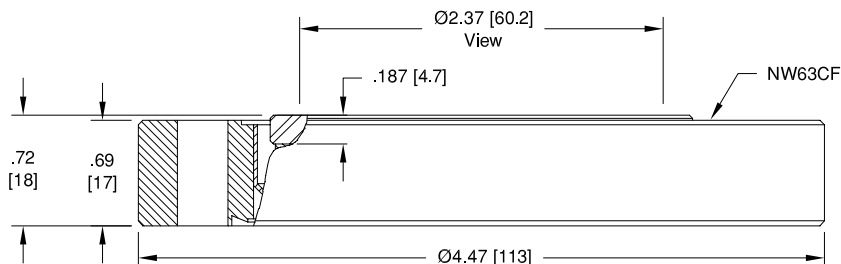
View Diameter: 2.37 [60.2]

Installation: Weld

Pressure @ 20 °C		Temperature °C		Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
PSIG	Bar	Min	Max				

35	2.4	-65	200	0.25 to 2 Microns	No	11466-10-W	\$575
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For optical transmission curves see page F3. For welding instructions see page L23.

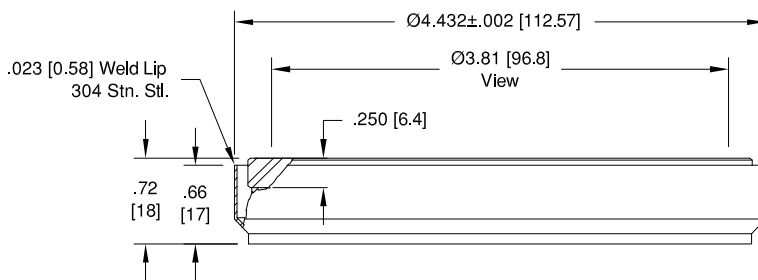


View Diameter: 2.37 [60.2]

Installation: 4 1/2" ConFlat (NW63CF)

Pressure @ 20°C PSIG	Pressure @ 20°C Bar	Temperature °C Min	Temperature °C Max	Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
35	2.4	-65	200	0.25 to 2 Microns	No	11466-02-CF	\$675

For optical transmission curves see page F3. For flange assembly instructions see pages L24 - L25.



View Diameter: 3.81 [96.8]

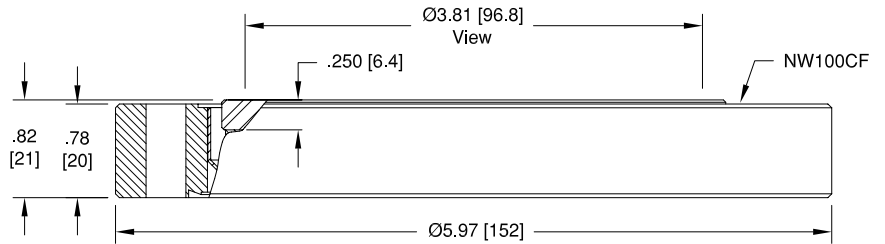
Installation: Weld

Pressure @ 20°C PSIG	Pressure @ 20°C Bar	Temperature °C Min	Temperature °C Max	Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
25	1.7	-65	200	0.25 to 2 Microns	No	11466-11-W	\$715

For optical transmission curves see page F3. For welding instructions see page L23.

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View Diameter: 3.81 [96.8]

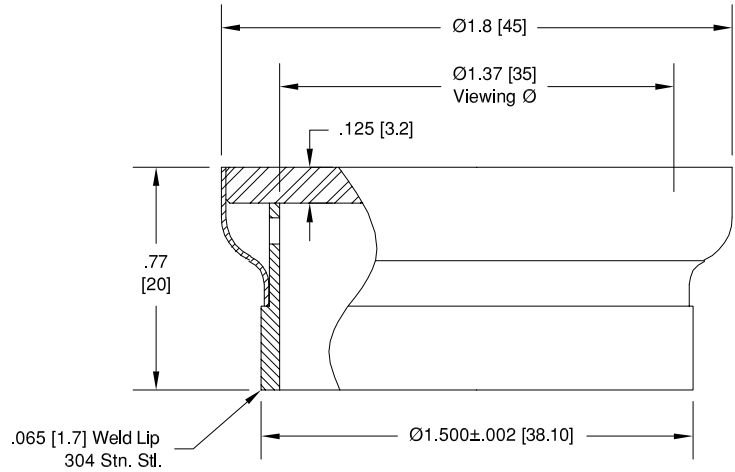
Installation: 6" ConFlat (NW100CF)

Pressure @ 20°C PSIG Bar	Temperature °C Min Max	Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
25 1.7	-65 200	0.25 to 2 Microns	No	11466-03-CF	\$825

For optical transmission curves see page F3. For flange assembly instructions see pages L24 - L25.

- Feedthrough
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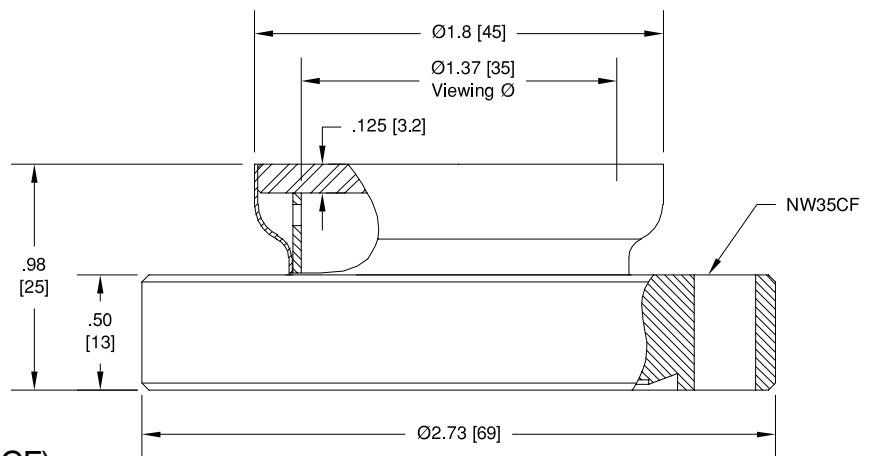
UV Grade

View Diameter: 1.37 [35]

Installation: Weld

Pressure @ 20 °C		Temperature °C		Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
PSIG	Bar	Min	Max				
35	2.4	-196	200	0.25 to 2 Microns	No	4901-01-W	\$390
35	2.4	-269	200	0.25 to 2 Microns	Yes	9600-01-W	\$420

For optical transmission curves see page F3. For welding instructions see page L23.



UV Grade

View Diameter: 1.37 [35]

Installation: 2 3/4" ConFlat (NW35CF)

Pressure @ 20 °C		Temperature °C		Transmission Range 80% Min	Magnetic Materials	Ceramaseal Part Number	List Price
PSIG	Bar	Min	Max				
35	2.4	-196	200	0.25 to 2 Microns	No	4900-01-CF	\$450
35	2.4	-269	200	0.25 to 2 Microns	Yes	4900-21-CF	\$480

For optical transmission curves see page F3. For flange assembly instructions see pages L24 - L25.

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Description

Hermetic Extended Range Transmission Ports

As its name suggests, an extended range transmission port is an optical component that provides for transmission of radiation in either the ultra violet or infrared portion of the electromagnetic spectrum. Standard viewports made of either fused silica or sapphire have useful transmission from .25 microns to 2.5 or 5.0 microns respectively. Extended range window materials have a combined transmission range from .12 microns to 20.0 microns.

Of course no single window material can offer good transmission over the entire spectrum. Alkali halides such as calcium fluoride, CaF_2 , or magnesium fluoride, MgF_2 , offer excellent transmission in the deep ultraviolet. Polycrystalline CVD grown infrared transmitting materials such as Zinc Sulfide, ZnS , and Zinc Selenide, ZnSe , transmit radiation out to 14 and 20 microns respectively.

Many factors govern the selection of optical materials for the construction of a high and ultra high vacuum assembly. Whereas quartz and sapphire can be readily metalized and sealed to vacuum flanges by brazing, most optical materials are too weak to join to by the high temperature joining processes. Further, many optically transmitting materials are strongly hygroscopic (such as sodium chloride) or melt at low temperatures (such as glass). The physical and chemical properties of Ceramaseal's extended range transmission ports have been selected on the basis of optical transmission, vacuum compatibility, strength of materials and widespread usage by optical engineers.

Accordingly, the following materials are offered standard as extended range transmission ports:

Zinc Selenide – Best transmission available at 10.6 micron (CO_2 laser fundamental line) and in the visible. It has some absorption in the blue-green causing it to appear yellow. The index of refraction is high and thus requires anti-reflection coatings on both sides for optimum performance. This polycrystalline, CVD grown material is strong, though relatively soft compared to other crystalline, optical materials. It is non-hygroscopic. ZnSe sublimates at 300°C and reacts violently with strong mineral acids.

Cleartran™ Zinc Sulfide – Comparable to ZnSe in most respects, only slightly more absorbing at 10.6 microns. Advantage is

the transmission in the visible is better, no absorption to only slight absorption in the blue-green thus appearing clear (i.e. not yellow).

It is much harder than ZnSe and thus resists scratching much better.

AR Coatings for both ZnSe and ZnS (Cleartran™) are standard and highly recommended for most applications. The exception is possibly for wide range pyrometry or spectrometry where artifacts from the coating materials leave a spectral “fingerprint” in regions beyond the useful transmission range of the coating. The standard coating has been specifically tailored to maximize transmission at 10.6 microns and will also transmit minimally 50% in the visible (i.e. remain at least partially transparent in the visible).

Calcium Fluoride – Best transmission by fluoride crystals in the UV (except very weak LiF). Relatively insoluble (non-to-very-low hygroscopic). Mechanically only slightly weaker than Zinc Selenide and slightly harder. Single crystal material with cubic symmetry, hence no birefringence. Calcium Fluoride is transparent in the visible (appears similar in color to quartz or glass) and in the UV down to 120nm, which services all excimer laser applications. Low index of refraction, which means that the windows rarely require anti-reflective coatings.

Magnesium Fluoride – Next best transmission of fluorides compared to CaF_2 and similar in all other characteristics with the following exceptions. MgF_2 is stronger and harder and is naturally, strongly birefringent.



Standard Specifications

- Optics: Zinc Selenide, Cleartran, Magnesium Fluoride, Calcium Fluoride, Fused Silica, BK7
- Temperature Range: -8°C to 204°C
- Standard transmission ranges from 0.12 to 20 microns
- Viewing diameter of .56” or 1.1”
- Anti-reflective coatings are optional

Extreme / Custom Design

- Larger viewports to fit within a 3 3/8” or 4 1/2” ConFlat flange.
- Different optics are available upon request. For example, Barium Fluoride, Crystal Quartz, Germanium, Sapphire, Silicon, Zinc Sulfide
- Specialized coatings are available.
- Higher temperature viewports are also available.

Installation

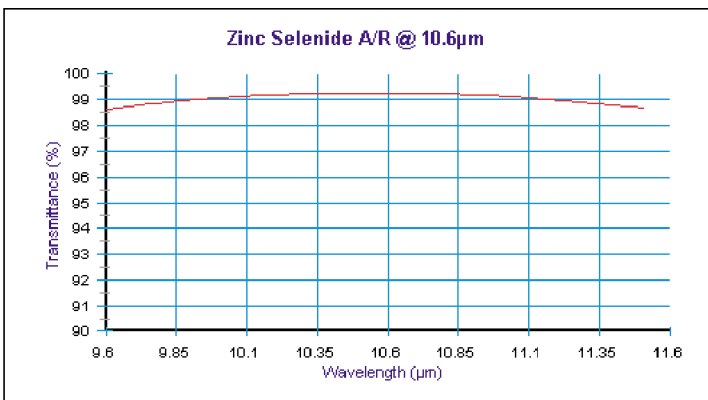
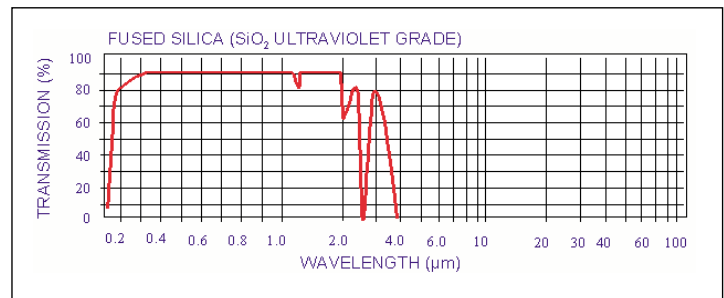
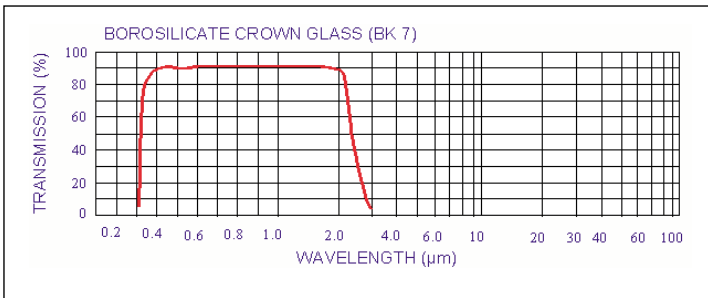
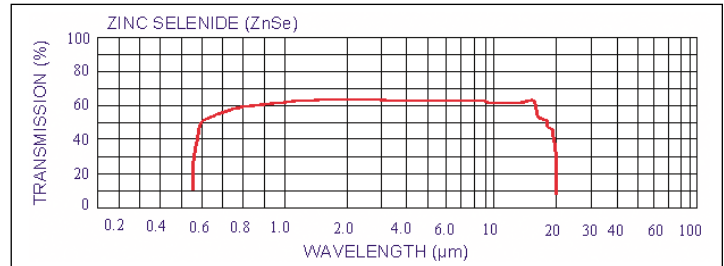
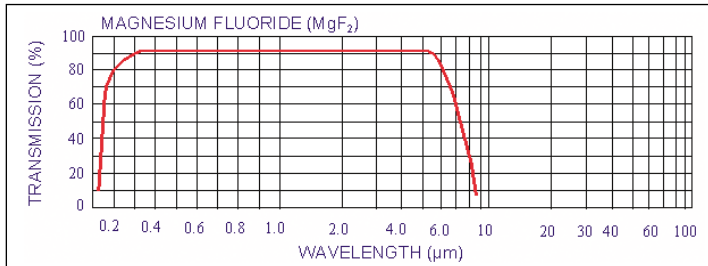
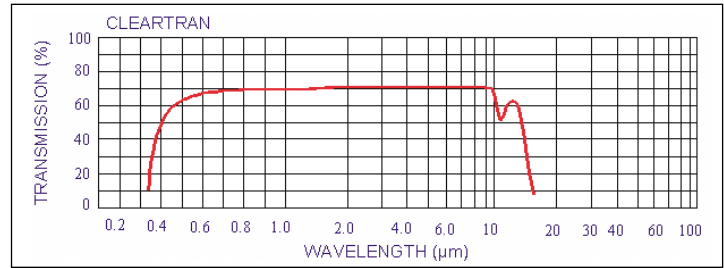
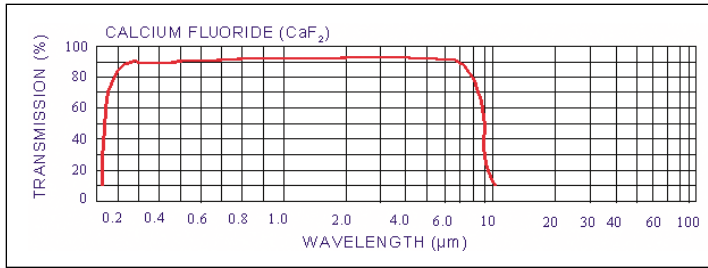
All of Ceramaseal's standard extended range viewports are mounted within a 1 1/3” or 2 3/4” ConFlat flange. For information on ConFlat flange installation, refer to the Technical Reference section.

Applications

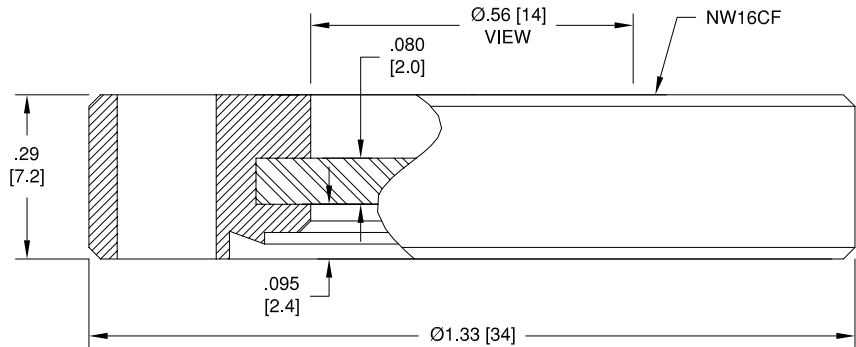
A few of the many applications in which these extended range viewports are commonly used are:

- CO_2 lasers
- Multispectral applications
- Optical imaging
- Materials processing
- Thermometry
- Pyrometry
- Spectroscopy
- Thermal imaging
- Excimer lasers
- YAG lasers

Extended Range Transmission Curves



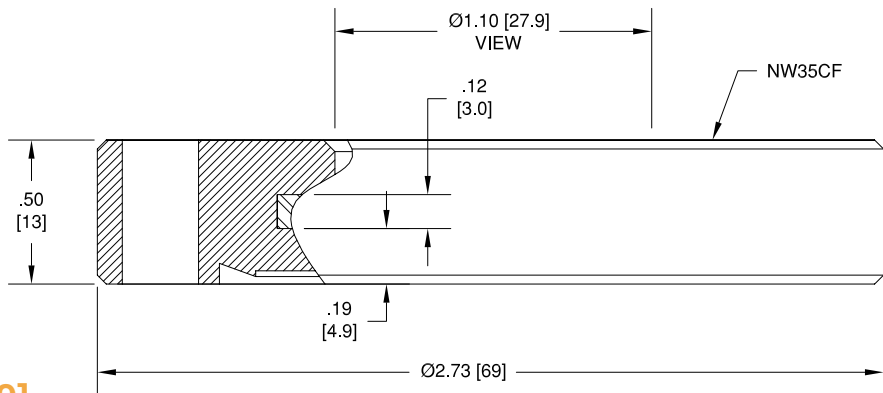
Transmission charts are for reference only. These transmission curves are based on a 10mm window thickness. Thermal gradient should not exceed 10°C/minute.



View Diameter: .56 [14]

Installation: 1 1/3" ConFlat (NW16CF)

Material	Anti-reflective Coatings	Temperature °C		Magnetic Materials	Transmission Range	Transmission % Min	Ceramaseal Part Number	List Price
		Min	Max					
Zinc Selenide	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	19485-01-CF	\$800
Cleartran™	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	19485-02-CF	\$800
Magnesium Fluoride	No	-8	204	Yes	0.12 to 7 Microns	-	19485-03-CF	\$610
Calcium Fluoride	No	-8	204	Yes	0.12 to 9 Microns	-	19485-04-CF	\$505
Zinc Selenide	No	-8	204	Yes	0.55 to 18 Microns	-	19485-05-CF	\$600
Fused Silica	No	-8	204	Yes	0.25 to 2 Microns	-	19485-06-CF	\$120
BK7	No	-8	204	Yes	0.33 to 2.1 Microns	-	19485-07-CF	\$84



View Diameter: 1.10 [27.9]

Installation: 2 3/4" ConFlat (NW35CF)

Material	Anti-reflective Coatings	Temperature °C		Magnetic Materials	Transmission Range	Transmission % Min	Ceramaseal Part Number	List Price
		Min	Max					
Zinc Selenide	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	19163-01-CF	\$1000
Cleartran™	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	19163-02-CF	\$1000
Magnesium Fluoride	No	-8	204	Yes	0.12 to 7 Microns	-	19163-03-CF	\$760
Calcium Fluoride	No	-8	204	Yes	0.12 to 9 Microns	-	19163-04-CF	\$630
Zinc Selenide	No	-8	204	Yes	0.55 to 18 Microns	-	19163-05-CF	\$760
Fused Silica	No	-8	204	Yes	0.25 to 2 Microns	-	19163-06-CF	\$150
BK7	No	-8	204	Yes	0.33 to 2.1 Microns	-	19163-07-CF	\$105

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Description

Differentially Pumped, Extended Range, Viewports for Extreme High Vacuum (EHV) Applications

EHV applications demand exceedingly high seal reliability. These requirements for vacuum integrity lead to consideration of two limits to commercial leak detection. First, what is the typical helium sensitivity for commercially available leak detectors; and second, what are the practical limitations of helium mass spectrometer (MS) leak rate certification.

While, helium MS leak detection systems are sensitive to leak rates less than 10^{-11} STD cc/sec, commercial vacuum seals are certified only for leak rates of less than 10^{-10} STD cc/sec. In these instances, the discrepancy between that achievable versus the reported sensitivity is not due to the presence of small, measurable leaks ($<10^{-11}$ STD cc/sec). Rather, the reduced certification is due to the difficulty of performing a reliable leak test with de-mountable hardware. An all metal welded joint to an MS leak detector, for example, could readily and reliably be certified to leak rates less than 10^{-11} . This type of joint is not practical for most de-mountable vacuum components. Even in the case of a copper O-ring seal, the process of sealing is not only too time consuming but also would cosmetically alter the finished part.

In other instances, such as in inert gas chronology measurements, where the desired background levels due to atmospheric argon or helium are actually below the level of instrument sensitivity; it is not possible to measure with sensitivity at the desired leak rate with commercially available Helium MS leak detectors.

In both instances, a differentially pumped vacuum seal can ensure EHV reliability. Arranging two or more seals such that the space between the seals is accessible to an appended vacuum pump creates a differentially pumped seal. Typically, each seal is readily qualified to have leak rates $<10^{-10}$ STD cc/sec. By actively pumping the region between the seals, minute leakage through atmospheric seal is further rarified to ensure that leakage through the inner

seal is reduced by several orders of magnitude. Thus differential pumping ensures EHV reliability.

Ceramaseal's differentially pumped, extended range, viewports have been designed specifically for such extreme high vacuum (EHV) applications including inert gas chronology.

Standard Specifications

- Optics: Zinc Selenide, Cleartran™
- Available in a 2 3/4", 3 3/8", or 4 1/2" ConFlat flange
- Pumping port termination options include: 1.33" ConFlat flange, male or female VCR fitting, or straight tube for Swagelok® fitting
- Temperature Range: -8°C to 204°C
- Standard transmission is 10.6 Microns
- Viewing diameter of 1.1"
- 10.6 Micron optimized anti-reflective coating

Extreme / Custom Design

- Larger viewport view diameters to fit within a 3 3/8" or 4 1/2" ConFlat flange.
- Different optics are available upon request. For example, Silicon, Germanium, Zinc Sulfide
- Specialized coatings are also available.
- Custom pumping port termination options are available.



Installation

All of Ceramaseal's standard differentially pumped viewports are mounted within a 2 3/4", 3 3/8", or 4 1/2" ConFlat flange. For information on ConFlat flange installation, refer to the Technical Reference section.

Applications

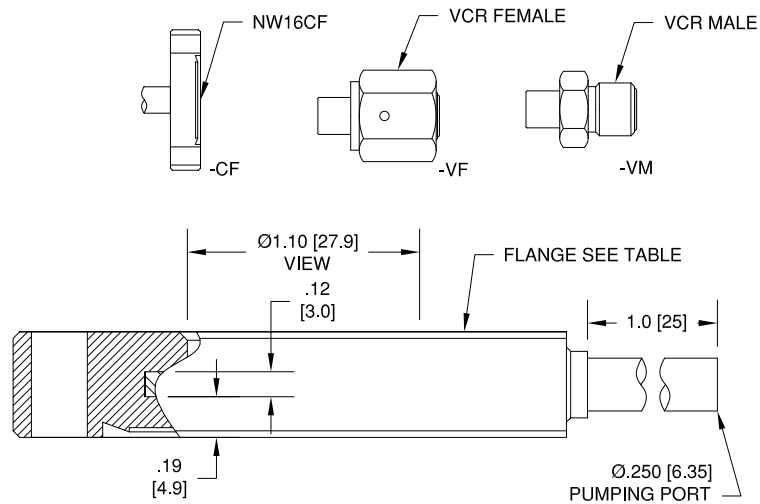
A few of the many applications in which these differentially pumped viewports are commonly used are:

- Geochronology
- Geology
- Argon Dating



View Diameter: 1.10 [27.9]

Installation: See Table



Material	Flange ConFlat	Anti-reflective Coatings	Temperature °C		Magnetic Materials	Transmission		Termination Options	Ceramaseal Part Number	List Price
			Min	Max		Range	% Min			
Zinc Selenide	2 3/4" (NW35CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Tube	19286-01-A	\$1,400
Zinc Selenide	2 3/4" (NW35CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	1 1/3" ConFlat	19286-01-CF	\$1,440
Zinc Selenide	2 3/4" (NW35CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Male VCR	19286-01-VM	\$1,440
Zinc Selenide	2 3/4" (NW35CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Female VCR	19286-01-VF	\$1,440
Cleartran™	2 3/4" (NW35CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Tube	19286-02-A	\$1,400
Cleartran™	2 3/4" (NW35CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	1 1/3" ConFlat	19286-02-CF	\$1,440
Cleartran™	2 3/4" (NW35CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Male VCR	19286-02-VM	\$1,440
Cleartran™	2 3/4" (NW35CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Female VCR	19286-02-VF	\$1,440
Zinc Selenide	3 3/8" (NW50CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Tube	19780-01-A	\$1,542
Zinc Selenide	3 3/8" (NW50CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	1 1/3" ConFlat	19780-01-CF	\$1,582
Zinc Selenide	3 3/8" (NW50CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Male VCR	19780-01-VM	\$1,582
Zinc Selenide	3 3/8" (NW50CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Female VCR	19780-01-VF	\$1,582
Cleartran™	3 3/8" (NW50CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Tube	19780-02-A	\$1,542
Cleartran™	3 3/8" (NW50CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	1 1/3" ConFlat	19780-02-CF	\$1,582
Cleartran™	3 3/8" (NW50CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Male VCR	19780-02-VM	\$1,582
Cleartran™	3 3/8" (NW50CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Female VCR	19780-02-VF	\$1,582
Zinc Selenide	4 1/2" (NW63CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Tube	19781-01-A	\$1,595
Zinc Selenide	4 1/2" (NW63CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	1 1/3" ConFlat	19781-01-CF	\$1,635
Zinc Selenide	4 1/2" (NW63CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Male VCR	19781-01-VM	\$1,635
Zinc Selenide	4 1/2" (NW63CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Female VCR	19781-01-VF	\$1,635
Cleartran™	4 1/2" (NW63CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Tube	19781-02-A	\$1,595
Cleartran™	4 1/2" (NW63CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	1 1/3" ConFlat	19781-02-CF	\$1,635
Cleartran™	4 1/2" (NW63CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Male VCR	19781-02-VM	\$1,635
Cleartran™	4 1/2" (NW63CF)	10.6 Micron	-8	204	Yes	10.6 Micron optimized	98	Female VCR	19781-02-VF	\$1,635

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Feedthrough
 Multipin Connector
 Coaxial
 Thermocouple
 Isolator
 Viewport
 Pressure
 Baseplate
 Crystal Sensor
 Heater
 Accessories