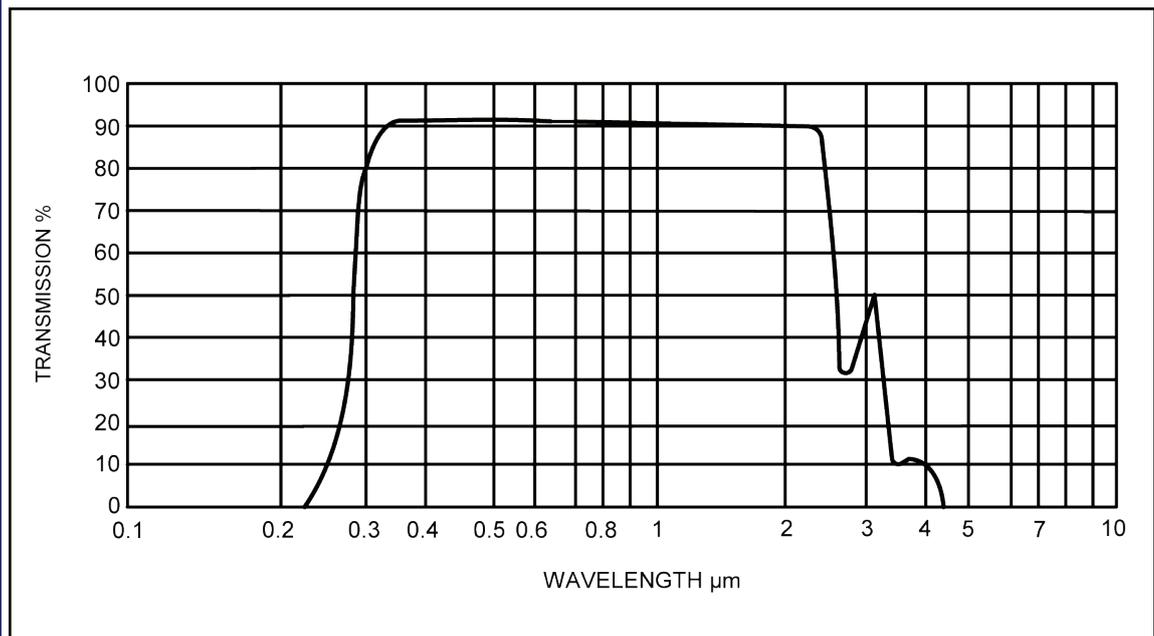


Specification	
Seal Type	Induction
Maximum Temperature	350°C (KF versions 150°C)
Minimum Temperature	minus 20°C
Maximum Rate of Temperature Change	3°C per minute
Leak Rate	<1x10 <sup>-10</sup> atm-cc/sec (He)
Pressure Range	1 bar to 1x10 <sup>-11</sup> mbar

Torr Scientific Kodial viewports are offered in CF, ISO and KF flange styles. The viewports comprise a borosilicate glass optic which is sealed to a Kovar weld ring using an induction heater process. The optic assemblies are TIG welded in to flanges and are helium leak tested and cleaned for ultra high vacuum (UHV) conditions. The CF versions are offered using 304L or 316LN stainless steel flanges. Flanges in 316L stainless steel are used for the high vacuum KF and ISO viewports. The rugged construction of the Kodial viewports allows repeated bake-out with UHV performance, whilst the window offers broadband optical transmission from the visible to near infra-red. Anti-reflective coatings to match customer reflectance requirements are also processed at TSL. Please advise the wavelength or wavelength ranges of your application and a reflectance curve will be prepared. Non-standard viewports can be manufactured on request, including re-entrant style microscope/camera viewports. Annealed copper gaskets and other component accessories are also supplied by TSL.

## Transmission Curve - Kodial



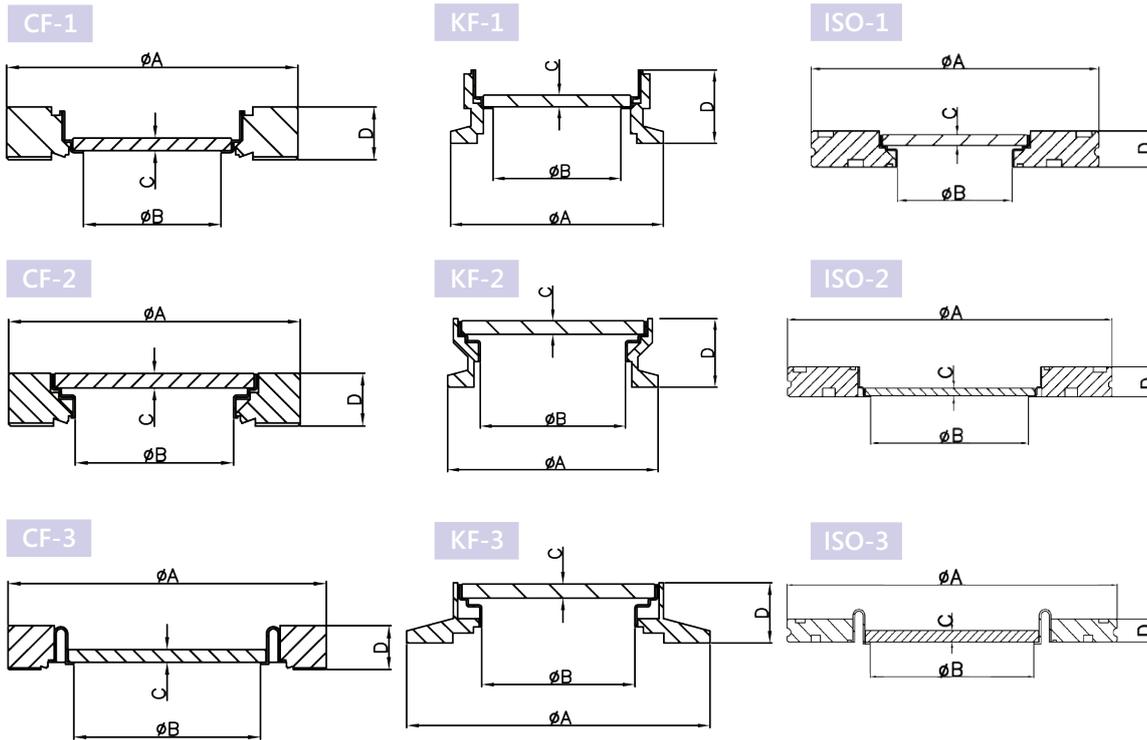
Please note that the optical transmission curves are approximations and should be used for reference only



# Kodial Zero Length Viewports



Kodial Zero Length Viewports

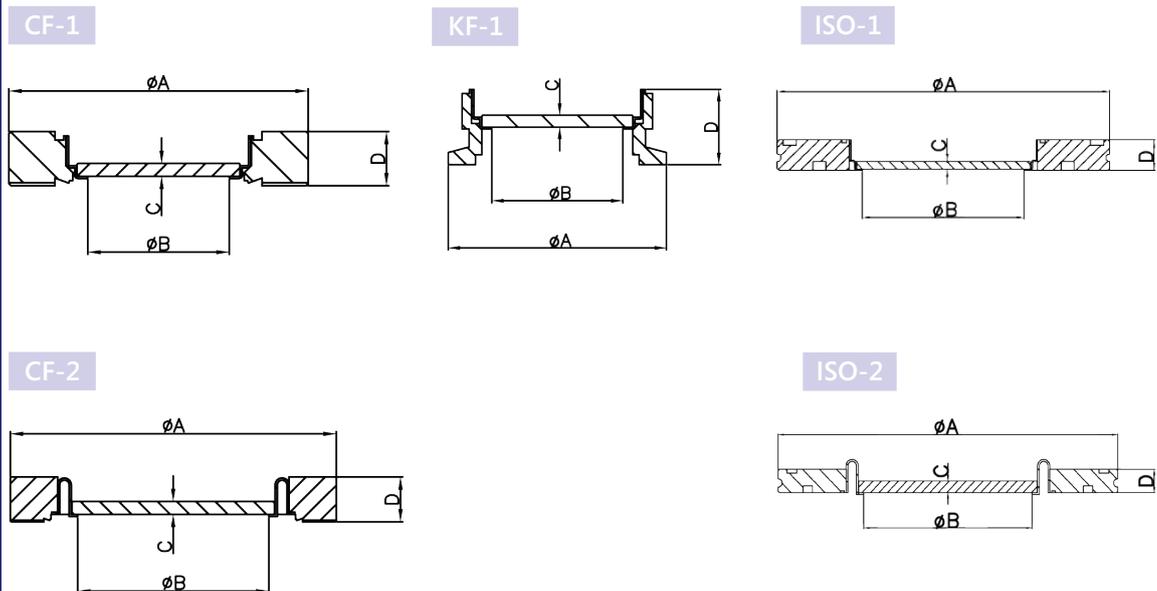


Part Number	Flange Type	A	B	C	D	Diagram	Flange Material	Weld Ring Material
VPZ16	NW16CF	34	15	1	12.7	CF-1	304L	Kovar
VPZ16-LN	NW16CF	34	15	1	12.7	CF-1	316LN	Kovar
KVPZ16	KF16	25	15	1	12.7	KF-1	304L	Kovar
KVPZ25	KF25	40	20	1.5	18.5	KF-2	304L	Kovar
VPZ38	NW35CF	70	32	2.5	12.7	CF-1	304L	Kovar
VPZ38LA	NW35CF	70	38	3	12.7	CF-2	304L	Kovar
VPZ38-LN	NW35CF	70	32	2.5	12.7	CF-1	316LN	Kovar
VPZ38LA-LN	NW35CF	70	38	3	12.7	CF-2	316LN	Kovar
KVPZ40LA	KF40	55	38	3	18.5	KF-3	304L	Kovar
KVPZ50	KF50	75	38	3	15	KF-3	304L	Kovar
VPZ50	NW50CF	86	38	3	16	CF-2	304L	Kovar
ISO63VPZ	ISO63	95	38	3	12	ISO-1	304L	Kovar
VPZ64	NW63CF	114	63	3	17.4	CF-1	304L	Kovar
VPZ64LA	NW63CF	114	65	3.5	17.4	CF-2	304L	Kovar
VPZ64-LN	NW63CF	114	63	3	17.4	CF-1	316LN	Kovar
VPZ100	NW100CF	152	89	4	19.9	CF-3	304L	Kovar
VPZ100-LN	NW100CF	152	89	4	19.9	CF-3	316LN	Kovar
ISO100VPZ	ISO100	130	63	3	12	ISO-2	304L	Kovar
VPZ150	NW150CF	203	136	8	22.3	CF-3	304L	Kovar
VPZ150-LN	NW150CF	203	136	8	22.3	CF-3	316LN	Kovar
ISO160VPZ	ISO160	180	89	4	12	ISO-3	304L	Kovar
VPZ200	NW200CF	254	136	8	24.5	CF-3	304L	Kovar



Specification	
Seal Type	Induction
Weld Ring	Kovar
Coating	Indium Tin Oxide (ITO) on vacuum face of window
Maximum Temperature	350°C
Minimum Temperature	minus 20°C
Maximum Rate of Temperature Change	3°C per minute
Leak Rate	$<1 \times 10^{-10}$ atm-cc/sec (He)
Pressure Range	1 bar to $1 \times 10^{-11}$ mbar

The Torr Scientific range of kodial zero length viewports is offered with a transparent conductive ITO (indium tin oxide  $\text{InSnO}_2$ ) on the vacuum side of the window to provide surface conductivity to eliminate electrostatic charge build up. The coatings are processed using sputter coating equipment in cleanroom conditions. The ITO coating increases reflectivity and viewports with an additional anti-reflective coating can be quoted as specials on request. The kodial viewports are offered in CF, ISO and KF flange styles. The viewports comprise a borosilicate glass optic which is sealed to a kovar weld ring using an induction heater process. The optic assemblies are TIG welded in to flanges and are helium leak tested and cleaned for ultra high vacuum (UHV) conditions. The CF versions are offered using 304L or 316LN stainless steel flanges. Flanges in 316L stainless steel are used for the high vacuum KF and ISO viewports. Non-standard viewports can be manufactured on request, including re-entrant style microscope/camera viewports. Annealed copper gaskets and other component accessories are also supplied by TSL.



## Kodial Zero Length Viewports with ITO Coating



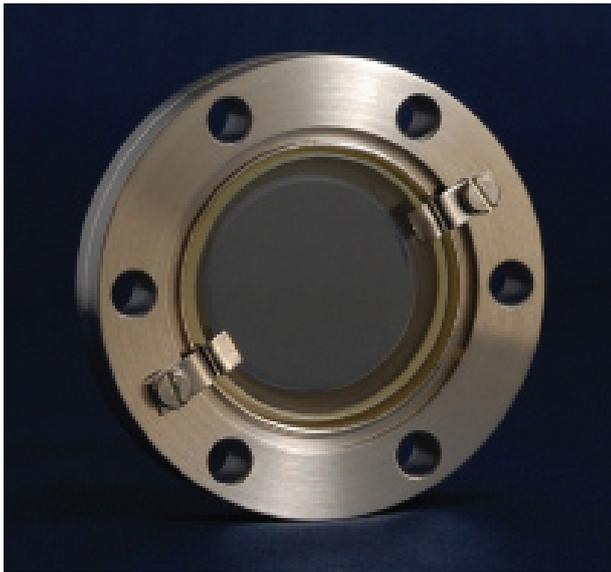
Kodial Zero  
Length Viewports  
with ITO Coating

Part Number	Flange Type	A	B	C	D	Diagram	Flange Material
VPZ16ITO	NW16CF	34	15	1	12.7	CF-1	304L
VPZ16ITO-LN	NW16CF	34	15	1	12.7	CF-1	316LN
KVPZ16ITO	KF16	25	15	1	12.7	KF-1	304L
KVPZ25ITO	KF25	40	20	1.5	18.5	KF-1	304L
VPZ38ITO	NW35CF	70	32	2.5	12.7	CF-1	304L
VPZ38ITO-LN	NW35CF	70	32	2.5	12.7	CF-1	316LN
KVPZ40/32ITO	KF40	55	32	2.5	12.7	KF-1	304L
KVPZ50/32ITO	KF50	75	32	2.5	12.7	KF-1	304L
ISO63/32VPZITO	ISO63	95	32	2.5	12	ISO-1	304L
VPZ64ITO	NW63CF	114	63	3	17.4	CF-1	304L
VPZ64ITO-LN	NW63CF	114	63	3	17.4	CF-1	316LN
VPZ100ITO	NW100CF	152	89	4	19.9	CF-2	304L
VPZ100ITO-LN	NW100CF	152	89	4	19.9	CF-2	316LN
ISO100VPZITO	ISO100	130	63	3	12	ISO-1	304L
VPZ150ITO	NW150CF	203	136	8	22.3	CF-2	304L
VPZ150ITO-LN	NW150CF	203	136	8	22.3	CF-2	316LN
ISO160VPZITO	ISO160	180	89	4	12	ISO-2	304L
VPZ200ITO	NW200CF	254	136	8	24.5	CF-2	304L



# Kodial Zero Length Viewports with X-Ray Protection Lead Glass

Kodial Zero Length Viewports with X-ray Protection Lead Glass

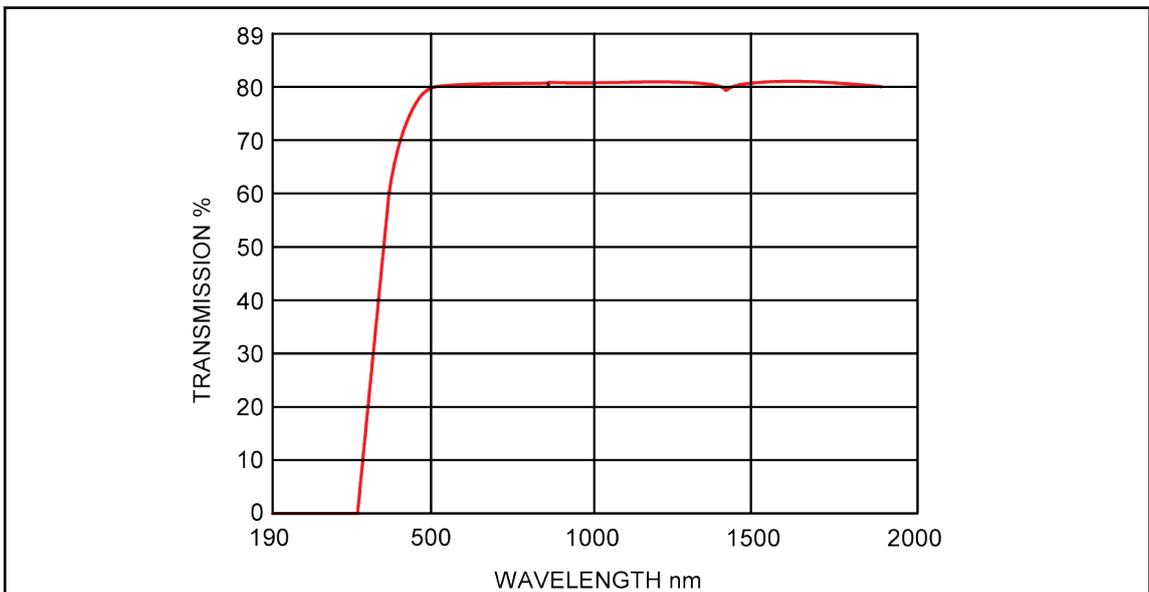


Specification	
Seal Type	Induction
Maximum Temperature	350°C
Minimum Temperature	minus 20°C
Maximum Rate of Temperature Change	3°C per minute
Leak Rate	<math>1 \times 10^{-10}</math> atm-cc/sec (He)
Pressure Range	1 bar to $1 \times 10^{-11}$ mbar

Torr Scientific CF kodial viewports are offered including an additional 6mm thick lead glass disc clipped in to the atmosphere side of the kodial window for X-Ray protection. The viewports comprise a borosilicate glass optic which is sealed to a kovar weld ring using an induction heater process. The optic assemblies are TIG welded in to the flanges and are helium leak tested and cleaned for ultra high vacuum (UHV) conditions. The CF versions are offered using 304L or 316LN stainless steel flanges. The rugged construction of the Kodial viewports allows repeated bake-out with UHV performance. The kodial/lead glass window assembly provides visible transmission as shown in the graph below.

Lead Glass Specification	
Optical Properties	
Refractive Index	1.76
Transmission % @ 550nm through 5mm path	>=85.0
Chemical Properties	
Lead (Pb)	48%
Barium (Ba)	15%
Mechanical Properties	
Density (g/cm <sup>2</sup> )	4.8
Knoop Hardness (kg/mm <sup>2</sup> )	440
Young's Modulus (GPa)	62.7

Transmission Curve – Kodial including the Lead Glass Disc



Please note that the optical transmission curves are approximations and should be used for reference only



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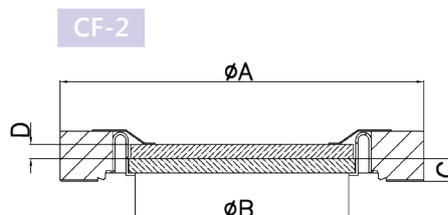
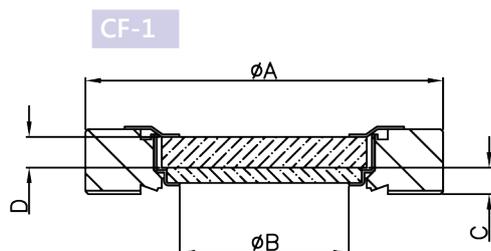
[Back to Contents](#)

# Kodial Zero Length Viewports with X-Ray Protection Lead Glass



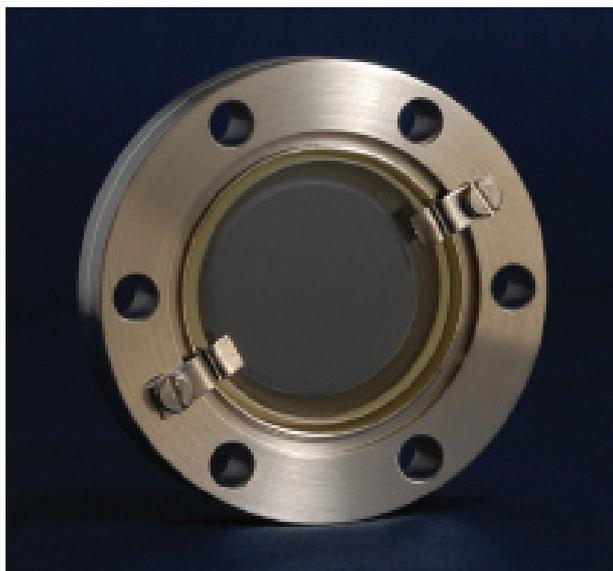
## Shielding characteristics

Thickness	Minimum lead equivalence (mm) for stated X-ray tube voltage					
mm	100kV	110kV	150kV	200kV	250kV	300kV
5-6.5	1.7	1.6	1.5	1.3	1.3	1.3



Kodial Zero Length Viewports with X-ray Protection Lead Glass

Part Number	Flange Type	A	B	C	D	Diagram	Flange Material	Weld Ring Material
VPZ16LG	NW16CF	34	15	1	6	CF-1	304L	Kovar
VPZ16LG-LN	NW16CF	34	15	1	6	CF-1	316LN	Kovar
VPZ38LG	NW35CF	70	32	2.5	6	CF-1	304L	Kovar
VPZ38LG-LN	NW35CF	70	32	2.5	6	CF-1	316LN	Kovar
VPZ64LG	NW63CF	114	63	3	6	CF-1	304L	Kovar
VPZ64LG-LN	NW63CF	114	63	3	6	CF-1	316LN	Kovar
VPZ100LG	NW100CF	152	89	4	6	CF-2	304L	Kovar
VPZ100LG-LN	NW100CF	152	89	4	6	CF-2	316LN	Kovar
VPZ150LG	NW150CF	203	136	8	6	CF-2	304L	Kovar
VPZ150LG-LN	NW150CF	203	136	8	6	CF-2	316LN	Kovar



Viewport Specification	
Seal Type	Induction
Weld Ring	Kovar
Coating	Indium Tin Oxide (ITO) on vacuum face of window
Maximum Temperature	350°C
Minimum Temperature	minus 20°C
Maximum Rate of Temperature Change	3°C per minute
Leak Rate	<math>1 \times 10^{-10}</math> atm-cc/sec (He)
Pressure Range	1 bar to $1 \times 10^{-11}$ mbar

The Torr Scientific range of kodial zero length viewports is offered with a transparent conductive ITO (indium tin oxide  $\text{InSnO}_2$ ) on the vacuum side of the window to provide surface conductivity to eliminate electrostatic charge build up. The coatings are processed using sputter coating equipment in cleanroom conditions. The ITO coating increases reflectivity and viewports with an additional anti-reflective coating can be quoted as specials on request. The CF kodial viewports are supplied including an additional 6mm thick lead glass discs clipped in to the atmosphere side of the kodial window for X-Ray protection. The viewports comprise a borosilicate glass optic which is sealed to a kovar weld ring using an induction heater process. The optic assembly are TIG welded in to flanges and are helium leak tested and cleaned for ultra high vacuum (UHV) conditions. The CF versions are offered using 304L or 316LN stainless steel flanges.

Lead Glass Specification	
Optical Properties	
Refractive Index	1.76
Transmission % @ 550nm through 5mm path	>=85.0
Chemical Properties	
Lead (Pb)	48%
Barium (Ba)	15%
Mechanical Properties	
Density ( $\text{g/cm}^2$ )	4.8
Knoop Hardness ( $\text{kg/mm}^2$ )	440
Young's Modulus (GPa)	62.7

## Shielding characteristics

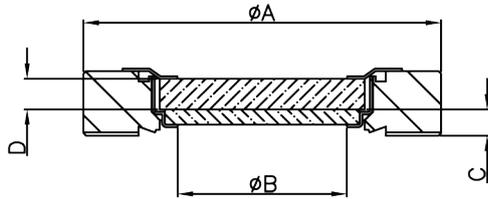
Thickness mm	Minimum lead equivalence (mm) for stated X-ray tube voltage					
	100kV	110kV	150kV	200kV	250kV	300kV
5-6.5	1.7	1.6	1.5	1.3	1.3	1.3



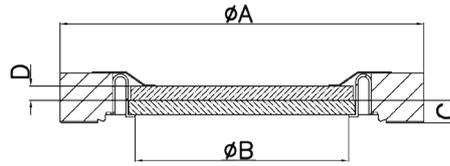
# Kodial Zero Length Viewports with ITO Coating and X-Ray Protection Lead Glass



CF-1



CF-2



Kodial Zero Length Viewports with ITO Coating and X-Ray Protection Lead Glass

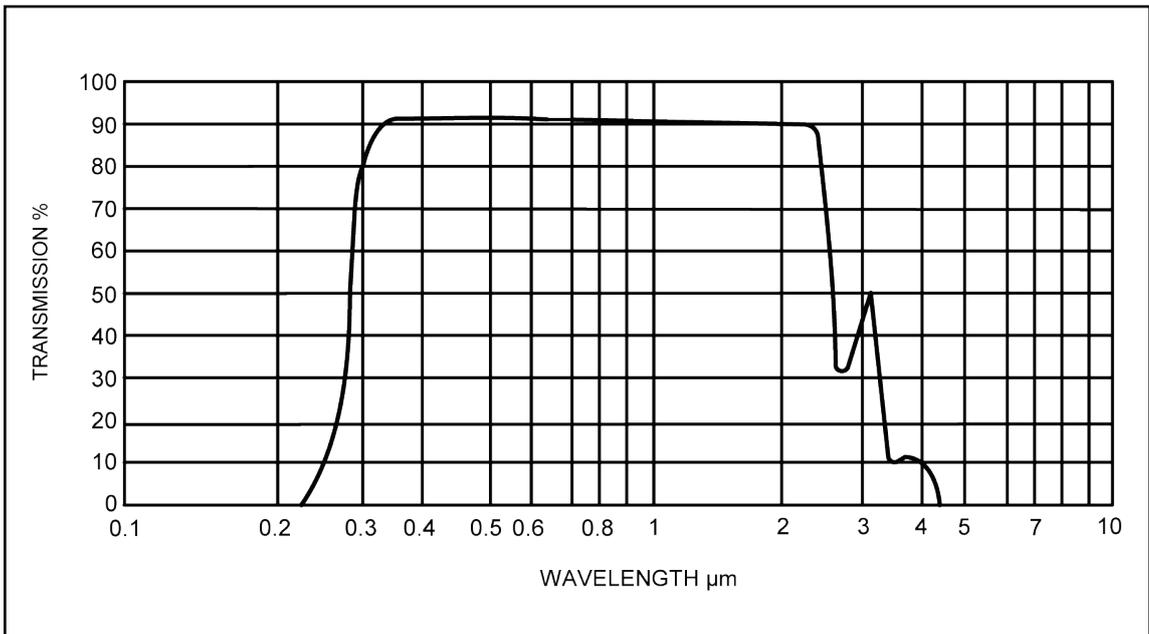
Part Number	Flange Type	A	B	C	D (lead glass thickness)	Coating (on vacuum face of kodial)	Diagram	Flange Material
VPZ16ITOLG	NW16CF	34	15	1	6	ITO	CF-1	304L
VPZ16ITOLG-LN	NW16CF	34	15	1	6	ITO	CF-1	316LN
VPZ38ITOLG	NW35CF	70	32	2.5	6	ITO	CF-1	304L
VPZ38ITOLG-LN	NW35CF	70	32	2.5	6	ITO	CF-1	316LN
VPZ64ITOLG	NW63CF	114	63	3	6	ITO	CF-1	304L
VPZ64ITOLG-LN	NW63CF	114	63	3	6	ITO	CF-1	316LN
VPZ100ITOLG	NW100CF	152	89	4	6	ITO	CF-2	304L
VPZ100ITOLG-LN	NW100CF	152	89	4	6	ITO	CF-2	316LN
VPZ150ITOLG	NW150CF	203	136	8	6	ITO	CF-2	304L
VPZ150ITOLG-LN	NW150CF	203	136	8	6	ITO	CF-2	316LN



Specification	
Seal Type	Bonded
Maximum Temperature	120°C
Minimum Temperature	minus 20°C
Maximum Rate of Temperature Change	3°C per minute
Leak Rate	<1x10 <sup>-10</sup> atm-cc/sec (He)
Pressure Range	1 bar to 1x10 <sup>-11</sup> mbar

Torr Scientific non-magnetic Kodial viewports are offered in 316LN CF flanges. The viewports comprise a borosilicate glass optic which is bonded to a tantalum weld ring. The viewports are helium leak tested and cleaned for ultra high vacuum (UHV) conditions. The rugged construction of the Kodial viewports allows bake-out to 120°C with UHV performance, whilst the window offers broadband optical transmission from the visible to near infra-red. Higher temperature specification non-magnetic viewports are available using fused silica and sapphire windows. Anti-reflective coatings to match customer reflectance requirements are also processed at TSL. Please advise the wavelength or wavelength ranges of your application and a reflectance curve will be prepared. Non-standard viewports can be manufactured on request, including re-entrant style microscope/camera viewports. Annealed copper gaskets and other component accessories are also supplied by TSL.

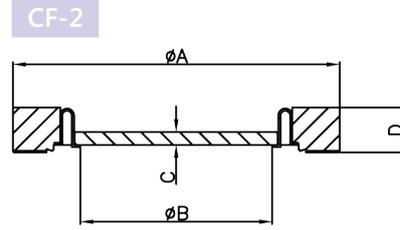
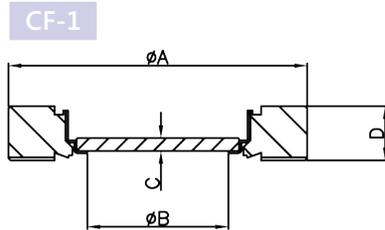
## Transmission Curve - Kodial



Please note that the optical transmission curves are approximations and should be used for reference only



# Non-Magnetic Kodial Zero Length Viewports



Non-Magnetic  
Kodial Zero Length  
Viewports

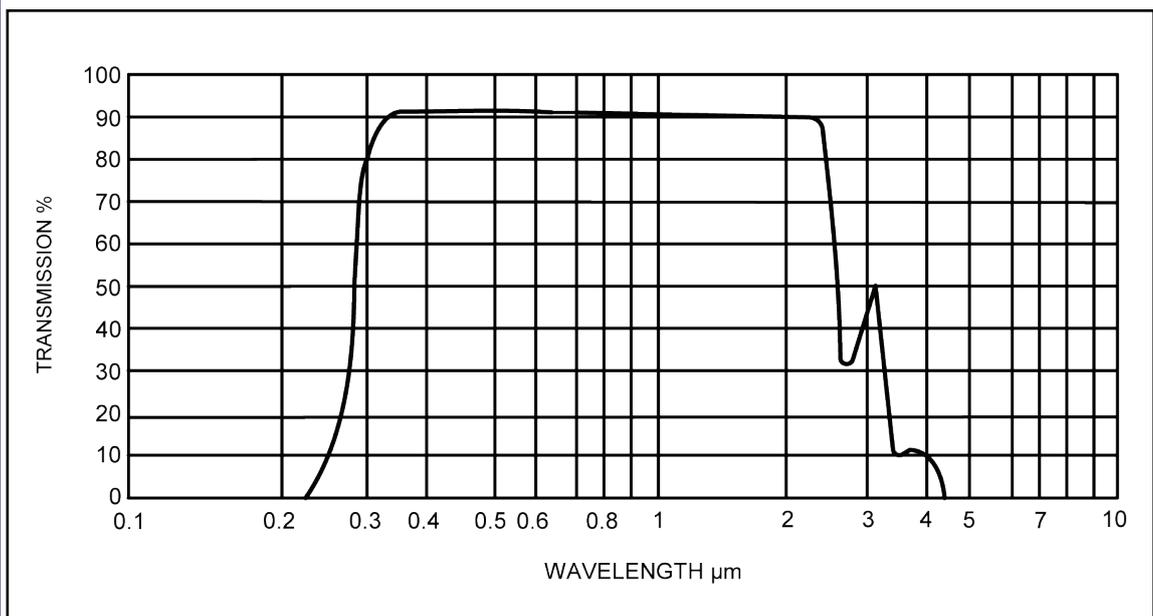
Part Number	Flange Type	A	B	C	D	Diagram	Flange Material	Weld Ring Material
BVPZ16-NM	NW16CF	34	15	1	12.7	CF-1	316LN	Tantalum
BVPZ38-NM	NW35CF	70	32	2.5	12.7	CF-1	316LN	Tantalum
BVPZ64-NM	NW63CF	114	63	3	17.4	CF-1	316LN	Tantalum
BVPZ100-NM	NW100CF	152	89	4	19.9	CF-2	316LN	Tantalum
BVPZ150-NM	NW150CF	203	136	8	22.3	CF-2	316LN	Tantalum



Specification	
Seal Type	Induction
Maximum Temperature	350°C
Minimum Temperature	minus 20°C
Maximum Rate of Temperature Change	3°C per minute
Leak Rate	<math>1 \times 10^{-10}</math> atm-cc/sec (He)
Pressure range	1 bar to $1 \times 10^{-11}$ mbar

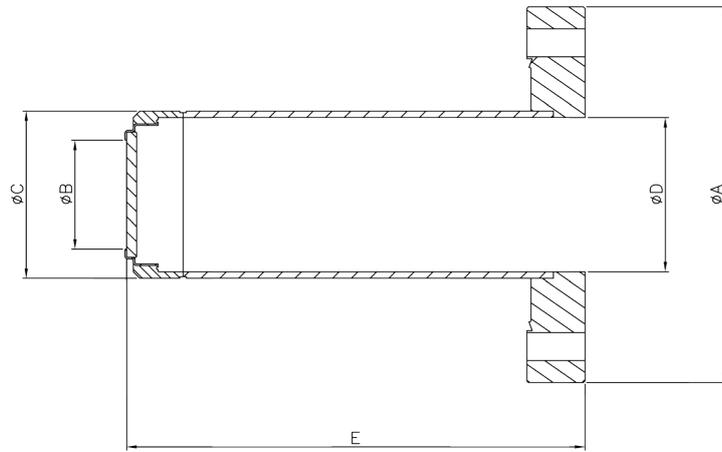
Torr Scientific kodial re-entrant viewports are typically used for inserting microscopes or cameras in to UHV/Vacuum systems. The re-entrant viewports are offered in CF flanges as standard, but custom designed viewports can be manufactured using ISO and KF flange styles on request. The viewports comprise a borosilicate glass optic which is sealed to a kovar weld ring using an induction heater process. The optic assemblies are TIG welded in to the tube assembly and are helium leak tested and cleaned for ultra high vacuum (UHV) conditions. The CF versions are offered using 304L stainless steel flanges, but 316LN flanges can be offered on request. The rugged construction of the Kodial viewports allows repeated bake-out with UHV performance, whilst the window offers broadband optical transmission from the visible to near infra-red. Anti-reflective coatings to match customer reflectance requirements are also processed at TSL. Please advise the wavelength or wavelength ranges of your application and a reflectance curve will be prepared. Annealed copper gaskets and other component accessories are also supplied by TSL. Please contact Torr Scientific if you require a quotation for a re-entrant viewport with a different length or different dimensions.

## Transmission Curve - Kodial



Please note that the optical transmission curves are approximations and should be used for reference only





Part Number	Flange Type	A	B	C	D	E	Material	Weld Ring Material
VPR38-111	NW35CF	70	15	22.5	20.2	111	304L	Kovar
VPR64-138	NW63CF	114	32	50.8	47.5	138	304L	Kovar
VPR64/38-80	NW63CF	114	38	57.2	53.2	80	304L	Kovar
VPR100-201	NW100CF	152	63	76.2	70.2	201	304L	Kovar
VPR150-330	NW150CF	203	63	108	102	330	304L	Kovar
VPR200-330	NW200CF	254	89	159	153	330	304L	Kovar