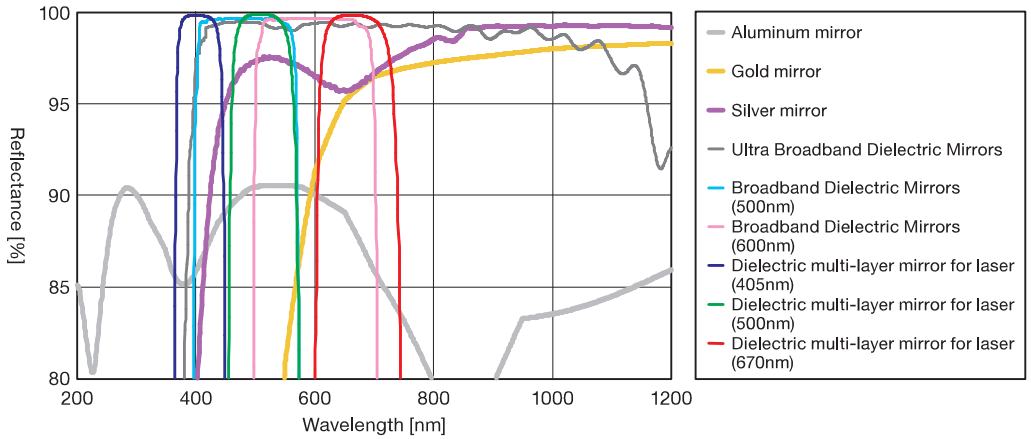
Mirrors INDEX

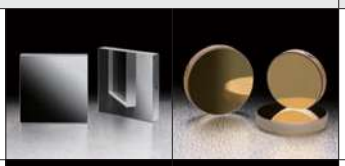
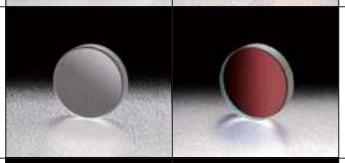
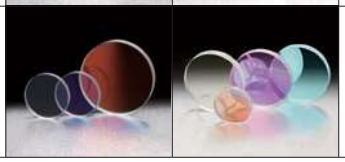
Mirrors Selection Guide

Mirrors designed for the optical laboratory are produced by metal or dielectric coating on the polished glass surface by vacuum deposition.
Optical characteristics of reflectance with a variety of features are provided with the coating.
Please select a mirror with the correct optical properties that matches your specifications.

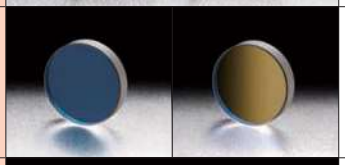
Performance Comparison of a typical reflectivity from mirror coatings



Features of the Mirrors

Type of Coat	Affected products		Features	How to Use
Metallic coating	**Aluminum (TFA)** Reference B030 **Gold (TFG/TFGS)** Reference B038 **Silver (TFAG)** Reference B040		Truly affordable ! Good reflectance in a wide range of wavelength. Mirrors are available in gold (AU) coating and at any angle of incidence. Light absorption coating, reflection is slightly reduced.	It is designed for any simple optical system. Works well with low power lasers. Together with imaging optics that uses white light illumination system. Also highly compatible when used together with infra-red optics. (Gold mirrors)
Broadband dielectric multi-layer	**Ultra Broadband (TFMS)** Reference B022 **Broadband (TFVM)** Reference B027		High reflectance with low loss. Zero absorption from the coatings with high laser strength. It is resistant to hard scratches. Designed and manufactured for narrow wavelength range. To be used at 45 degrees angle of incidence	Designed for the following: Precision optical systems especially for low light and low loss optical systems. Sub-watt class laser systems. Multi-wavelength laser optical systems.
Dielectric multi-layer coating	**For Laser (TFM)** Reference B024 **High Power (TFMHP)** Reference B020		High reflectance with low loss. Zero absorption from the coatings with high laser strength. It is resistant to hard scratches. Designed and manufactured for narrow wavelength range. To be used at 45 degrees angle of incidence	For all general and high power laser systems (TFMHP)

Mirrors with a dielectric multi-layer coating can have a variety of features in addition to the characteristics of reflectance.

Super Mirrors (TFSM) Reference B010		It is a mirror which had low-scattering loss and high reflectivity of 99.999%.
Mirrors for femtosecond laser Low dispersion mirrors for femtosecond laser (FLM/FLMHP) Reference B011 Negative dispersion mirrors for femtosecond laser (GFM/GCM) Reference B013		For a femtosecond laser, it uses a mirror with the combined characteristics of a dielectric multi-layer coating, wide range, low dispersion and high strength for high power lasers.
Dielectric Mirrors for high power laser (TFMHP) Reference B020		With our propriety engineering process of the multi-layer coating, it is designed to work well with high-energy laser pulse.

Super Mirror | TFHSM

RoHS Catalog Code W3176

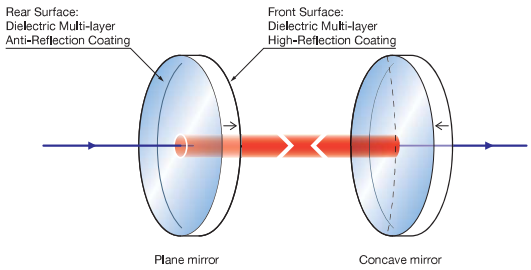
The Fabry-Perot type resonator cavity is often used for measuring extremely high accuracy time or distance with use of the light. Super mirror is a ultra-high performance mirror that surface reflectance is close to 1 (100%) as much as possible in order to increase the performance of the resonator.

- By using an ion beam sputtering (IBS), high quality and dense coating with few defects has been coated.
- With a special polishing technique, the low-scattering substrate of surface flatness Ra<0.1nm is used.
- The mirror coating with reflectivity of 99.999% is achieved from the coating design technology that had been developed for many years.
- Scattering loss due to the substrate and the coating is very small, when it is incorporated into a cavity, it is to be expected a high finesse and very narrow spectral bandwidth.
- It is provided two types of wavelength 532nm and 1064nm.

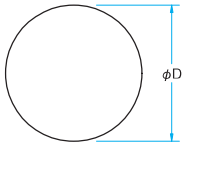
Specifications

Material	Synthetic Fused Silica
Coating	Front Surface: Dielectric Multi-layer High-Reflection Coating Rear Surface: Dielectric Multi-layer Anti-Reflection Coating
Incident Angle	0°
Surface flatness of substrate	λ/10
Parallelism	<5″
Surface Quality (Scratch–Dig)	10–5
Clear Aperture	80% of Actual Aperture
Reflectance of Rear Surface	<0.15%
Substrate Type	Optical Flat

Schematic



Outline Drawing (in mm)



●Tolerance
Diameter $\phi D^{+0}_{-0.1}$
Thickness t ±0.1

Guide

- The super mirror coated on a concave substrate is available as custom. Please specify the radius of curvature.
- Fro products with different wavelengths, sizes, and incident angles not listed on-line or in our catalog, contact our Sales Division with your request.

Attention

- When used as a single mirror, it does not transmit the light because the reflectance is high. Please use it after assembled to precise cavity in order to use transmitted light.
- Please make a measurement or handling of the mirror in the clean environment. The dirt, dust and gas contamination will cause a significant effect on the measured value.
- If a cavity is consisted of two plane mirrors, the output light may become unstable. In order to realize the stable cavity, please change the mirror of one side or both into a concave mirror, and build a cavity.
- The Super Mirror has an extremely long lead time manufacture and test resulting in longer delivery than simple products on-line and in our general catalog. Please consult our Sales Team in advance when ordering.

Specifications

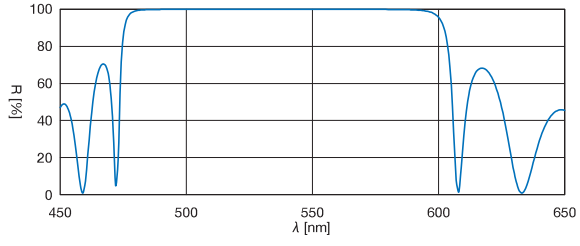
Part Number	Wavelength Range [nm]	Diameter ϕD [mm]	Thickness t [mm]	Reflectance*1 [%]	Loss*2 [ppm]
TFHSM-12.7C06-532	532	ϕ12.7	6	99.995	20
TFHSM-25C06-532	532	ϕ25	6	99.995	20
TFHSM-25.4C06-532	532	ϕ25.4	6	99.995	20
TFHSM-30C06-532	532	ϕ30	6	99.995	20
TFHSM-50C08-532	532	ϕ50	8	99.995	20
TFHSM-12.7C06-1064	1064	ϕ12.7	6	99.999	8
TFHSM-25C06-1064	1064	ϕ25	6	99.999	8
TFHSM-25.4C06-1064	1064	ϕ25.4	6	99.999	8
TFHSM-30C06-1064	1064	ϕ30	6	99.999	8
TFHSM-50C08-1064	1064	ϕ50	8	99.999	8

*1 The above is the reflectance measured in the CRD method. However, there may vary depending on measurement conditions and measurement method.
*2 The values indicated in "Loss" is only reference data. These data will not be attached with the product.

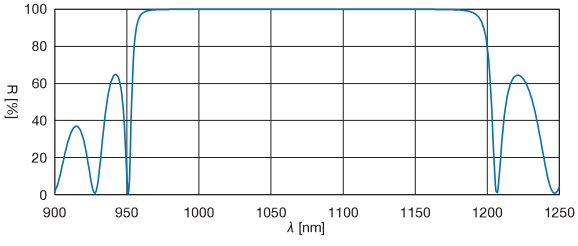
Typical Reflectance Data

R: Reflectance

TFHSM-532



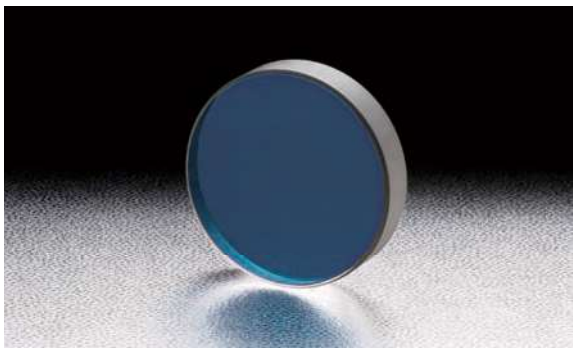
TFHSM-1064



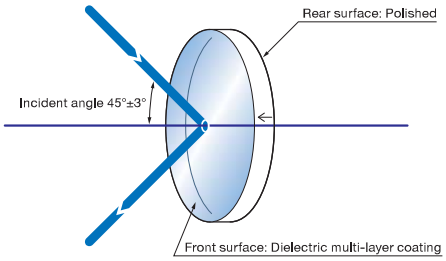
WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

This mirror is designed to provide low wavelength dispersion suitable for use with ultra-short pulse lasers with 100 femtosecond or less.

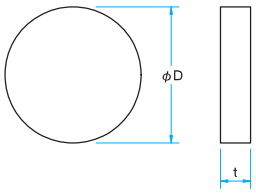
- We have designed a special thin film coating that optimizes wavelength dispersion, range and the strength of lasers.
- It has the effect of suppressing the spread of the pulse width produced by a plurality of reflecting mirrors.
- There are three types available, FLM1 standard, FLM2 wide wavelength band, and FLMHP for high power femtosecond laser*.
- These mirrors are designed and produced for usage within the microscopy with femtosecond laser and optical systems with femtosecond time-resolved spectroscopy.



Schematic



Outline Drawing (in mm)



●Tolerance
Diameter $\phi D^{+0}_{-0.1}$
Thickness t ±0.1

Specifications

Material	BK7 (FLM) Synthetic fused silica (FLMHP)
Coating	Dielectric multi-layer coating
Incident angle	45°±3°
Surface Flatness	λ/10
Parallelism	<5″
Surface Quality (Scratch–Dig)	10–5
Clear aperture	80% of Actual Aperture
Rear Surface	Polished

Guide

- These low dispersion wavelength mirrors are available in physical dimensions other than those found in the catalog, please contact our Sales Division for Custom products.
- We can also provide high power negative dispersion mirror.
- Also available are our surface flatness guarantee (HTFM) mirrors with accuracy guarantee after surface coating. Reference B016

Attention

- When used in angles other than 45 degrees (AOI), we would not be able to guarantee the wavelength dispersion.

Low Dispersion Mirrors for Femtosecond Laser

Part Number	Wavelength Range S polarization [nm]	Wavelength Range P polarization [nm]	Diameter ϕD [mm]	Thickness t [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm²]
FLM1-12.7C05-800	720 – 900	760 – 840	ϕ12.7	5	>99.8	1
FLM1-25.4C05-800	720 – 900	760 – 840	ϕ25.4	5	>99.8	1
FLM1-30C05-800	720 – 900	760 – 840	ϕ30	5	>99.8	1
FLM2-12.7C05-800	700 – 940	740 – 860	ϕ12.7	5	>99.8	0.5
FLM2-25.4C05-800	700 – 940	740 – 860	ϕ25.4	5	>99.8	0.5
FLM2-30C05-800	700 – 940	740 – 860	ϕ30	5	>99.8	0.5

* Laser pulse width 50fs, wavelength 800nm

Low Dispersion Mirrors for High Power Femtosecond Laser

Part Number	Wavelength Range S polarization [nm]	Wavelength Range P polarization [nm]	Diameter ϕD [mm]	Thickness t [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm²]
FLMHP-12.7C05-800	745 – 855	775 – 825	ϕ12.7	5	>99	2
FLMHP-25.4C05-800	745 – 855	775 – 825	ϕ25.4	5	>99	2
FLMHP-30C05-800	745 – 855	775 – 825	ϕ30	5	>99	2

* Laser pulse width 65fs, wavelength 800nm

Compatible Optic Mounts

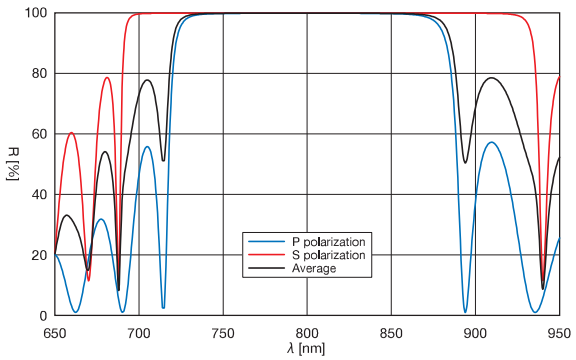
MHG-MP12.7-NL / MHG-MP25-NL, HS25-NL / MHG-MP30-NL, HS30-NL

Low Dispersion Mirrors for Femtosecond Laser | FLM/FLMHP

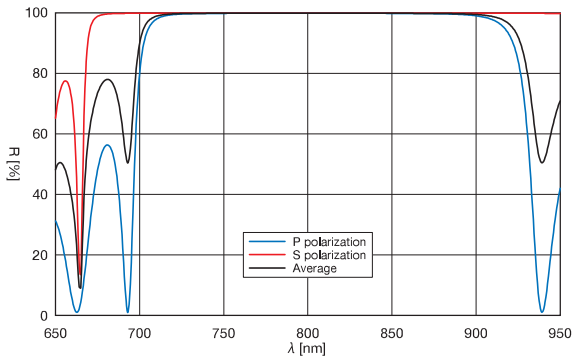
Typical Reflectance Data

R: Reflectance

FLM1



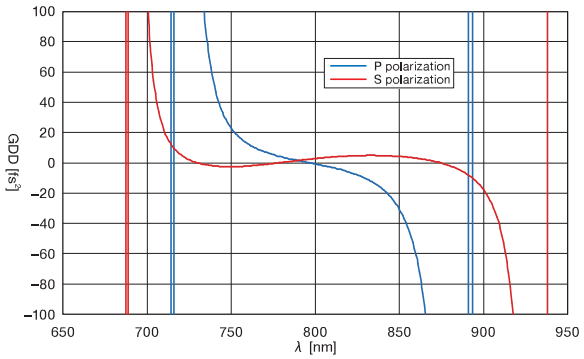
FLM2



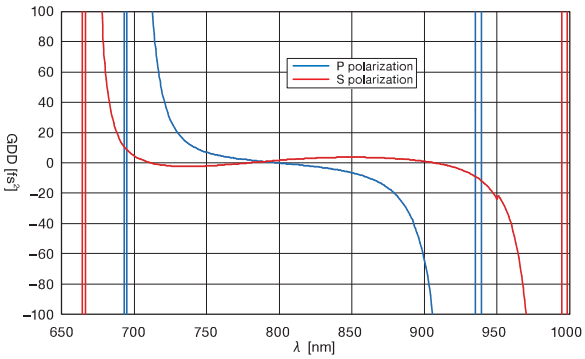
Group Delay Data (for reference only)

GDD: Group Delay Dispersion

FLM1



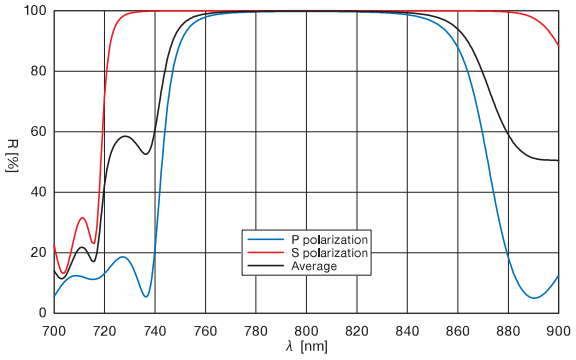
FLM2



Typical Reflectance Data

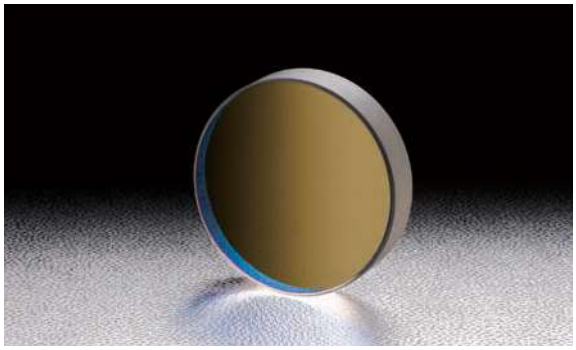
R: Reflectance

FLMHP

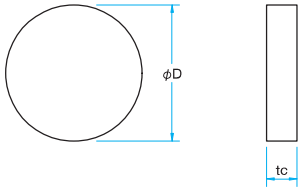


This mirror has a negative dispersion and can be used for pulse compression in a femtosecond laser system.

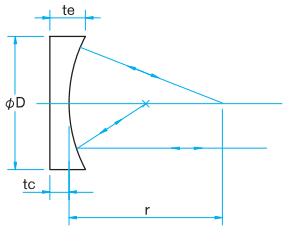
- These mirrors are more compact and exhibit a smaller optical loss than the conventional prisms used for pulse compression.
- Center wavelength is for Ti: Sapphire at 800nm.
- Plano and concave substrates designed for cavities are available.



Outline Drawing (in mm)



●Tolerance
Diameter $\phi D^{+0}_{-0.1}$
Thickness tc ±0.1



●Tolerance
Diameter $\phi D^{+0}_{-0.1}$
Thickness tc ±0.2

Specifications

Material	BK7
Coating	Dielectric multi-layer coating
Incident angle	0° – 20°
Surface Flatness	λ/10
Parallelism	<5″ (flat surface)
Surface Quality (Scratch–Dig)	10–5
Clear aperture	80% of Autual Aperture
Rear Surface	Polished

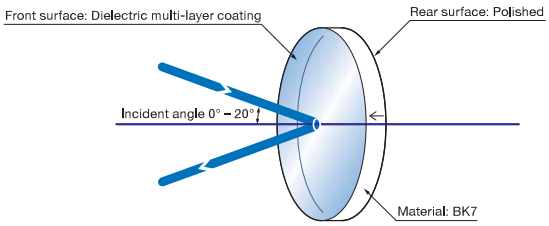
Guide

- Fabrication of negative dispersion mirror is also available.
- We can also provide high power negative dispersion mirror.
- Also available are our surface flatness guarantee (HTFM) mirrors with accuracy guarantee after surface coating. Reference B016

Attention

- The angle of incident for this series is 0 to 20 degrees and the laser dispersion may not be corrected for other angles. Please contact our Sales Division for further details.

Schematic



Negative Dispersion Mirrors for Femtosecond Laser (Plano)

Part Number	Wavelength Range [nm]	Diameter ϕD [mm]	Thickness tc [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm²]
GFM-12.7C05-800	700 – 900	ϕ12.7	5	>99.8	0.5
GFM-25.4C05-800	700 – 900	ϕ25.4	5	>99.8	0.5
GFM-30C05-800	700 – 900	ϕ30	5	>99.8	0.5

* Laser pulse width 50fs, wavelength 800nm

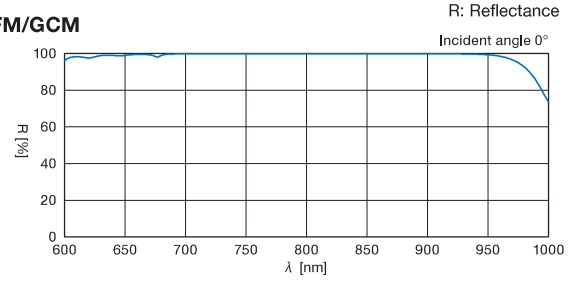
Negative Dispersion Mirrors for Femtosecond Laser (Concave)

Part Number	Wavelength Range [nm]	Diameter ϕD [mm]	Edge Thickness te [mm]	Radius of curvature r [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm²]
GCM-30C07-50-800	700 – 900	ϕ30	7	50	>99.8	0.5
GCM-30C07-100-800	700 – 900	ϕ30	7	100	>99.8	0.5
GCM-30C05-500-800	700 – 900	ϕ30	5	500	>99.8	0.5
GCM-30C05-1000-800	700 – 900	ϕ30	5	1000	>99.8	0.5

* Laser pulse width 50fs, wavelength 800nm

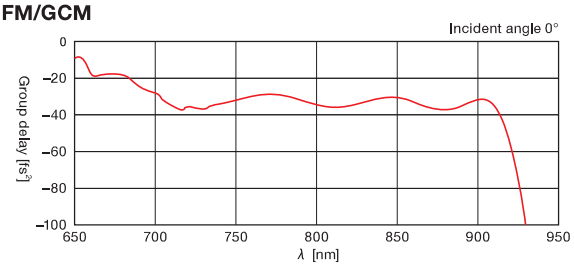
Typical Reflectance Data

GFM/GCM



Incident angle Group Velocity Delay Data (for reference only)

GFM/GCM



Frameless Mirror Unit
Frameless Beamsplitter Unit

GMMUHP
GBSMU

RoHS
RoHS

Frameless mounting is designed to minimize product footprint and maximize the front surface area of the mirror used.
Our high-reflectivity mirrors are produced using a ceramic material with thermal expansion raito equivalent to Zerodur® to provide maximum thermal stability.

- Laser damage threshold of the mirror is equivalent to our high power dielectric laser mirrors (TFMHP).
- λ/10 surface accuracy guarantee after coating.
- The Beamplitter coating is equivalent to our ultra broadband dielectric half mirror (PSMH).
- Fused Silica is used for our beamsplitters to minimize transmitted wavefront error(s).

Guide

- These mirrors are mounted to the base is the same method as using the mirror holder MHG. WEB Reference Catalog Code W4001
- Able to mount on Pedestal Bases(PST-∗∗) WEB Reference Catalog Code W6039 and Post(RO-∗∗) with M6 thread (sold separately) WEB Reference Catalog Code W6052

Attention

- Surface accuracy data is not provided standard with the product. Please contact our Sales Division for this data at an additional charge.
- The reflectance specifications are represented by the average of the reflectance of P polarized light and S polarized light.
- If the product is used without setting the angle of incidence to 45 degrees, the reflection may decrease.
- Be sure to wear laser safety goggles when checking optical path and adjusting optical axis.

Specifications

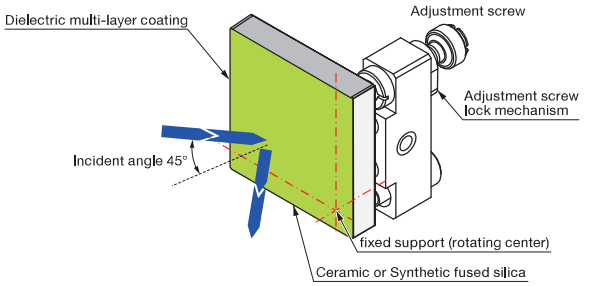
Holder

Type		GMMUHP-24.4	GMMUHP-49 GBSMU-49
Adjustable axis		3 axis	2 axis
Adjustment Range [°]	Elevation	±3	±2
	Rotation	±3	±2
Resolution [°/rotation]	Elevation	0.74	0.26
	Rotation	0.74	0.26
Main material		Brass	Aluminum
Surface finishing		Super black chrome	Black anodized
Weight [kg]		0.04	0.16

Mirror

Type	Mirror	Beamsplitter
Material	Ceramic	Synthetic fused silica
Incident angle	45°±3°	
Surface flatness after coating	Reflective wavefront λ/10	
Surface Quality (Scratch–Dig)	20–10	
Reflectance	>99%	Average 50±5%

Schematic



Catalog Code W3001

Mirror Unit

Part Number	Wavelength Range [nm]	Dimension of front plate [mm]	Coating clear aperture [mm]	Surface flatness after coating [mm]	Laser Damage Threshold* [J/cm²]
GMMUHP-24.4-355	355	24.4×24.4×7	23×23	ϕ20	8
GMMUHP-24.4-532	532	24.4×24.4×7	23×23	ϕ20	26.5
GMMUHP-24.4-1064	1064	24.4×24.4×7	23×23	ϕ20	28
GMMUHP-49-355	355	49×49×8.5	48×48	ϕ30	8
GMMUHP-49-532	532	49×49×8.5	48×48	ϕ30	26.5
GMMUHP-49-1064	1064	49×49×8.5	48×48	ϕ30	28

* Laser pulse width 10ns, repetition frequency 20Hz

Catalog Code W3406

Beamsplitter Unit

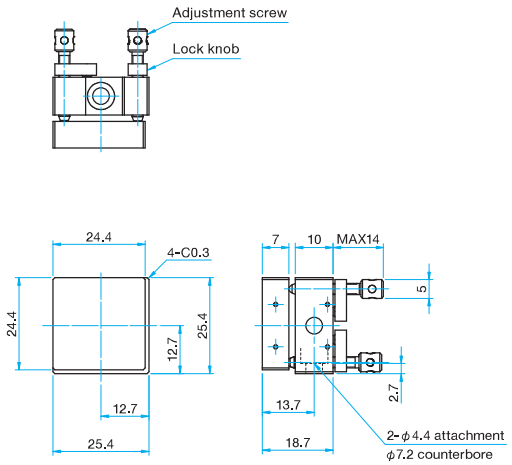
Part Number	Wavelength Range [nm]	Dimension of front plate [mm]	Coating clear aperture [mm]	Surface accuracy after coating [mm]	Clear aperture of transmitted beam [mm]	Laser Damage Threshold* [J/cm²]
GBSMU-49-VIS	400 – 700	49×49×12	48×48	ϕ30	ϕ20	2.1

* Laser pulse width 10ns, repetition frequency 20Hz

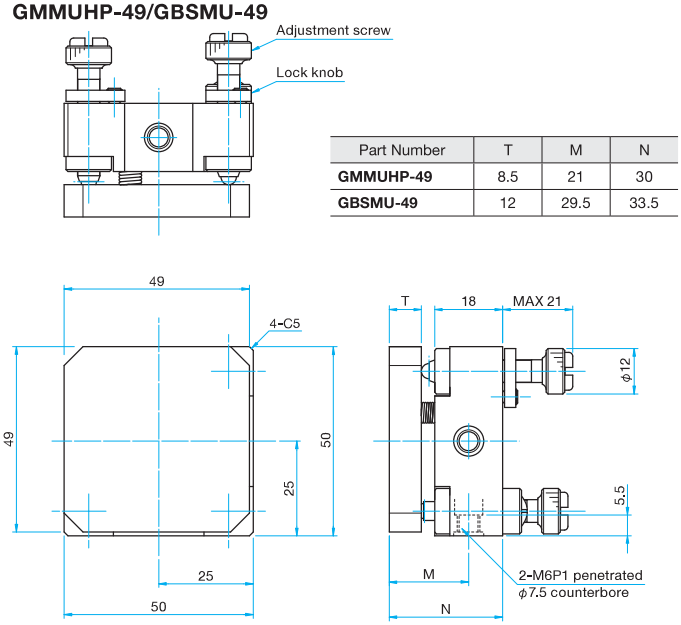
WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

Outline Drawing (in mm)

GMMUHP-24.4



GMMUHP-49/GBSMU-49

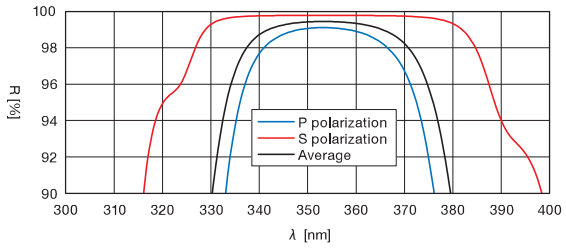


Part Number	T	M	N
GMMUHP-49	8.5	21	30
GBSMU-49	12	29.5	33.5

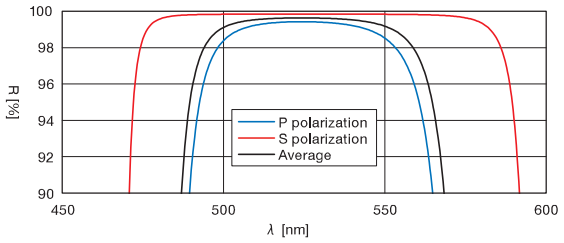
Typical Reflectance Data of Frameless Mirror

R: Reflectance

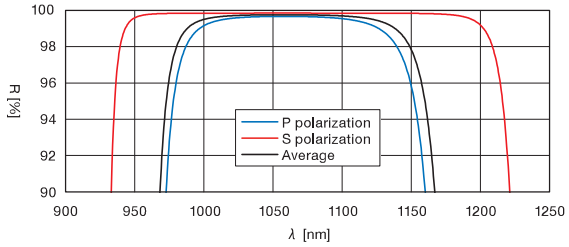
GMMUHP-355



GMMUHP-532



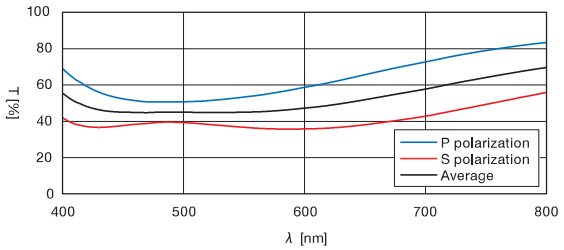
GMMUHP-1064



Typical Transmittance Data of Frameless Beamsplitter

T: Transmission

GBSMU-VIS



Surface Accuracy Data (reference data)

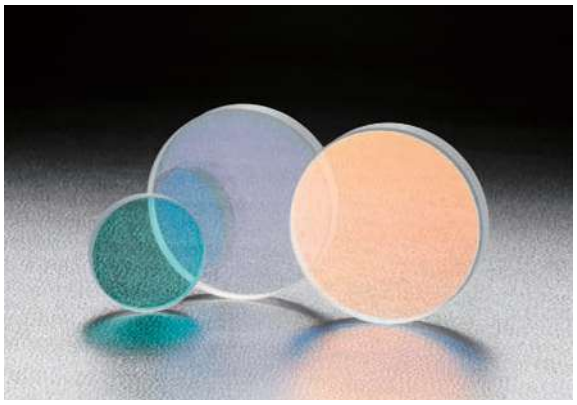
- Surface accuracy measurement method:
  Measured with Zygo laser interferometer
- Surface accuracy measurement wavelength
  632.8nm
- Surface accuracy guaranteed temperature
  23°C±2°C

Surface Accuracy Guaranteed Mirror | HTFM

RoHS

High Surface Accuracy Mirrors are realized by optimizing the conditions of the substrate material, thickness and coating. A surface accuracy of λ/10 after coating is guaranteed on these mirrors.

- This product features a surface accuracy (after coating) higher than our standard dielectric multi-layer flat mirrors (TFM).
- By using synthetic fused silica and increasing the substrate thickness the rigidity of the mirrors are increased.
- Our product line includes mirrors with high-reflection for use in individual wavelenghts including ultra-violet,YAG and other lasers.



Specifications

Material	Synthetic fused silica
Coating	Dielectric multi-layer coating
Incident angle	45°±3°
Surface Flatness after coating	λ/10
Parallelism	<3′
Surface Quality (Scratch–Dig)	10–5
Clear aperture	80% of external diameter
Rear Surface	Polished

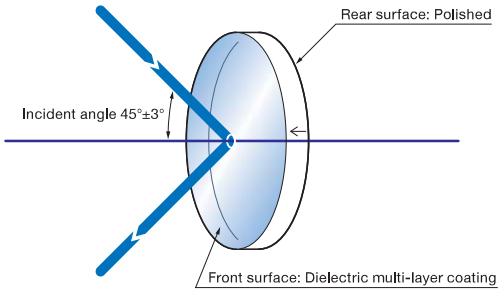
Guide

- These mirrors are available mounted in a holder with surface accuracy guaranteed (HTFM-MHG), contact our Sales Division to assist in your selection. Reference B018
- Please contact our Sales Division for customized products. (customized on outer diameter, wavelength characteristic, etc.) Please use the inquiry sheet. (Reference > B041). Reference B041

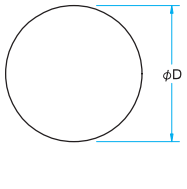
Attention

- Surface accuracy data is not provided standard with the product. Please contact our Sales Division for this data at an additional charge.
- For the dielectric multi-layer film, the reflection rate wavelength characteristics vary depending on the polarization state of the incident beam. The reflection rate of P polarization is lower than that of S polarization and the reflection band is narrow.
- The reflectance specifications are represented by the average of the reflectance of P polarized light and S polarized light.
- If the product is used without setting the angle of incidence to 45 degrees, the reflection may decrease.
- If the product is not used at an applicable wavelength, the reflection rate may decrease.

Schematic

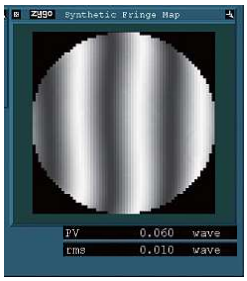


Outline Drawing (in mm)



●Tolerance
Diameter $\phi D^{0}_{-0.1}$
Thickness t ±0.1

Surface Accuracy Data (reference data)



- Surface accuracy measurement method: Measured with Zygo laser interferometer
- Surface accuracy measurement wavelength 632.8nm
- Surface accuracy guaranteed temperature 23°C±2°C

248 – 308nm

Part Number	Wavelength Range [nm]	Diameter ϕD [mm]	Thickness t [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm²]
HTFM-12.7C08-248	248	ϕ12.7	8	>99.2	2
HTFM-25.4C08-248	248	ϕ25.4	8	>99.2	2
HTFM-30C08-248	248	ϕ30	8	>99.2	2
HTFM-50C11-248	248	ϕ50	11	>99.2	2
HTFM-50.8C11-248	248	ϕ50.8	11	>99.2	2
HTFM-12.7C08-266	266	ϕ12.7	8	>99.2	2
HTFM-25.4C08-266	266	ϕ25.4	8	>99.2	2
HTFM-30C08-266	266	ϕ30	8	>99.2	2
HTFM-50C11-266	266	ϕ50	11	>99.2	2
HTFM-50.8C11-266	266	ϕ50.8	11	>99.2	2
HTFM-12.7C08-308	308	ϕ12.7	8	>99.5	2
HTFM-25.4C08-308	308	ϕ25.4	8	>99.5	2
HTFM-30C08-308	308	ϕ30	8	>99.5	2
HTFM-50C11-308	308	ϕ50	11	>99.5	2
HTFM-50.8C11-308	308	ϕ50.8	11	>99.5	2

* Laser pulse width 10ns, repetition frequency 20Hz

Compatible Optic Mounts

MHG-MP12.7-NL / MHG-MP25-NL, HS25-NL / MHG-MP30-NL, HS30-NL / MHG-MP50-NL / MHG-MP50.8-NL

WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

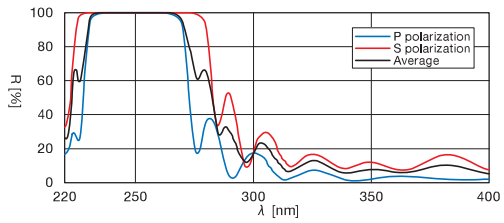
355 – 1064nm					
Part Number	Wavelength Range [nm]	Diameter ϕD [mm]	Thickness t [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm^2]
HTFM-12.7C08-355	355	ϕ12.7	8	>99.5	5
HTFM-25.4C08-355	355	ϕ25.4	8	>99.5	5
HTFM-30C08-355	355	ϕ30	8	>99.5	5
HTFM-50C11-355	355	ϕ50	11	>99.5	5
HTFM-50.8C11-355	355	ϕ50.8	11	>99.5	5
HTFM-12.7C08-532	532	ϕ12.7	8	>99.5	7
HTFM-25.4C08-532	532	ϕ25.4	8	>99.5	7
HTFM-30C08-532	532	ϕ30	8	>99.5	7
HTFM-50C11-532	532	ϕ50	11	>99.5	7
HTFM-50.8C11-532	532	ϕ50.8	11	>99.5	7
HTFM-12.7C08-1064	1064	ϕ12.7	8	>99.5	20
HTFM-25.4C08-1064	1064	ϕ25.4	8	>99.5	20
HTFM-30C08-1064	1064	ϕ30	8	>99.5	20
HTFM-50C11-1064	1064	ϕ50	11	>99.5	20
HTFM-50.8C11-1064	1064	ϕ50.8	11	>99.5	20

* Laser pulse width 10ns, repetition frequency 20Hz

Typical Reflectance Data

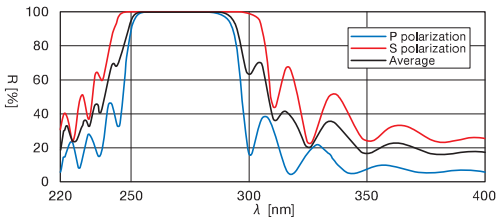
R: Reflectance

HTFM-248



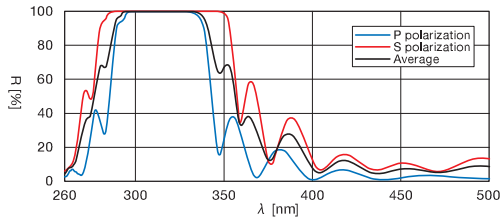
●Transmission factor in visible range...80 – 90%

HTFM-266



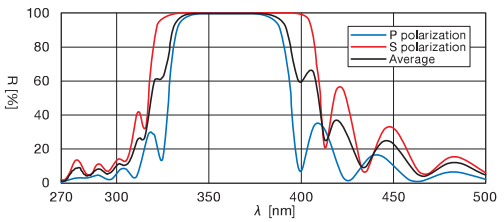
●Transmission factor in visible range...80 – 90%

HTFM-308

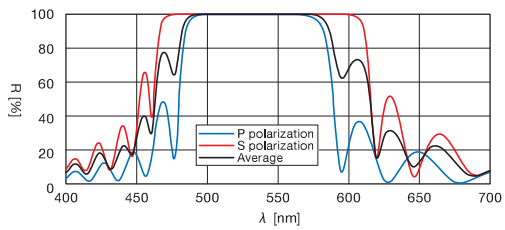


●Transmission factor in visible range...80 – 90%

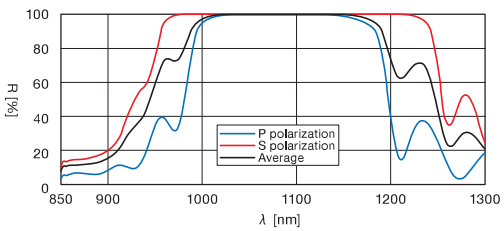
HTFM-355



HTFM-532



HTFM-1064



Holder Attached Surface Accuracy Guaranteed Mirrors | HTFM-MHG RoHS

By bonding the coated surface to our Kinematic Mirror Holders, a λ/10 surface flatness is guaranteed!
This product is suitable for high accuracy wavefront optical systems and interferometer requirements.

● 2 types of performance mirror holders are offered: high stability mirror holder (MHG-HS) or production model (MHG-MP).

Guide

- The Production model (MHG-MP) is equipped with locking mechanisms on the adjustment screw.
- This product can be attached to a rod (RO-**-**: separately available WEB Reference Catalog Code W6052 or a post stand (PS-**: separately available). WEB Reference Catalog Code W6039
- The mirror reflection wavelength characteristic are noted with the graph of the surface accuracy guaranteed mirror (HTFM). Reference B017

Attention

- The mirror surface will protrude by 2mm beyond the front surface of the holder after attachment.
- Surface flatness data is not provided standard with the product. Please contact our Sales Division for this data at an additional charge.
- Surface flatness will not be guaranteed when the mirror is detached.
- Any impacted shock to the holder or mirror may result in poor surface flatness.
- For production model (MHG-MP), the rotation center is at the external side of the mirror (support point of the holder)
- When fixing the high stability model (MHG-HS) to a flat surface, please use supplied plate for attaching posts.
- The optical axis will be 10mm higher after attaching the supplied plates.

Specifications

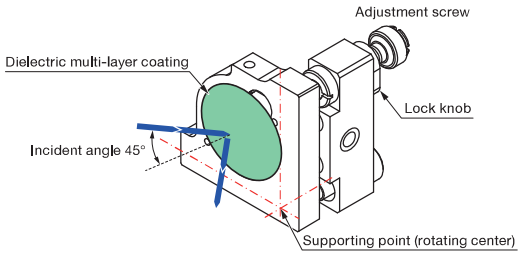
Holder

Movable axis	HTFM-MHG-HS: 3 axes HTFM-MHG-MP: 2 axes (HTFM-12.7C08-MHG-MP: 3axes)
Main Material	Aluminum (Brass: MHG-MP12.7 only)
Finishing	Black anodized (Only MHG-MP12.7 is Super black chrome)

Mirror

Material	Synthetic fused silica
Coating	Dielectric multi-layer coating
Incident angle	45°±3°
Surface Flatness	After holder is attached λ/10
Surface Quality (Scratch–Dig)	10–5
Clear aperture	80% of Actual Aperture
Rear Surface	Polished

Schematic



248 – 308nm

Part Number	Wavelength Range [nm]	Compatible Optics Diameter φD [mm]	Reflectance [%]	Holder part number	Adjustment Range Elevation [°]	Adjustment Range Rotation [°]	Resolution Elevation [°/rotation]	Resolution Rotation [°/rotation]	Weight [kg]
HTFM-12.7C08-248-MHG-MP	248	φ12.7	>99.2	MHG-MP12.7	±3	±3	about 0.74	about 0.74	0.04
HTFM-25.4C08-248-MHG-MP	248	φ25.4	>99.2	MHG-MP25	±3	±3	about 0.39	about 0.39	0.12
HTFM-25.4C08-248-MHG-HS	248	φ25.4	>99.2	MHG-HS25	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-248-MHG-MP	248	φ30	>99.2	MHG-MP30	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-248-MHG-HS	248	φ30	>99.2	MHG-HS30	±3	±3	about 0.39	about 0.39	0.12
HTFM-50C11-248-MHG-MP	248	φ50	>99.2	MHG-MP50	±2	±2	about 0.26	about 0.26	0.24
HTFM-50.8C11-248-MHG-MP	248	φ50.8	>99.2	MHG-MP50.8	±2	±2	about 0.26	about 0.26	0.24
HTFM-12.7C08-266-MHG-MP	266	φ12.7	>99.2	MHG-MP12.7	±3	±3	about 0.74	about 0.74	0.04
HTFM-25.4C08-266-MHG-MP	266	φ25.4	>99.2	MHG-MP25	±3	±3	about 0.39	about 0.39	0.12
HTFM-25.4C08-266-MHG-HS	266	φ25.4	>99.2	MHG-HS25	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-266-MHG-MP	266	φ30	>99.2	MHG-MP30	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-266-MHG-HS	266	φ30	>99.2	MHG-HS30	±3	±3	about 0.39	about 0.39	0.12
HTFM-50C11-266-MHG-MP	266	φ50	>99.2	MHG-MP50	±2	±2	about 0.26	about 0.26	0.24
HTFM-50.8C11-266-MHG-MP	266	φ50.8	>99.2	MHG-MP50.8	±2	±2	about 0.26	about 0.26	0.24
HTFM-12.7C08-308-MHG-MP	308	φ12.7	>99.5	MHG-MP12.7	±3	±3	about 0.74	about 0.74	0.04
HTFM-25.4C08-308-MHG-MP	308	φ25.4	>99.5	MHG-MP25	±3	±3	about 0.39	about 0.39	0.12
HTFM-25.4C08-308-MHG-HS	308	φ25.4	>99.5	MHG-HS25	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-308-MHG-MP	308	φ30	>99.5	MHG-MP30	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-308-MHG-HS	308	φ30	>99.5	MHG-HS30	±3	±3	about 0.39	about 0.39	0.12
HTFM-50C11-308-MHG-MP	308	φ50	>99.5	MHG-MP50	±2	±2	about 0.26	about 0.26	0.24
HTFM-50.8C11-308-MHG-MP	308	φ50.8	>99.5	MHG-MP50.8	±2	±2	about 0.26	about 0.26	0.24

WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

355 – 1064nm

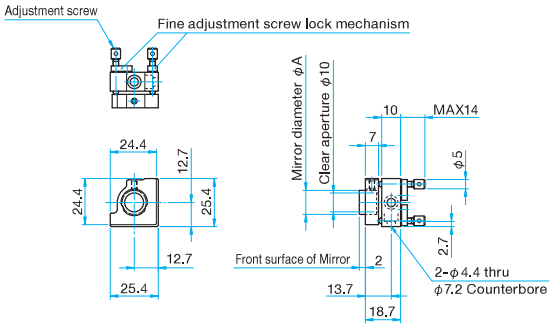
Part Number	Wavelength Range [nm]	Compatible Optics Diameter ϕD [mm]	Reflectance [%]	Holder part number	Adjustment Range		Resolution		Weight [kg]
					Elevation [°]	Rotation [°]	Elevation [°/rotation]	Rotation [°/rotation]	
HTFM-12.7C08-355-MHG-MP	355	ϕ12.7	>99.5	MHG-MP12.7	±3	±3	about 0.74	about 0.74	0.04
HTFM-25.4C08-355-MHG-MP	355	ϕ25.4	>99.5	MHG-MP25	±3	±3	about 0.39	about 0.39	0.12
HTFM-25.4C08-355-MHG-HS	355	ϕ25.4	>99.5	MHG-HS25	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-355-MHG-MP	355	ϕ30	>99.5	MHG-MP30	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-355-MHG-HS	355	ϕ30	>99.5	MHG-HS30	±3	±3	about 0.39	about 0.39	0.12
HTFM-50C11-355-MHG-MP	355	ϕ50	>99.5	MHG-MP50	±2	±2	about 0.26	about 0.26	0.24
HTFM-50.8C11-355-MHG-MP	355	ϕ50.8	>99.5	MHG-MP50.8	±2	±2	about 0.26	about 0.26	0.24
HTFM-12.7C08-532-MHG-MP	532	ϕ12.7	>99.5	MHG-MP12.7	±3	±3	about 0.74	about 0.74	0.04
HTFM-25.4C08-532-MHG-MP	532	ϕ25.4	>99.5	MHG-MP25	±3	±3	about 0.39	about 0.39	0.12
HTFM-25.4C08-532-MHG-HS	532	ϕ25.4	>99.5	MHG-HS25	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-532-MHG-MP	532	ϕ30	>99.5	MHG-MP30	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-532-MHG-HS	532	ϕ30	>99.5	MHG-HS30	±3	±3	about 0.39	about 0.39	0.12
HTFM-50C11-532-MHG-MP	532	ϕ50	>99.5	MHG-MP50	±2	±2	about 0.26	about 0.26	0.24
HTFM-50.8C11-532-MHG-MP	532	ϕ50.8	>99.5	MHG-MP50.8	±2	±2	about 0.26	about 0.26	0.24
HTFM-12.7C08-1064-MHG-MP	1064	ϕ12.7	>99.5	MHG-MP12.7	±3	±3	about 0.74	about 0.74	0.04
HTFM-25.4C08-1064-MHG-MP	1064	ϕ25.4	>99.5	MHG-MP25	±3	±3	about 0.39	about 0.39	0.12
HTFM-25.4C08-1064-MHG-HS	1064	ϕ25.4	>99.5	MHG-HS25	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-1064-MHG-MP	1064	ϕ30	>99.5	MHG-MP30	±3	±3	about 0.39	about 0.39	0.12
HTFM-30C08-1064-MHG-HS	1064	ϕ30	>99.5	MHG-HS30	±3	±3	about 0.39	about 0.39	0.12
HTFM-50C11-1064-MHG-MP	1064	ϕ50	>99.5	MHG-MP50	±2	±2	about 0.26	about 0.26	0.24
HTFM-50.8C11-1064-MHG-MP	1064	ϕ50.8	>99.5	MHG-MP50.8	±2	±2	about 0.26	about 0.26	0.24

Outline Drawing

(in mm)

HTFM-12.7C08-MHG-MP

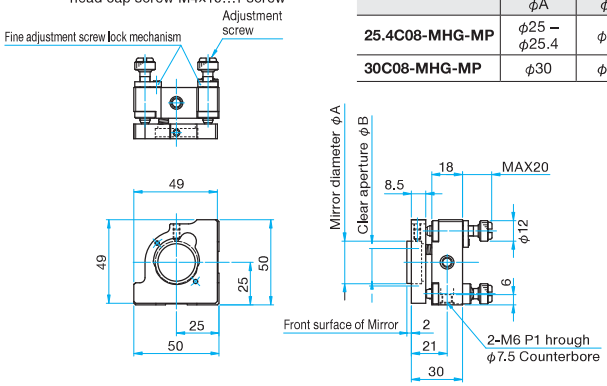
Hexagon socket head cap screw M4×6...1 screw



HTFM-25.4C08-MHG-MP
HTFM-30C08-MHG-MP

Hexagon socket head cap screw M4×10...1 screw

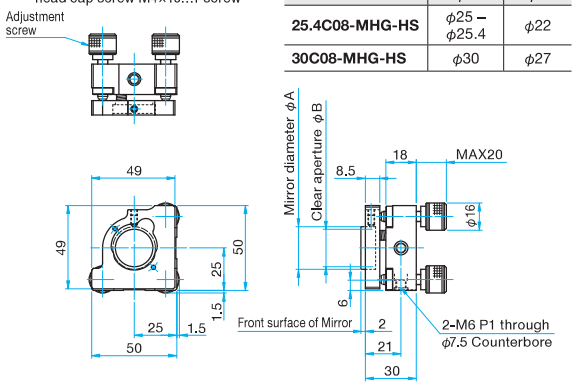
Part Number	Mirror diameter ϕA	Clear aperture ϕB
25.4C08-MHG-MP	ϕ25 – ϕ25.4	ϕ22
30C08-MHG-MP	ϕ30	ϕ27



HTFM-25.4C08-MHG-HS
HTFM-30C08-MHG-HS

Hexagon socket head cap screw M4×10...1 screw

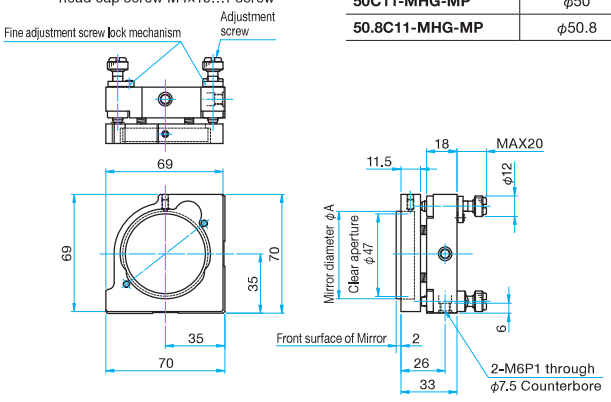
Part Number	Mirror diameter ϕA	Clear aperture ϕB
25.4C08-MHG-HS	ϕ25 – ϕ25.4	ϕ22
30C08-MHG-HS	ϕ30	ϕ27



HTFM-50C11-MHG-MP
HTFM-50.8C11-MHG-MP

Hexagon socket head cap screw M4×10...1 screw

Part Number	Mirror diameter ϕA
50C11-MHG-MP	ϕ50
50.8C11-MHG-MP	ϕ50.8



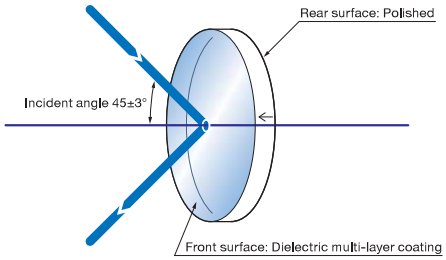
Dielectric Mirrors for High Power Laser | TFMHP

RoHS

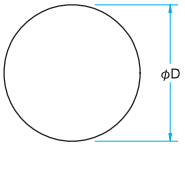
All dielectric coating designs are much more resistant to laser damage than typical mirrors and are suitable for use with high power laser systems.

- All Dielectric Mirrors for High Power Laser are manufactured using dielectric multi-layer coatings of alternating high and low index layers.
- The Mirrors are specifically designed for use at 45 degrees (AOI).
- All dielectric coating designs are much more resistant to laser damage than typical mirrors and are suitable for use with high power laser systems.
- Mirrors for YAG lasers are also available.

Schematic



Outline Drawing (in mm)



●Tolerance
Diameter ϕD$^{0}_{-0.1}$
Thickness t ±0.1

Specifications

Material	BK7
Coating	Dielectric multi-layer coating
Incident angle	45°±3°
Surface Flatness	λ/10
Parallelism	<3′
Surface Quality (Scratch–Dig)	10–5
Clear aperture	90% of Actual Aperture
Rear Surface	Polished

Guide

- Please consult our Sales Division for assistance in your selection and for customized products. (customized on outer diameter, wavelength characteristic, etc.) Please use the inquiry sheet. Reference B041
- Also available are our surface flatness guarantee (HTFM) mirrors with accuracy guarantee after surface coating. Reference B016

Attention

- Reflectance of dielectric mirrors will vary according to the polarization of the input beams.
- The un-coated rear surface of the mirror is polished and the arrow on the side of the substrate points towards the coated surface.
- Reflectance of laser line mirrors are different according to the polarization of input beams. S-polarization has the high reflectance and the wide reflective bandwidth compared with p-polarization. The reflectance in the specifications list is that of random polarization or (p-polarization reflectance + s-polarization reflectance) / 2.
- The reflectance curves are based on actual measurements and may vary with production lots.
- Be sure to wear laser safety goggles when checking optical path and adjusting optical axis.
- The surface flatness is the reflected surface wavefront distortion before coating.

Specifications

Part Number	Wavelength Range [nm]	Diameter ϕD [mm]	Thickness t [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm^2]
TFMHP-25.4C05-193	193	ϕ25.4	5	>95	2
TFMHP-30C05-193	193	ϕ30	5	>95	2
TFMHP-50C08-193	193	ϕ50	8	>95	2
TFMHP-25.4C05-248	248	ϕ25.4	5	>98	4
TFMHP-30C05-248	248	ϕ30	5	>98	4
TFMHP-50C08-248	248	ϕ50	8	>98	4
TFMHP-25.4C05-266	266	ϕ25.4	5	>98	5
TFMHP-30C05-266	266	ϕ30	5	>98	5
TFMHP-50C08-266	266	ϕ50	8	>98	5
TFMHP-25.4C05-355	355	ϕ25.4	5	>99	8
TFMHP-30C05-355	355	ϕ30	5	>99	8
TFMHP-50C08-355	355	ϕ50	8	>99	8
TFMHP-25.4C05-532	532	ϕ25.4	5	>99	26.5
TFMHP-30C05-532	532	ϕ30	5	>99	26.5
TFMHP-50C08-532	532	ϕ50	8	>99	26.5
TFMHP-25.4C05-1064	1064	ϕ25.4	5	>99	28
TFMHP-30C05-1064	1064	ϕ30	5	>99	28
TFMHP-50C08-1064	1064	ϕ50	8	>99	28

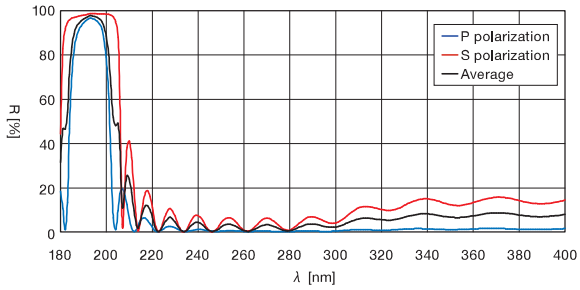
* Angle of incidence 0°, laser pulse width 10ns (TFMHP-193: 20ns), repetition frequency 20Hz

WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

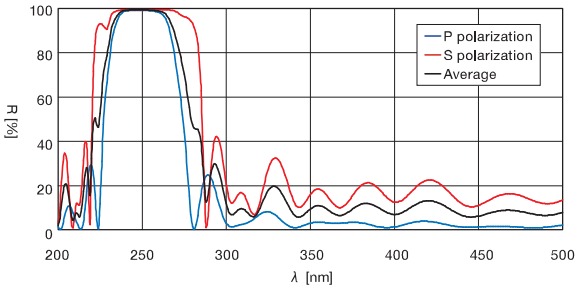
Typical Reflectance Data

R: Reflectance

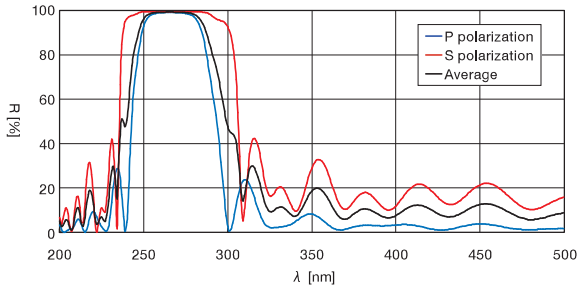
TFMHP-193



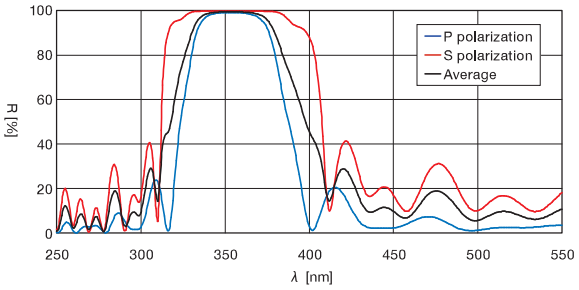
TFMHP-248



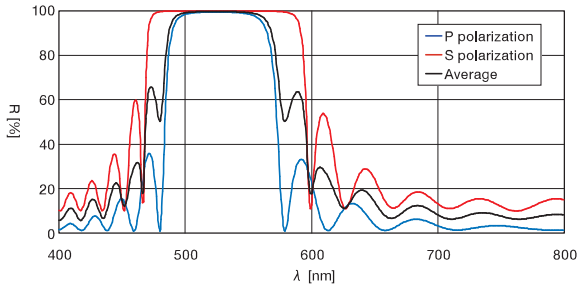
TFMHP-266



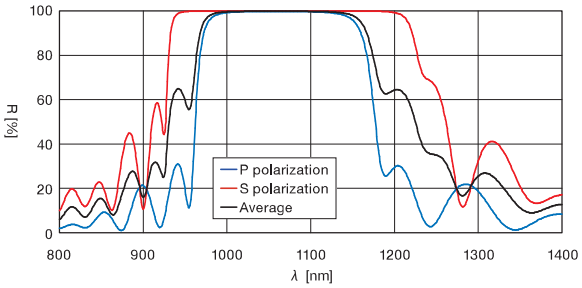
TFMHP-355



TFMHP-532



TFMHP-1064



Compatible Optic Mounts

MHG-HS25-NL, -HS30-NL / MHG-MP50-NL / MHAN-25.4S, -30S, -50S

Ultra Broadband Dielectric Mirrors | TFMS

RoHS

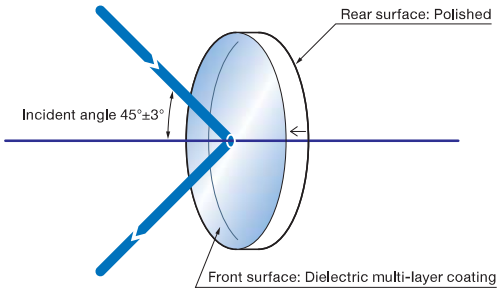
Ultra Broadband Dielectric Mirrors are manufactured using all dielectric multi-layer coatings of alternating high and low index layers. These are specifically designed for use at 45 degrees angle of incidence. The mirrors are offered for use in applications where high-reflection over a broad wavelength range is required.

- Visible, near infrared and multiple wavelengths are covered with a single mirror.
- These mirrors have many advantages over a metal mirror including very little deterioration with age and that it is durable and easy to clean and maintain.

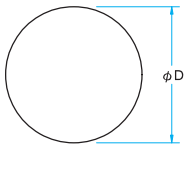
Specifications

Material	BK7
Coating	Dielectric multi-layer coating
Incident angle	45°±3°
Surface Flatness	λ/10
Parallelism	<3′
Surface Quality (Scratch–Dig)	40–20
Clear aperture	90% of Actual Aperture
Rear Surface	Polished

Schematic



Outline Drawing (in mm)



●Tolerance
Diameter $\phi D^{+0}_{-0.1}$
Thickness t ±0.1

Guide

- Please consult our Sales Division for assistance in your selection and for customized products. (customized on outer diameter, wavelength characteristic, etc.) Please use the inquiry sheet. Reference B041
- Also available are our surface flatness guarantee (HTFM) mirrors with accuracy guarantee after surface coating. Reference B016

Attention

- Reflectance of dielectric mirrors will vary according to the polarization of the input beams.
- The un-coated rear surface of the mirror is polished and the arrow on the side of the substrate points towards the coated surface. Reflectance of laser line mirrors are different according to the polarization of input beams. S-Polarization has high reflectance with a wide reflective bandwidth compared with P-Polarization.
- The reflectance specification listed is at random polarization or (P-Polarization reflectance + S-Polarization reflectance) / 2.

Specifications

Part Number	Wavelength Range [nm]	Diameter ϕD [mm]	Thickness t [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm²]
TFMS-25.4C05-2/4	245 – 400	ϕ25.4	5	> Average 97	0.5
TFMS-30C05-2/4	245 – 400	ϕ30	5	> Average 97	0.5
TFMS-25.4C05-2/7	245 – 700	ϕ25.4	5	> Average 97	0.5
TFMS-30C05-2/7	245 – 700	ϕ30	5	> Average 97	0.5
TFMS-25.4C05-4/11	400 – 1100	ϕ25.4	5	> Average 98	0.5
TFMS-30C05-4/11	400 – 1100	ϕ30	5	> Average 98	0.5
TFMS-50C08-4/11	400 – 1100	ϕ50	8	> Average 98	0.5
TFMS-25.4C05-4/20	400 – 2000	ϕ25.4	5	> Average 98	0.5
TFMS-30C05-4/20	400 – 2000	ϕ30	5	> Average 98	0.5
TFMS-50C08-4/20	400 – 2000	ϕ50	8	> Average 98	0.5
TFMS-25.4C05-3/20	300 – 2000	ϕ25.4	5	> Average 97	0.5
TFMS-30C05-3/20	300 – 2000	ϕ30	5	> Average 97	0.5
TFMS-50C08-3/20	300 – 2000	ϕ50	8	> Average 97	0.5

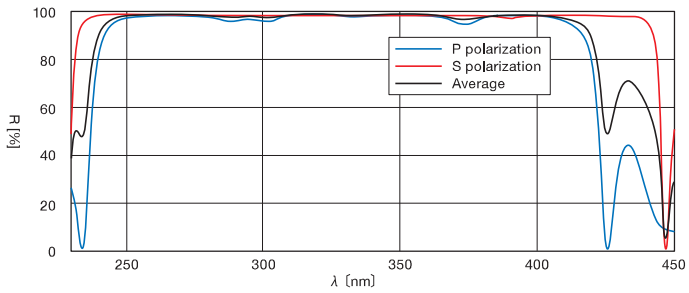
* Laser pulse width 10ns, wavelength 532nm, repetition frequency 20Hz

WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

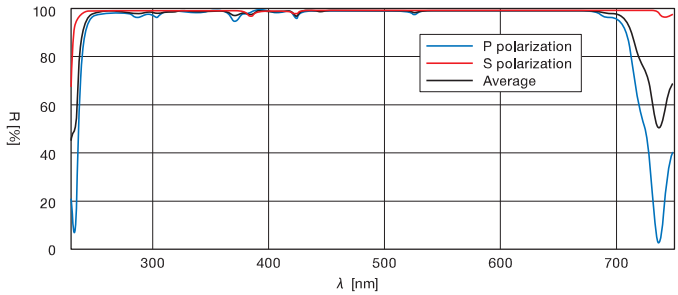
Typical Reflectance Data

R: Reflectance

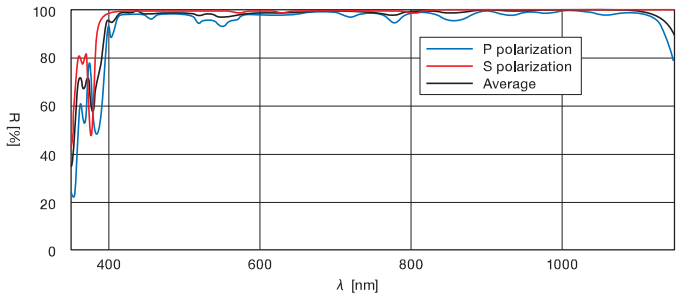
TFMS-2/4



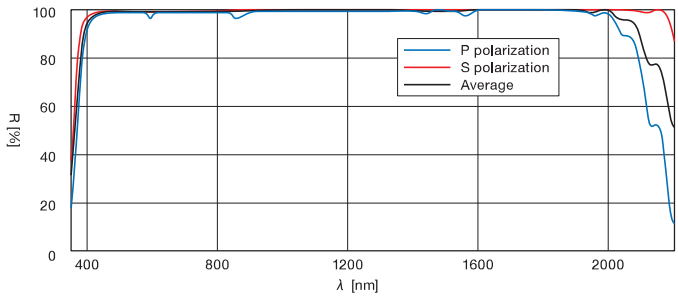
TFMS-2/7



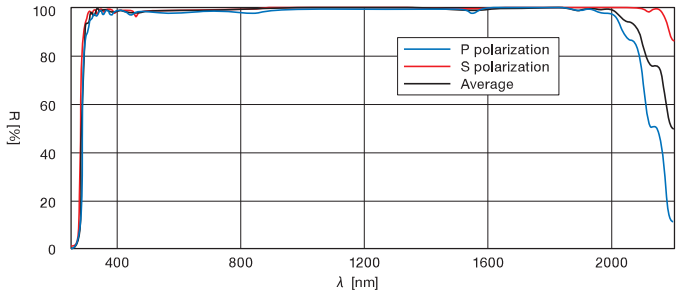
TFMS-4/11



TFMS-4/20



TFMS-3/20



Compatible Optic Mounts

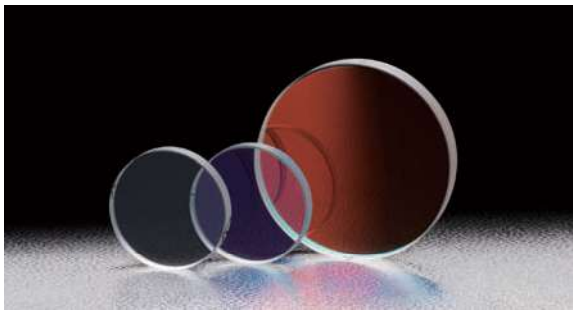
MHG-HS25-NL, -HS30-NL / MHG-MP50-NL / MHAN-25.4S, -30S, -50S

Laser Line Mirrors | TFM

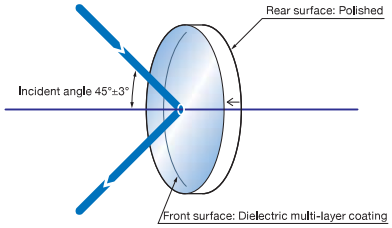
RoHS

These lasesr mirrors are designed for specific wavelength laser applications where low wavefront distortion, low scattering and high reflectivity are usually important. These narrowband reflectors are for several wavelengths and sizes.

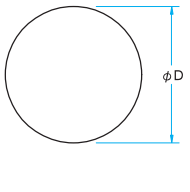
- Dielectric multi-layer coating does not have absorption like Aluminum coatings and provide higher than 99% reflectance except some mirrors for UV wavelength use are provide 95% reflectance.
- These coatings are much harder and provide higher laser damage threshold than Al+MgF2 coating.



Schematic



Outline Drawing (in mm)



●Tolerance
Diameter $\phi D^{+0}_{-0.1}$
Thickness t ±0.1

Specifications

Material	BK7 (CaF_2 crystal for TFM-157 only)
Coating	Dielectric multi-layer coating
Incident angle	45°±3°
Surface Flatness	λ/10, Polished (TFM-157)
Parallelism	<3′
Surface Quality (Scratch–Dig)	10–5 (TFM-157: 40–20)
Clear aperture	90% of Actual Aperture

Guide

- Please consult our Sales Division for assistance in your selection and for customized products. (customized on outer diameter, wavelength characteristic, etc.) Please use the inquiry sheet. Reference B041
- Also available are our surface flatness guarantee (HTFM) mirrors with accuracy guarantee after surface coating. Reference B016

Attention

- The un-coated rear surface of the mirror is polished and the arrow on the side of the substrate points towards the coated surface.
- Reflectance values of laser line mirrors are different according to the polarization of input beams. S-Polarization has high reflectance with a wide reflective bandwidth when compared to P-Polarization. The reflectance specification listed is at random polarization or (P-Polarization reflectance + S-Polarization reflectance) / 2.
- The reflectance curves are based on actual measurements and may be vary by production lots.
- Be sure to wear laser safety goggles when checking optical path and adjusting optical axis.
- The surface flatness is the reflected surface wavefront distortion before coating.

Laser Line Mirrors Narrowband

157 – 337.1nm

Part Number	Wavelength Range [nm]	Diameter ϕD [mm]	Thickness t [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm²]	Rear Surface
TFM-30C03-157	157	ϕ30	3	>95.0	0.5	Polished
TFM-50C05-157	157	ϕ50	5	>95.0	0.5	Polished
TFM-25.4C05-193	193	ϕ25.4	5	>95.0	0.8	Polished
TFM-30C05-193	193	ϕ30	5	>95.0	0.8	Polished
TFM-50C08-193	193	ϕ50	8	>95.0	0.8	Polished
TFM-25.4C05-248	248.4	ϕ25.4	5	>99.0	2	Polished
TFM-30C05-248	248.4	ϕ30	5	>99.0	2	Polished
TFM-50C08-248	248.4	ϕ50	8	>99.0	2	Polished
TFM-25.4C05-266	266	ϕ25.4	5	>99.2	2	Polished
TFM-30C05-266	266	ϕ30	5	>99.2	2	Polished
TFM-50C08-266	266	ϕ50	8	>99.2	2	Polished
TFM-25.4C05-282	281.8	ϕ25.4	5	>99.3	2	Polished
TFM-30C05-282	281.8	ϕ30	5	>99.3	2	Polished
TFM-50C08-282	281.8	ϕ50	8	>99.3	2	Polished
TFM-25.4C05-308	308	ϕ25.4	5	>99.5	3	Polished
TFM-30C05-308	308	ϕ30	5	>99.5	3	Polished
TFM-50C08-308	308	ϕ50	8	>99.5	3	Polished
TFM-25.4C05-325/337	325 – 337	ϕ25.4	5	>99.5	3	Polished
TFM-30C05-325/337	325 – 337	ϕ30	5	>99.5	3	Polished
TFM-50C08-325/337	325 – 337	ϕ50	8	>99.5	3	Polished

* Laser pulse width 10ns (TFM-157, TFM-193: 20ns), repetition frequency 20Hz

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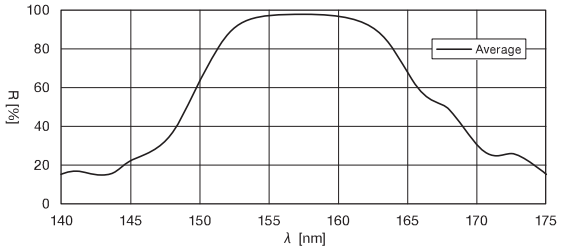
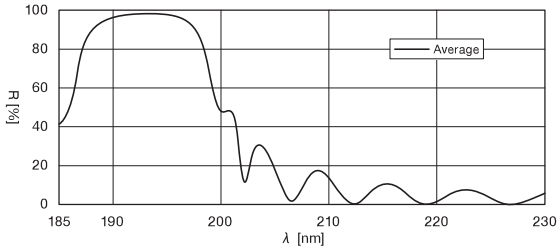
Typical Reflectance Data ... Laser Line Mirrors Narrowband

R: Reflectance

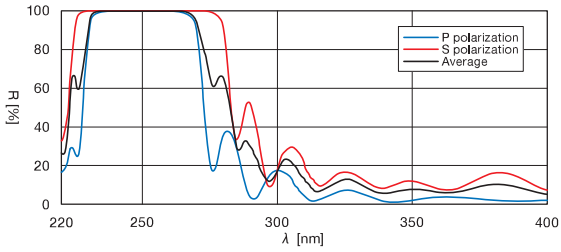
TFM-157



TFM-193

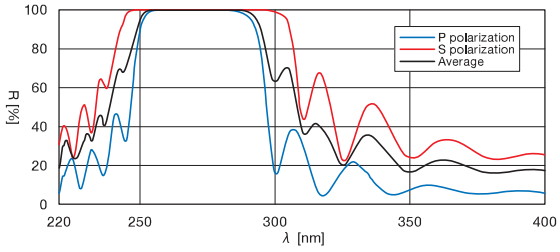


TFM-248



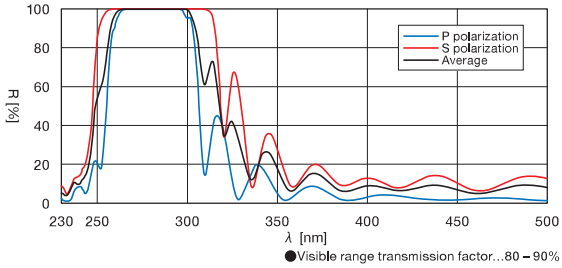
●Visible range transmission factor...80 – 90%

TFM-266



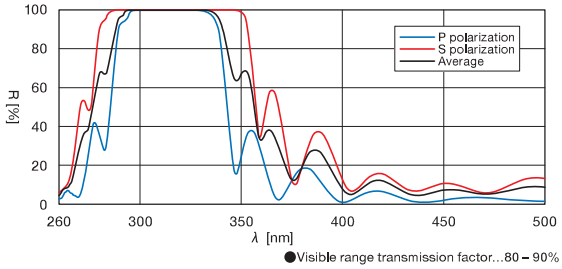
●Visible range transmission factor...80 – 90%

TFM-282



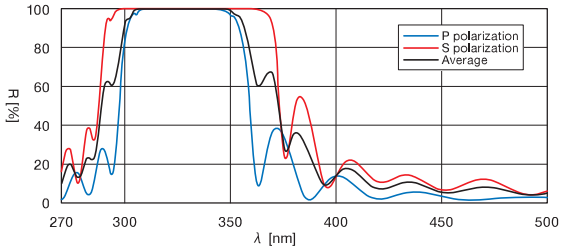
●Visible range transmission factor...80 – 90%

TFM-308



●Visible range transmission factor...80 – 90%

TFM-325/337



●Visible range transmission factor...80 – 90%

Compatible Optic Mounts

MHG-MP12.7-NL / MHG-HS25-NL, -HS30-NL / MHG-MP50-NL ,- MP50.8-NL

Laser Line Mirrors | TFM

Laser Line Mirrors Narrowband

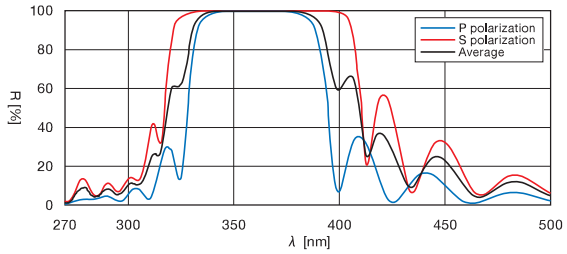
352 – 1064nm

Part Number	Wavelength Range [nm]	Diameter D [mm]	Thickness t [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm^2]	Rear Surface
TFM-25.4C05-352/355	352 – 355	ϕ25.4	5	>99.5	5	Polished
TFM-30C05-352/355	352 – 355	ϕ30	5	>99.5	5	Polished
TFM-50C08-352/355	352 – 355	ϕ50	8	>99.5	5	Polished
TFM-12.7C05-532	532	ϕ12.7	5	>99.5	8	Ground
TFM-25C05-532	532	ϕ25	5	>99.5	8	Polished
TFM-25.4C05-532	532	ϕ25.4	5	>99.5	8	Polished
TFM-30C05-532	532	ϕ30	5	>99.5	8	Polished
TFM-40C06-532	532	ϕ40	6	>99.5	8	Polished
TFM-50C08-532	532	ϕ50	8	>99.5	8	Polished
TFM-50.8C08-532	532	ϕ50.8	8	>99.5	8	Polished
TFM-12.7C05-1064	1064	ϕ12.7	5	>99.5	20	Ground
TFM-25.4C05-1064	1064	ϕ25.4	5	>99.5	20	Polished
TFM-30C05-1064	1064	ϕ30	5	>99.5	20	Polished
TFM-40C06-1064	1064	ϕ40	6	>99.5	20	Polished
TFM-50C08-1064	1064	ϕ50	8	>99.5	20	Polished
TFM-50.8C08-1064	1064	ϕ50.8	8	>99.5	20	Polished

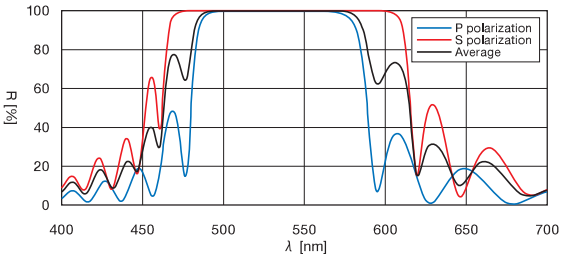
* Laser pulse width 10ns, repetition frequency 20Hz

Typical Reflectance Data ... Laser Line Mirrors Narrowband R: Reflectance

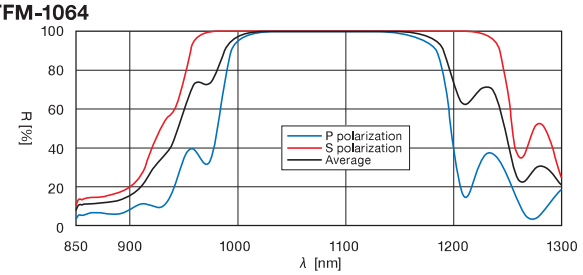
TFM-352/355



TFM-532



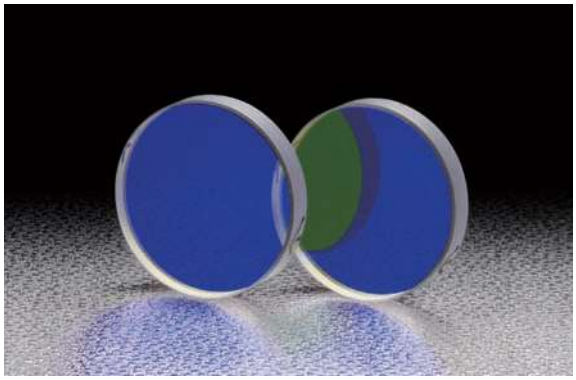
TFM-1064



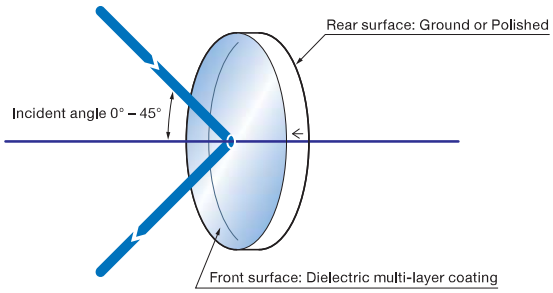
0-45° Wide Angle Dielectric Mirrors | TFVM

You can use the 0-45° Wide Angle Dielectric Mirrors for an optical system for reciprocating the light between two mirrors or Michelson interferometer, if you want to use a mirror at an incident angle of 45 ° or less. When used at 45 degree and 0 degree incidence angle, one mirror can be shared to obtain high reflectivity.

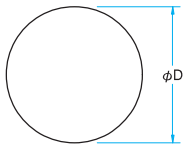
- Very high reflectivity can be obtained between 0 degree to 45 degree angle of incidence.
- If used at a fixed angle of incidence, it can also be used as a broadband mirror. For example, if TFVM-800 is used in a 45 degree incident, reflectance of 99% or more can be obtained in the range of 730nm to 900nm.
- Since there is no absorption in the coating there will be very little change in the performance over time and the mirror is durable even with continuous laser irradiation.



Schematic



Outline Drawing (in mm)



●Tolerance
Diameter $\phi D^{0}_{-0.1}$
Thickness t ±0.1

Specifications

Material	BK7
Coating	Dielectric multi-layer coating
Incident angle	0° – 45°
Surface Flatness	λ/10
Parallelism	<3′
Surface Quality (Scratch–Dig)	10–5
Clear aperture	90% of Actual Aperture

Guide

- Please consult our Sales Division for assistance in your selection and for customized products. (customized on outer diameter, wavelength characteristic, etc.) Please use the inquiry sheet. Reference B041
- This mirror is also available as a "HTFM mirror" which provides guaranteed surface accuracy after coating. Reference B016

Attention

- Reflectance wavelength characteristics of dielectric multilayer coating vary depending on the polarization state of the incident beam. Reflectance of P-polarized light is lower than that of the S-polarized light, and the reflection range will also be narrower.
- When used not in adaptive wavelength, reflectance may be lower.
- If a mirror is used other than normal incidence, wavelength reflectance characteristics also vary depending on the polarization condition.
- The reflectance characteristics of the 45 degree angle of incidence listed are the average value of the reflectance of P-polarized light and S-polarized light.

400 – 700nm

Part Number	Wavelength Range [nm]	Diameter ϕD [mm]	Thickness t [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm²]	Rear Surface
TFVM-15C03-405	405	ϕ15	3	>99	0.5	Ground
TFVM-25.4C05-405	405	ϕ25.4	5	>99	0.5	Polished
TFVM-30C05-405	405	ϕ30	5	>99	0.5	Polished
TFVM-50C08-405	405	ϕ50	8	>99	0.5	Polished
TFVM-25.4C05-532	532	ϕ25.4	5	>99	8	Polished
TFVM-30C05-532	532	ϕ30	5	>99	8	Polished
TFVM-50C08-532	532	ϕ50	8	>99	8	Polished
TFVM-10C03-VIS	400 – 700	ϕ10	3	>99	0.5	Ground
TFVM-15C03-VIS	400 – 700	ϕ15	3	>99	0.5	Ground
TFVM-15C05-VIS	400 – 700	ϕ15	5	>99	0.5	Ground
TFVM-20C03-VIS	400 – 700	ϕ20	3	>99	0.5	Ground
TFVM-20C05-VIS	400 – 700	ϕ20	5	>99	0.5	Ground
TFVM-25C05-VIS	400 – 700	ϕ25	5	>99	0.5	Polished
TFVM-25.4C05-VIS	400 – 700	ϕ25.4	5	>99	0.5	Polished
TFVM-30C05-VIS	400 – 700	ϕ30	5	>99	0.5	Polished
TFVM-40C06-VIS	400 – 700	ϕ40	6	>99	0.5	Polished
TFVM-50C08-VIS	400 – 700	ϕ50	8	>99	0.5	Polished

* Laser pulse width 10ns, repetition frequency 20Hz

0-45° Wide Angle Dielectric Mirrors | TFVM

780 – 1550nm

Part Number	Wavelength Range [nm]	Diameter ϕD [mm]	Thickness t [mm]	Reflectance [%]	Laser Damage Threshold* [J/cm²]	Rear Surface
TFVM-10C03-800	780 – 830	ϕ10	3	>99	0.5	Ground
TFVM-15C03-800	780 – 830	ϕ15	3	>99	0.5	Ground
TFVM-15C05-800	780 – 830	ϕ15	5	>99	0.5	Ground
TFVM-20C03-800	780 – 830	ϕ20	3	>99	0.5	Ground
TFVM-20C05-800	780 – 830	ϕ20	5	>99	0.5	Ground
TFVM-25C05-800	780 – 830	ϕ25	5	>99	0.5	Polished
TFVM-25.4C05-800	780 – 830	ϕ25.4	5	>99	0.5	Polished
TFVM-30C05-800	780 – 830	ϕ30	5	>99	0.5	Polished
TFVM-40C06-800	780 – 830	ϕ40	6	>99	0.5	Polished
TFVM-50C08-800	780 – 830	ϕ50	8	>99	0.5	Polished
TFVM-25.4C05-1064	1064	ϕ25.4	5	>99	20	Polished
TFVM-30C05-1064	1064	ϕ30	5	>99	20	Polished
TFVM-50C08-1064	1064	ϕ50	8	>99	20	Polished
TFVM-15C03-1300	1300	ϕ15	3	>99	1	Ground
TFVM-25.4C05-1300	1300	ϕ25.4	5	>99	1	Polished
TFVM-30C05-1300	1300	ϕ30	5	>99	1	Polished
TFVM-15C03-1550	1550	ϕ15	3	>99	1	Ground
TFVM-25.4C05-1550	1550	ϕ25.4	5	>99	1	Polished
TFVM-30C05-1550	1550	ϕ30	5	>99	1	Polished

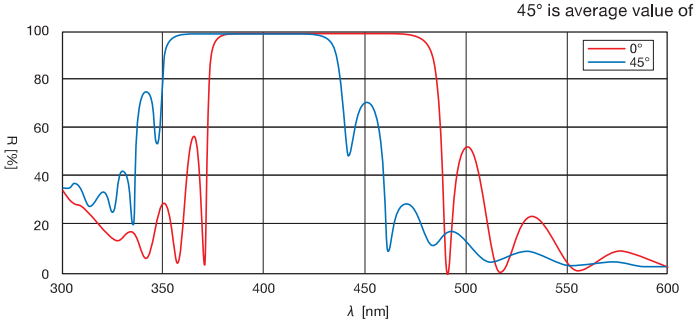
* Laser pulse width 10ns, repetition frequency 20Hz

Typical Reflectance Data

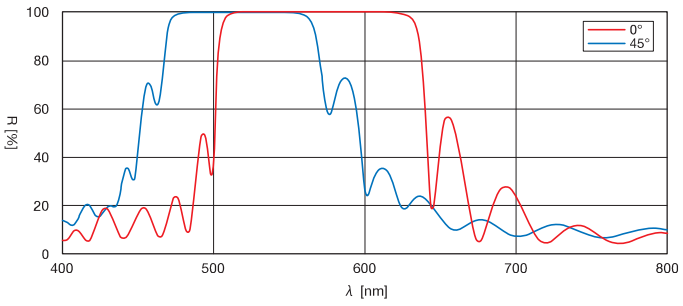
R: Reflectance

45° is average value of P polarization and S polarization

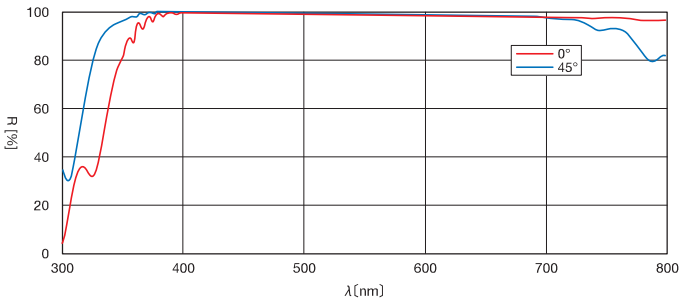
TFVM-405



TFVM-532



TFVM-VIS

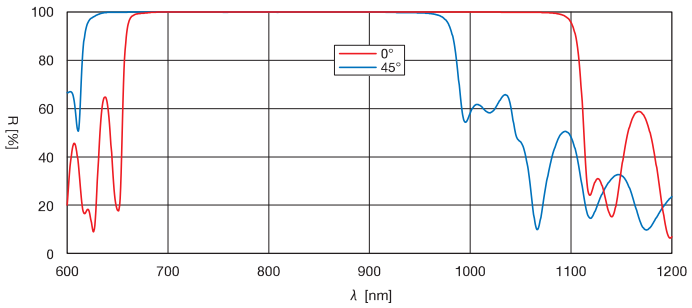


Typical Reflectance Data

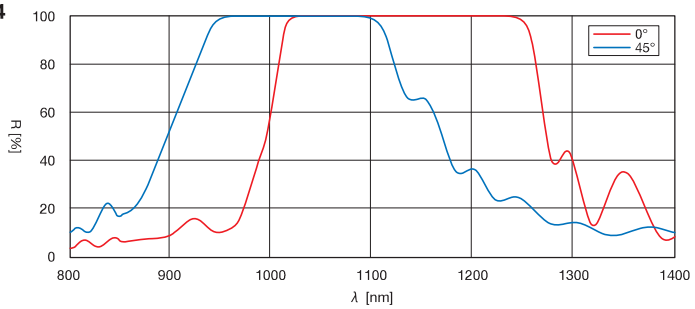
R: Reflectance

45° is average value of P polarization and S polarization

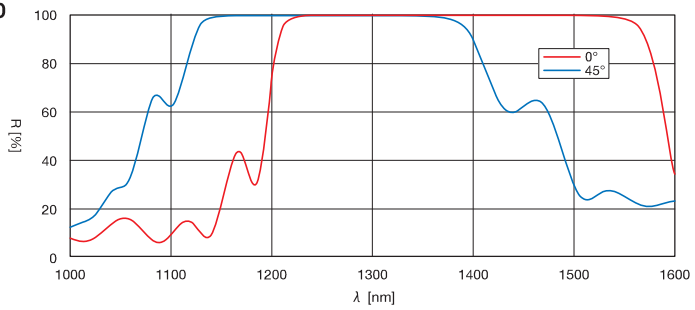
TFVM-800



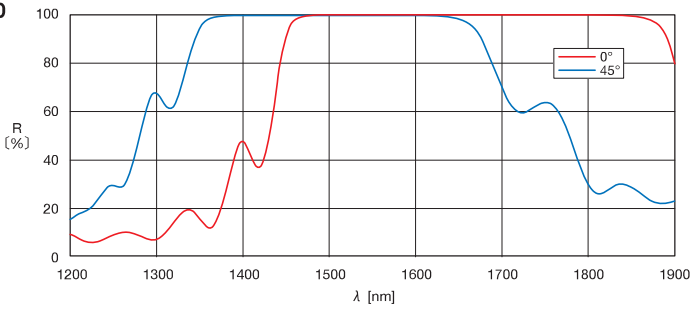
TFVM-1064



TFVM-1300



TFVM-1550



Compatible Optic Mounts

MHG-MP30-NL / MHG-MP50-NL / BSHL-15-2

Aluminum Mirrors | TFA/TFAN/TFAQ/TFAQN/TFAE/OPBA/OPSQA

RoHS

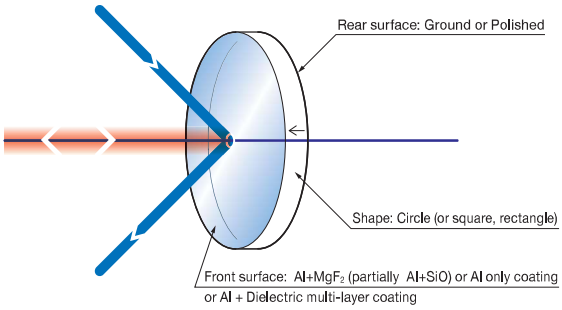
This is a vapor-deposited aluminium flat mirror with the substrate polished with high accuracy, designed for high reflectivity at any incident angle.

- With four types to choose from; (TFAN/TFAQN) which is coated with aluminium only, (TFA/TFAQ) which is coated with a protective coating against accidental hard scratches, (TFAE) which is coated aluminium and a protective coating to increase the reflectance of ultraviolet and lastly, (OPBA/OPSQA) which provides Aluminum with protective coat on the optical parallel substrate.
- For ultraviolet, visible and near-infrared light applications.
- For low thermal expansion mirrors, we have (TFAQ/TFAQN) which is made of Synthetic fused silica that provides high rigidity and high precision surface quality.

Specifications

Material	BK7 Synthetic fused silica Hard glass (Pyrex® etc.)
Coating	TFAN/TFAQN: Al (without protection coating) TFA/TFAQ/OPBA/OPSQA: Al+MgF_2 (surface flatness $\lambda/20$ is Al+SiO) TFAE: Al + Dielectric multi-layer coating
Parallelism	TFA/TFAN/TFAQ/TFAQN/TFAE: <3′ OPBA/OPSQA: <2″
Incident angle	TFA/TFAQ/TFAE: 45° OPBA/OPSQA: 0°
Laser Damage Threshold	0.25J/cm^2 (pulse width 10ns, repetition frequency 20Hz)
Surface Quality (Scratch–Dig)	40–20
Clear aperture	90% of actual aperture or circle or ellipse that contacts 90% square of dimension

Schematic



Guide

- If you need a higher reflectance aluminium mirror, please kindly contact us.
- Should you require a surface accuracy analysis/data, please kindly contact our sales group.
- For non-standard sizes other than those listed in the product table, please kindly contact us.
- Pyrex® is a registered trademark of Corning Inc.

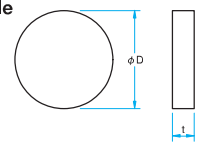
Attention

- For aluminium mirrors without a protective film, (TFAN/TFAQN) handle carfully as they can be easily scratched oxidation builds up in the surface. Do not rub the surface with paper or cloth as this will harm the surface. For long term storage, use a de-oxidizer to prevent the oxidation.
- When a laser light is transmitted with multiple mirrors installed there will be a large amount of light loss due to the absorption of the aluminium coating. Please consider using dielectric multi-layer mirrors (TFM) for improved performance.
- The reflectance specification are represented by the average of the reflectance of P polarized light and S polarized light. Reflectance may vary depending on the polarization state of the incident beam.

Outline Drawing

(in mm)

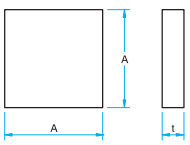
●Circle



●Tolerance

ϕD≦ϕ50		ϕ60≦ϕD	
Diameter	$\phi D^{0}_{-0.1}$	Diameter	$\phi D^{0}_{-0.2}$
Thickness	t ±0.1	Thickness	t ±0.2

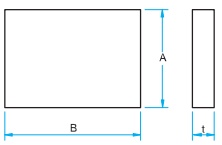
●Square



●Tolerance

A≦50		60≦A	
Length	$A^{0}_{-0.1}$	Length	$A^{0}_{-0.2}$
Thickness	t ±0.1	Thickness	t ±0.2

●Rectangle



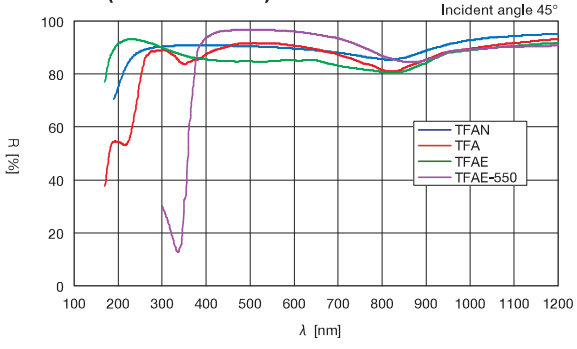
●Tolerance

A×B≦40×50		50×60≦A×B	
Length	$A{\cdot}B^{0}_{-0.1}$	Length	$A{\cdot}B^{0}_{-0.2}$
Thickness	t ±0.1	Thickness	t ±0.2

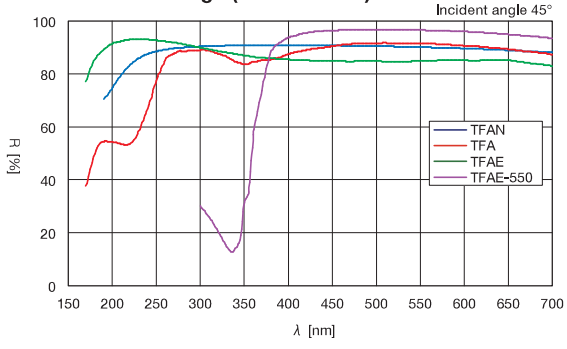
Typical Reflectance Data

R: Reflectance

Wide Band (1000 – 1200nm)



Ultraviolet-visible range (150 – 700nm)



WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

Circle

Al+MgF_2 (partially Al+SiO) Part Number	Al only Part Number	Diameter ϕD [mm]	Thickness t [mm]	Material	Surface Flatness	Rear Surface
TFA-10C03-4	—	ϕ10	3	BK7	λ/4	Ground
TFA-10C03-10	TFAN-10C03-10	ϕ10	3	BK7	λ/10	Ground
TFA-10C05-10	TFAN-10C05-10	ϕ10	5	BK7	λ/10	Ground
TFA-10C05-20	TFAN-10C05-20	ϕ10	5	BK7	λ/20	Ground
TFAQ-10C06-20	TFAQN-10C06-20	ϕ10	6	Synthetic Fused Silica	λ/20	Ground
TFA-12.7C05-4	—	ϕ12.7	5	BK7	λ/4	Ground
TFA-12.7C05-10	—	ϕ12.7	5	BK7	λ/10	Ground
TFAQ-12.7C06-20	—	ϕ12.7	6	Synthetic Fused Silica	λ/20	Ground
TFA-15C03-10	TFAN-15C03-10	ϕ15	3	BK7	λ/10	Ground
TFA-15C05-10	TFAN-15C05-10	ϕ15	5	BK7	λ/10	Ground
TFA-15C05-20	TFAN-15C05-20	ϕ15	5	BK7	λ/20	Ground
TFAQ-15C06-20	TFAQN-15C06-20	ϕ15	6	Synthetic Fused Silica	λ/20	Ground
TFA-20C03-10	TFAN-20C03-10	ϕ20	3	BK7	λ/10	Ground
TFA-20C05-4	TFAN-20C05-4	ϕ20	5	BK7	λ/4	Ground
TFA-20C05-10	TFAN-20C05-10	ϕ20	5	BK7	λ/10	Ground
TFA-20C05-20	TFAN-20C05-20	ϕ20	5	BK7	λ/20	Ground
TFAQ-20C06-20	TFAQN-20C06-20	ϕ20	6	Synthetic Fused Silica	λ/20	Ground
TFA-25C05-1	TFAN-25C05-1	ϕ25	5	BK7	λ	Polished
TFA-25C05-4	TFAN-25C05-4	ϕ25	5	BK7	λ/4	Polished
TFA-25C05-10	TFAN-25C05-10	ϕ25	5	BK7	λ/10	Polished
TFA-25C05-20	TFAN-25C05-20	ϕ25	5	BK7	λ/20	Polished
TFAQ-25C06-20	TFAQN-25C06-20	ϕ25	6	Synthetic Fused Silica	λ/20	Polished
TFA-25.4C05-4	—	ϕ25.4	5	BK7	λ/4	Polished
TFA-25.4C05-10	TFAN-25.4C05-10	ϕ25.4	5	BK7	λ/10	Polished
TFAQ-25.4C06-20	—	ϕ25.4	6	Synthetic Fused Silica	λ/20	Polished
TFA-30C05-1	TFAN-30C05-1	ϕ30	5	BK7	λ	Polished
TFA-30C05-4	TFAN-30C05-4	ϕ30	5	BK7	λ/4	Polished
TFA-30C05-10	TFAN-30C05-10	ϕ30	5	BK7	λ/10	Polished
TFA-30C05-20	TFAN-30C05-20	ϕ30	5	BK7	λ/20	Polished
TFAQ-30C06-20	TFAQN-30C06-20	ϕ30	6	Synthetic Fused Silica	λ/20	Polished
TFA-40C06-1	TFAN-40C06-1	ϕ40	6	BK7	λ	Polished
TFA-40C06-4	TFAN-40C06-4	ϕ40	6	BK7	λ/4	Polished
TFA-40C06-10	TFAN-40C06-10	ϕ40	6	BK7	λ/10	Polished
TFA-40C06-20	TFAN-40C06-20	ϕ40	6	BK7	λ/20	Polished
TFAQ-40C08-20	TFAQN-40C08-20	ϕ40	8	Synthetic Fused Silica	λ/20	Polished
TFA-50C08-1	TFAN-50C08-1	ϕ50	8	BK7	λ	Polished
TFA-50C08-4	TFAN-50C08-4	ϕ50	8	BK7	λ/4	Polished
TFA-50C08-10	TFAN-50C08-10	ϕ50	8	BK7	λ/10	Polished
TFA-50C08-20	TFAN-50C08-20	ϕ50	8	BK7	λ/20	Polished
TFAQ-50C10-20	TFAQN-50C10-20	ϕ50	10	Synthetic Fused Silica	λ/20	Polished
TFA-50.8C08-10	—	ϕ50.8	8	BK7	λ/10	Polished
TFA-60C10-1	TFAN-60C10-1	ϕ60	10	Hard glass	λ	Polished
TFA-60C10-4	TFAN-60C10-4	ϕ60	10	Hard glass	λ/4	Polished
TFA-60C10-10	TFAN-60C10-10	ϕ60	10	Hard glass	λ/10	Polished
TFA-60C10-20	TFAN-60C10-20	ϕ60	10	Hard glass	λ/20	Polished
TFA-80C12-1	TFAN-80C12-1	ϕ80	12	Hard glass	λ	Polished
TFA-80C12-4	TFAN-80C12-4	ϕ80	12	Hard glass	λ/4	Polished
TFA-80C12-10	TFAN-80C12-10	ϕ80	12	Hard glass	λ/10	Polished
TFA-80C12-20	TFAN-80C12-20	ϕ80	12	Hard glass	λ/20	Polished
TFA-100C15-1	TFAN-100C15-1	ϕ100	15	Hard glass	λ	Polished
TFA-100C15-4	TFAN-100C15-4	ϕ100	15	Hard glass	λ/4	Polished
TFA-100C15-10	TFAN-100C15-10	ϕ100	15	Hard glass	λ/10	Polished
TFA-130C18-1	TFAN-130C18-1	ϕ130	18	Hard glass	λ	Polished
TFA-130C18-4	TFAN-130C18-4	ϕ130	18	Hard glass	λ/4	Polished
TFA-130C18-10	TFAN-130C18-10	ϕ130	18	Hard glass	λ/10	Polished
TFA-150C20-1	TFAN-150C20-1	ϕ150	20	Hard glass	λ	Polished
TFA-150C20-4	TFAN-150C20-4	ϕ150	20	Hard glass	λ/4	Polished
TFA-150C20-10	TFAN-150C20-10	ϕ150	20	Hard glass	λ/10	Polished

Compatible Optic Mounts

MHG-MP12.7-NL / MHG-HS25-NL, -HS30-NL / MHG-MP50-NL,-MP50.8-NL / MAD-30-10 + MHL-30S / BSHL-15-2 / MHF-20
MHAN-40S, -60S / MHA-80S, -100AS, -130AS, -150S

Aluminum Mirrors | TFA/TFAN/TFAQ/TFAQN/TFAE/OPBA/OPSQA RoHS

Catalog Code W3405

UV Enhanced Aluminum Flat Mirrors

Part Number	Wavelength Range [nm]	Reflectance [%]	Diameter ϕD [mm]	Tickness t [mm]	Material	Surface Flatness	Rear Surface
TFAE-12.7C05-10	170 – 400	> average 85	ϕ12.7	5	BK7	λ/10	Ground
TFAE-25.4C05-10	170 – 400	> average 85	ϕ25.4	5	BK7	λ/10	Polished
TFAE-30C05-10	170 – 400	> average 85	ϕ30	5	BK7	λ/10	Polished
TFAE-50C08-10	170 – 400	> average 85	ϕ50	8	BK7	λ/10	Polished
TFAE-12.7C05-10-550	400 – 700	> average 94	ϕ12.7	5	BK7	λ/10	Ground
TFAE-25.4C05-10-550	400 – 700	> average 94	ϕ25.4	5	BK7	λ/10	Polished
TFAE-30C05-10-550	400 – 700	> average 94	ϕ30	5	BK7	λ/10	Polished

Catalog Code W3403

Square

Al+MgF_2 (partially Al+SiO) Part Number	Al only Part Number	Length A [mm]	Thickness t [mm]	Material	Surface Flatness	Rear Surface
TFA-10S03-10	TFAN-10S03-10	□10	3	BK7	λ/10	Ground
TFA-10S05-10	TFAN-10S05-10	□10	5	BK7	λ/10	Ground
TFA-10S05-20	TFAN-10S05-20	□10	5	BK7	λ/20	Ground
TFAQ-10S06-20	TFAQN-10S06-20	□10	6	Synthetic fused silica	λ/20	Ground
TFA-12.7S03-4	—	□12.7	3	BK7	λ/4	Ground
TFA-12.7S03-10	—	□12.7	3	BK7	λ/10	Ground
TFA-15S03-4	TFAN-15S03-4	□15	3	BK7	λ/4	Ground
TFA-15S03-10	TFAN-15S03-10	□15	3	BK7	λ/10	Ground
TFA-15S05-4	TFAN-15S05-4	□15	5	BK7	λ/4	Ground
TFA-15S05-10	TFAN-15S05-10	□15	5	BK7	λ/10	Ground
TFA-15S05-20	TFAN-15S05-20	□15	5	BK7	λ/20	Ground
TFAQ-15S06-20	TFAQN-15S06-20	□15	6	Synthetic fused silica	λ/20	Ground
TFA-20S03-4	TFAN-20S03-4	□20	3	BK7	λ/4	Ground
TFA-20S03-10	TFAN-20S03-10	□20	3	BK7	λ/10	Ground
TFA-20S05-4	TFAN-20S05-4	□20	5	BK7	λ/4	Ground
TFA-20S05-10	TFAN-20S05-10	□20	5	BK7	λ/10	Ground
TFA-20S05-20	TFAN-20S05-20	□20	5	BK7	λ/20	Ground
TFAQ-20S06-20	TFAQN-20S06-20	□20	6	Synthetic fused silica	λ/20	Ground
TFA-25S05-1	TFAN-25S05-1	□25	5	BK7	λ	Ground
TFA-25S05-4	TFAN-25S05-4	□25	5	BK7	λ/4	Ground
TFA-25S05-10	TFAN-25S05-10	□25	5	BK7	λ/10	Ground
TFA-25S05-20	TFAN-25S05-20	□25	5	BK7	λ/20	Ground
TFAQ-25S06-20	TFAQN-25S06-20	□25	6	Synthetic fused silica	λ/20	Ground
TFA-30S05-1	TFAN-30S05-1	□30	5	BK7	λ	Ground
TFA-30S05-4	TFAN-30S05-4	□30	5	BK7	λ/4	Ground
TFA-30S05-10	TFAN-30S05-10	□30	5	BK7	λ/10	Ground
TFA-30S05-20	TFAN-30S05-20	□30	5	BK7	λ/20	Ground
TFAQ-30S06-20	TFAQN-30S06-20	□30	6	Synthetic fused silica	λ/20	Ground
TFA-40S06-1	TFAN-40S06-1	□40	6	Hard glass	λ	Polished
TFA-40S06-4	TFAN-40S06-4	□40	6	Hard glass	λ/4	Polished
TFA-40S06-10	TFAN-40S06-10	□40	6	Hard glass	λ/10	Polished
TFA-40S06-20	TFAN-40S06-20	□40	6	Hard glass	λ/20	Polished
TFA-50S08-1	TFAN-50S08-1	□50	8	Hard glass	λ	Polished
TFA-50S08-4	TFAN-50S08-4	□50	8	Hard glass	λ/4	Polished
TFA-50S08-10	TFAN-50S08-10	□50	8	Hard glass	λ/10	Polished
TFA-50S08-20	TFAN-50S08-20	□50	8	Hard glass	λ/20	Polished
TFA-60S10-1	TFAN-60S10-1	□60	10	Hard glass	λ	Polished
TFA-60S10-4	TFAN-60S10-4	□60	10	Hard glass	λ/4	Polished
TFA-60S10-10	TFAN-60S10-10	□60	10	Hard glass	λ/10	Polished
TFA-60S10-20	TFAN-60S10-20	□60	10	Hard glass	λ/20	Polished
TFA-80S12-1	TFAN-80S12-1	□80	12	Hard glass	λ	Polished
TFA-80S12-4	TFAN-80S12-4	□80	12	Hard glass	λ/4	Polished
TFA-80S12-10	TFAN-80S12-10	□80	12	Hard glass	λ/10	Polished
TFA-80S12-20	TFAN-80S12-20	□80	12	Hard glass	λ/20	Polished
TFA-100S15-1	TFAN-100S15-1	□100	15	Hard glass	λ	Polished
TFA-100S15-4	TFAN-100S15-4	□100	15	Hard glass	λ/4	Polished
TFA-100S15-10	TFAN-100S15-10	□100	15	Hard glass	λ/10	Polished
TFA-130S18-1	TFAN-130S18-1	□130	18	Hard glass	λ	Polished
TFA-130S18-4	TFAN-130S18-4	□130	18	Hard glass	λ/4	Polished
TFA-130S18-10	TFAN-130S18-10	□130	18	Hard glass	λ/10	Polished
TFA-150S20-1	TFAN-150S20-1	□150	20	Hard glass	λ	Polished
TFA-150S20-4	TFAN-150S20-4	□150	20	Hard glass	λ/4	Polished
TFA-150S20-10	TFAN-150S20-10	□150	20	Hard glass	λ/10	Polished

Compatible Optic Mounts

CHA-25, -60, -130 / LHA-150

Catalog Code W3404

Rectangle

Al+MgF_2 (partially Al+SiO) Part Number	Al only Part Number	Length A×B [mm]	Thickness t [mm]	Material	Surface Flatness	Rear Surface
TFA-1015R03-4	TFAN-1015R03-4	10×15	3	BK7	λ/4	Ground
TFA-1015R03-10	TFAN-1015R03-10	10×15	3	BK7	λ/10	Ground
TFA-1015R05-4	TFAN-1015R05-4	10×15	5	BK7	λ/4	Ground
TFA-1015R05-10	TFAN-1015R05-10	10×15	5	BK7	λ/10	Ground
TFA-1015R05-20	TFAN-1015R05-20	10×15	5	BK7	λ/20	Ground
TFAQ-1015R06-20	TFAQN-1015R06-20	10×15	6	Synthetic fused silica	λ/20	Ground
TFA-1525R03-4	TFAN-1525R03-4	15×25	3	BK7	λ/4	Ground
TFA-1525R03-10	TFAN-1525R03-10	15×25	3	BK7	λ/10	Ground
TFA-1525R05-4	TFAN-1525R05-4	15×25	5	BK7	λ/4	Ground
TFA-1525R05-10	TFAN-1525R05-10	15×25	5	BK7	λ/10	Ground
TFA-1525R05-20	TFAN-1525R05-20	15×25	5	BK7	λ/20	Ground
TFAQ-1525R06-20	TFAQN-1525R06-20	15×25	6	Synthetic fused silica	λ/20	Ground
TFA-2030R05-1	TFAN-2030R05-1	20×30	5	BK7	λ	Ground
TFA-2030R05-4	TFAN-2030R05-4	20×30	5	BK7	λ/4	Ground
TFA-2030R05-10	TFAN-2030R05-10	20×30	5	BK7	λ/10	Ground
TFA-2030R05-20	TFAN-2030R05-20	20×30	5	BK7	λ/20	Ground
TFAQ-2030R06-20	TFAQN-2030R06-20	20×30	6	Synthetic fused silica	λ/20	Ground
TFA-2535R05-1	TFAN-2535R05-1	25×35	5	BK7	λ	Ground
TFA-2535R05-4	TFAN-2535R05-4	25×35	5	BK7	λ/4	Ground
TFA-2535R05-10	TFAN-2535R05-10	25×35	5	BK7	λ/10	Ground
TFA-2535R05-20	TFAN-2535R05-20	25×35	5	BK7	λ/20	Ground
TFAQ-2535R06-20	TFAQN-2535R06-20	25×35	6	Synthetic fused silica	λ/20	Ground
TFA-3040R06-1	TFAN-3040R06-1	30×40	6	Hard glass	λ	Polished
TFA-3040R06-4	TFAN-3040R06-4	30×40	6	Hard glass	λ/4	Polished
TFA-3040R06-10	TFAN-3040R06-10	30×40	6	Hard glass	λ/10	Polished
TFA-3040R06-20	TFAN-3040R06-20	30×40	6	Hard glass	λ/20	Polished
TFAQ-3040R08-20	TFAQN-3040R08-20	30×40	8	Hard glass	λ/20	Polished
TFA-4050R08-1	TFAN-4050R08-1	40×50	8	Hard glass	λ	Polished
TFA-4050R08-4	TFAN-4050R08-4	40×50	8	Hard glass	λ/4	Polished
TFA-4050R08-10	TFAN-4050R08-10	40×50	8	Hard glass	λ/10	Polished
TFA-4050R08-20	TFAN-4050R08-20	40×50	8	Hard glass	λ/20	Polished
TFA-5060R10-1	TFAN-5060R10-1	50×60	10	Hard glass	λ	Polished
TFA-5060R10-4	TFAN-5060R10-4	50×60	10	Hard glass	λ/4	Polished
TFA-5060R10-10	TFAN-5060R10-10	50×60	10	Hard glass	λ/10	Polished
TFA-5060R10-20	TFAN-5060R10-20	50×60	10	Hard glass	λ/20	Polished
TFA-6080R12-1	TFAN-6080R12-1	60×80	12	Hard glass	λ	Polished
TFA-6080R12-4	TFAN-6080R12-4	60×80	12	Hard glass	λ/4	Polished
TFA-6080R12-10	TFAN-6080R12-10	60×80	12	Hard glass	λ/10	Polished
TFA-6080R12-20	TFAN-6080R12-20	60×80	12	Hard glass	λ/20	Polished
TFA-80100R15-1	TFAN-80100R15-1	80×100	15	Hard glass	λ	Polished
TFA-80100R15-4	TFAN-80100R15-4	80×100	15	Hard glass	λ/4	Polished
TFA-80100R15-10	TFAN-80100R15-10	80×100	15	Hard glass	λ/10	Polished

Catalog Code W3407

High Parallelism

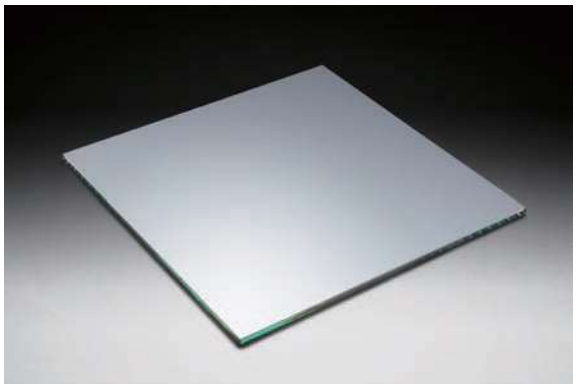
Part Number	Diameter ϕD [mm]	Thickness t [mm]	Material	Surface Flatness	Rear Surface
OPBA-10C05-10	ϕ10	5	BK7	λ/10	Polished
OPBA-15C05-10	ϕ15	5	BK7	λ/10	Polished
OPBA-20C05-10	ϕ20	5	BK7	λ/10	Polished
OPBA-25C05-10	ϕ25	5	BK7	λ/10	Polished
OPBA-30C05-10	ϕ30	5	BK7	λ/10	Polished
OPBA-40C06-10	ϕ40	6	BK7	λ/10	Polished
OPBA-50C08-10	ϕ50	8	BK7	λ/10	Polished
OPBA-60C10-10	ϕ60	10	BK7	λ/10	Polished
OPSQA-10C05-10	ϕ10	5	Synthetic fused silica	λ/10	Polished
OPSQA-15C05-10	ϕ15	5	Synthetic fused silica	λ/10	Polished
OPSQA-20C05-10	ϕ20	5	Synthetic fused silica	λ/10	Polished
OPSQA-25C05-10	ϕ25	5	Synthetic fused silica	λ/10	Polished
OPSQA-30C05-10	ϕ30	5	Synthetic fused silica	λ/10	Polished

Large Aluminum Mirrors | TFAEFL

RoHS Catalog Code W3177

For applications requiring large aluminum mirrors, standard catalog products of 200mm square are available. Custom larger sizes are available upon request.

- For visible and near-infrared light applications.
- For large aperture optical system.



Specifications

Material	Float glass (Soda-Lime glass)
Coating	Al + Dielectric multi-layer coating
Clear aperture	90% of Actual Aperture
Rear surface	Glossy surface
Surface Quality (Scratch–Dig)	60–40

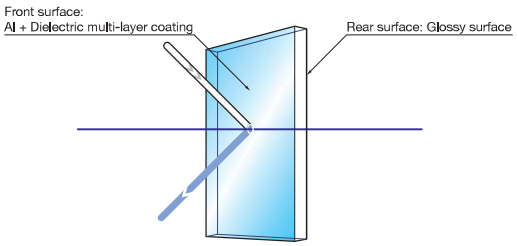
Guide

- Please contact our Sales Team for customized products.
- Holders to mount the mirrors are available , please contact our Sales Team to assist your selection.

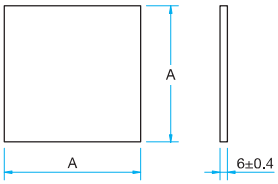
Attention

- The mirrors are supplied with a protective film attached to the coated surface. Before use, please remove the protective film.
- When a laser light is transmitted with multiple mirrors installed there will be a large amount of light loss due to the absorption of the aluminium coating. Please consider using dielectric multi-layer mirrors (TFM) for improved performance.

Schematic



Outline Drawing (in mm)



●Tolerance
Length A ±0.3
Chamfer C0.6 – C1

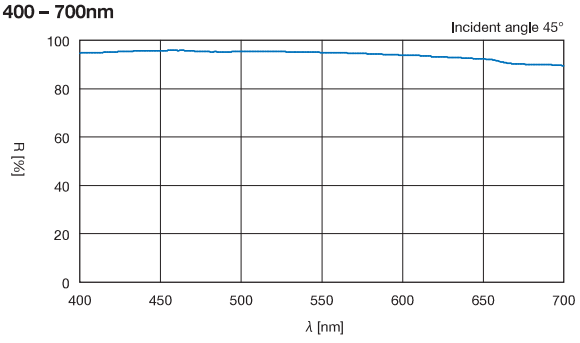
Specifications

Part Number	Wavelength Range [nm]	Reflectance	Length A [mm]	Surface Flatness
TFAEFL-200S06-P	400 – 700	> average 90	200	4 – 6λ (Within ϕ25.4)
TFAEFL-250S06-P	400 – 700	> average 90	250	4 – 6λ (Within ϕ25.4)
TFAEFL-300S06-P	400 – 700	> average 90	300	4 – 6λ (Within ϕ25.4)

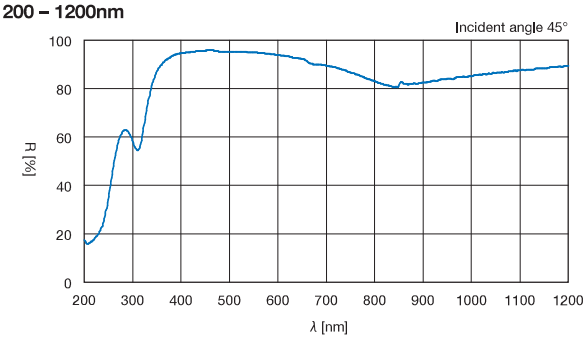
Typical Reflectance Data

R: Reflectance

400 – 700nm



200 – 1200nm



WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

Reasonable Aluminum Flat Mirrors | S-TFA

RoHS Catalog Code W3178

An economic general use mirror suitable for an illumination optical system and a simple experiments. It has the same reflectance and surface flatness as our aluminum mirrors (TFA) designed for use with a laser, but lower surface quality.

- The dirt on the surface of the mirror can be wiped because the scratch-resistant protection is coated on the aluminum coating.
- Reflectance of less variation can be obtained in a wide wavelength range from visible to near-infrared.

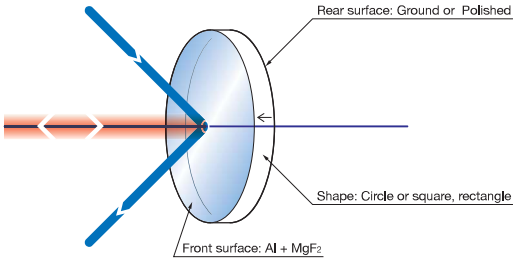
Specifications

Material	BK7
Coating	Al + MgF_2
Parallelism	<3′
Incident angle	45°
Laser Damage Threshold	0.25J/cm^2 (pulse width 10ns, repetition frequency 20Hz)
Surface Quality (Scratch–Dig)	60–40
Clear aperture	90% of actual aperture or circle or ellipse that contacts 90% square of dimension

Attention

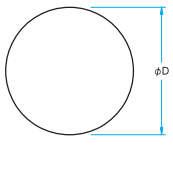
- When a laser is transmitted with multiple mirrors installed, there will be loss of a large amount of light caused by the absorption of the aluminum coating. Please switch to dielectric multi-layer mirrors (TFM) for improved performance.
- Reflectance specification is represented by the average of the reflectance of P polarized light and S polarized light. Reflectance may vary depending on the polarization state of the incident beam.

Schematic

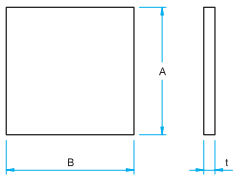


Outline Drawing (in mm)

●Circle



●Square / Rectangle



●Tolerance

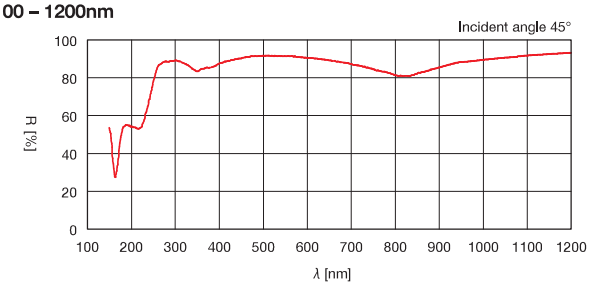
Diameter $\phi D^{0}_{-0.1}$

Length $A^{0}_{-0.1}$, $B^{0}_{-0.1}$

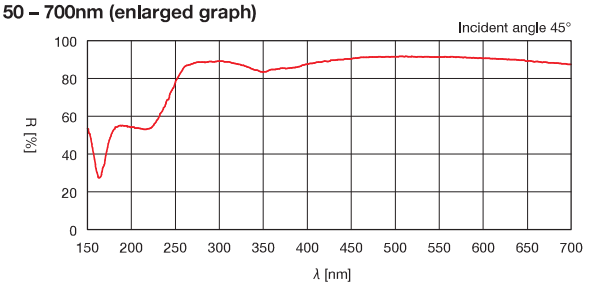
Thickness t ±0.1

Typical Reflectance Data R: Reflectance

100 – 1200nm



150 – 700nm (enlarged graph)



Circle

Part Number	Diameter φD [mm]	Thickness t [mm]	Surface flatness	Rear surface
S-TFA-10C03-10	φ10	3	λ/10	Ground
S-TFA-10C05-10	φ10	5	λ/10	Ground
S-TFA-15C03-10	φ15	3	λ/10	Ground
S-TFA-15C05-10	φ15	5	λ/10	Ground
S-TFA-20C03-10	φ20	3	λ/10	Ground
S-TFA-20C05-10	φ20	5	λ/10	Ground
S-TFA-25C05-1	φ25	5	λ	Polished
S-TFA-25C05-10	φ25	5	λ/10	Polished
S-TFA-30C05-1	φ30	5	λ	Polished
S-TFA-30C05-10	φ30	5	λ/10	Polished
S-TFA-40C06-1	φ40	6	λ	Polished
S-TFA-40C06-10	φ40	6	λ/10	Polished
S-TFA-50C08-1	φ50	8	λ	Polished
S-TFA-50C08-10	φ50	8	λ/10	Polished

Square / Rectangle

Part Number	Length A × B [mm]	Thickness t [mm]	Surface flatness	Rear surface
S-TFA-10S03-10	10×10	3	λ/10	Ground
S-TFA-15S03-10	15×15	3	λ/10	Ground
S-TFA-20S03-10	20×20	3	λ/10	Ground
S-TFA-20S05-4	20×20	5	λ/4	Ground
S-TFA-20S05-10	20×20	5	λ/10	Ground
S-TFA-25S05-10	25×25	5	λ/10	Ground
S-TFA-30S05-1	30×30	5	λ	Ground
S-TFA-30S05-10	30×30	5	λ/10	Ground
S-TFA-1015R03-10	10×15	3	λ/10	Ground
S-TFA-1015R05-10	10×15	5	λ/10	Ground
S-TFA-1525R03-10	15×25	3	λ/10	Ground
S-TFA-1525R05-10	15×25	5	λ/10	Ground
S-TFA-2030R05-10	20×30	5	λ/10	Ground
S-TFA-2535R05-10	25×35	5	λ/10	Ground

Compatible Optic Mounts

MHG-HS25-NL, -HS30-NL / MHG-MP50-NL / MAD-30-10 + MHL-30S / BSHL-15-2 / MHF-20 / MHAN-40S

Ellipsoidal mirror | TCEA

RoHS Catalog Code W3179

In general, an ellipsoid has two focal points and the light that passes through one focal point also passes through the other focal point after being reflected by the elliptical surface. By using this principle, if one light source is put on one focal point, it is possible to collect light at the other focal point.
It is used to incident the light of the lamp into optical fiber or light guide.

- It obtains high performance condensing by precision aspheric surface processing.
- It can provide long-term stability because it has a protective scratch-resistant coating over aluminum.
- Customer can select a mirror to suit specifications from among the wide variety of products which are classified in the focal position and outer diameter.

Specifications

Material	Tempax®
Coating	Al + SiO_2

Tempax® is a registered trademark of SCHOTT AG company.

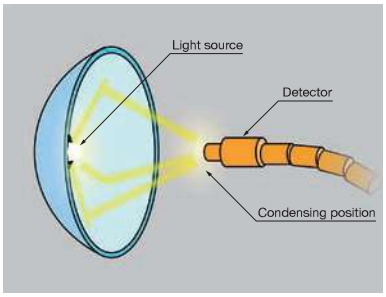
Guide

- Different focal length, outer diameter and hole sizes not mentioned on-line or in our catalog are available as a custom product upon request.
- It is also available for parabolic TCPA mirror, to project the light from the first focal point to infinity. Reference B037

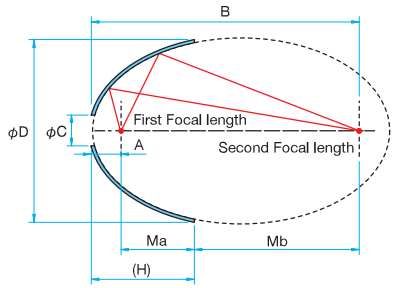
Attention

- The focus is not available on the second focal point when using a light source with directivity, because the light is not reflected by the mirror surface.
- Brightness distribution if away from the second focal point, may result in the distribution of ring-shaped.

Schematic

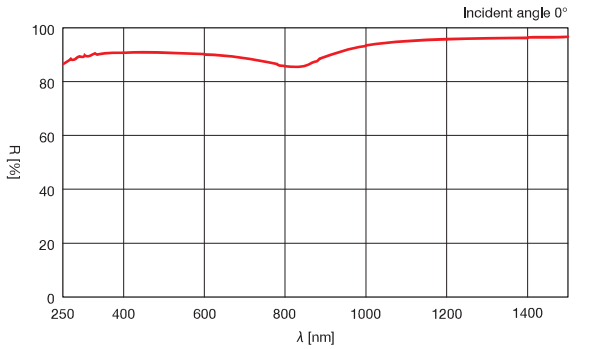


Outline Drawing (in mm)



●Tolerance
Diameter $\phi D^{+0}_{-0.5}$

Typical Reflectance Data R: Reflectance



Specifications

Part Number	Dimension ϕD [mm]	Thickness* H [mm]	Hole dimension ϕC [mm]	Ma [mm]	Mb [mm]	First Focal length A [mm]	Second Focal length B [mm]
TCEA-64C-11/78-SH18	ϕ64	44	ϕ18	31	36	11	78
TCEA-76C-13.5/120-SH18	ϕ76	42	ϕ18	25	81.5	13.5	120
TCEA-86C-14/134-SH20	ϕ86	46	ϕ20	32	88	14	134
TCEA-105C-22/145-SH27	ϕ105	44	ϕ27	20	103	22	145
TCEA-113C-17/272-SH27	ϕ113	54	ϕ27	36	219	17	272
TCEA-124C-23/195-SH25	ϕ124	56.5	ϕ25	32.6	139.4	23	195
TCEA-128C-18/288-SH31	ϕ128	67	ϕ31	50	220	18	288
TCEA-148C-28/252-SH30	ϕ148	63	ϕ30	34.6	189.4	28	252

* The thickness "H" is design value and there is a possibility of individual variability in the actual product. It is Not guaranteed value.

WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

Paraboloid mirror is a curved mirror that converts diverging light from a point of light source into parallel light.
By making the paraboloid a curved surface, it is possible to retrieve parallel light more efficiently than a spherical concave mirror. An example use of paraboloid mirror is as a lamp reflector of a microscope.

- It obtains high performance condensing by precision aspheric surface processing.
- It can provide long-term stability because it has a protective scratch-resistant coating over aluminum.
- It is easy to position the light source at the focusing point because there is a hole on the axis of the paraboloid.
- By entering the thick parallel light, it allows the light to be collected at one point.

Specifications

Material	Tempax®
Coating	Al + SiO_2

Tempax® is a registered trademark of SCHOTT AG company.

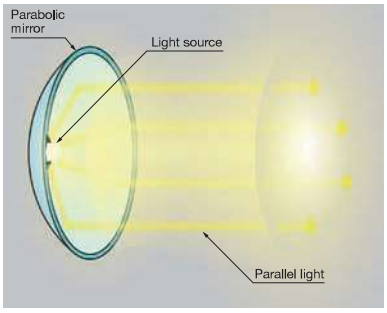
Guide

- Different focal length, outer diameter and hole sizes not mentioned on-line or in our catalog are available as a custom product upon request.
- Also available for ellipsoidal TCEA mirror for focusing light of the lamp at one point. Reference B036

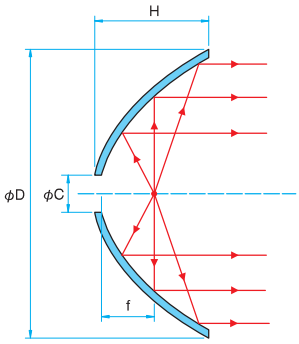
Attention

- Light does not reach to the mirror surface when high directivity source is placed at focal point, so it is not available to get the effect of paraboloid mirror.
- Light near the optical axis center is not reflected by the hole in the mirror, there is a case that intensity distribution of the parallel light becomes ring-shaped.
- When focusing the light emitted from a parabolic mirror by a lens, it does not focused at one point by the influence of light incident on the lens directly from the lamp.

Schematic



Outline Drawing (in mm)

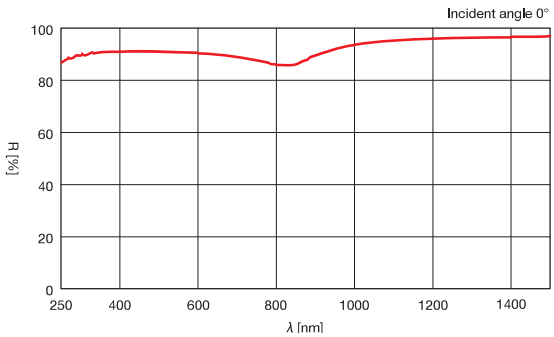


●Tolerance

Diameter	$\phi D^{+0}_{-0.5}$
Hole diameter	$\phi C^{+0}_{-0.5}$
Focal length	±1%

Typical Reflectance Data

R: Reflectance



Specifications

Part Number	Dimension ϕD [mm]	Focal length f [mm]	Thickness* H [mm]	Hole dimension ϕC [mm]
TCPA-100C-12.5-SH18	ϕ100	12.5	46	ϕ18
TCPA-105C-15-SH23	ϕ105	15	42	ϕ23
TCPA-152C-17-SH30	ϕ152	17	76.5	ϕ30
TCPA-152C-30-SH35	ϕ152	30	44.5	ϕ35

* The thickness "H" is design value and there is a possibility of individual variability in the actual product. It is Not guaranteed value.

Gold Flat Mirrors | TFG/TFGS

RoHS

Gold (Au) coated reflection mirrors have high reflectance over wide infrared range.

- Chromium (Cr) is used as the undercoated to better reinforce the adhesion of gold to the substrate.
- Gold mirrors with silicon substrates have higher durability than glass because gold coating adheres much stronger to silicon and has a higher thermal conductivity. (thermal conductivity of silicon is 111 times better compared to glass)

Specifications

Material	BK7 Hard glass (Pyrex® etc.) Silicon crystal
Coating	Cr (chrome) + Au (Gold)
Parallelism	<3′
Surface Quality (Scratch–Dig)	40–20
Clear aperture	90% of diameter or circle that internally contacts 90% square of dimension
Laser Damage Threshold	1.2kW/cm^2 (CW laser)

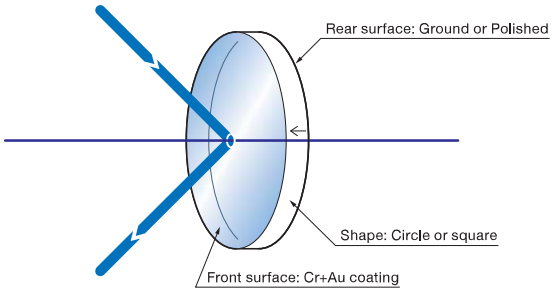
Guide

- Please contact our Sales Division for customized products. (customize outer diameter, etc.)
- Pyrex® is a registered trademark of Corning Inc.

Attention

- When silicon mirrors are water-cooled, heat dissipates more quickly and they have higher durability.
- Since gold coating has an extremely low mechanical strength, extra care should be taken and it is recommended that cleaning of the surface be limited to blowning off the coated surface.
- Reflectance of the specification are represented by the average of the reflectance of P polarized light and S polarized light.

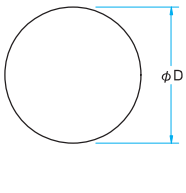
Schematic



Outline Drawing

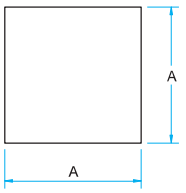
(in mm)

●Circle



●Tolerance
Diameter ϕD$^{0}_{-0.1}$
Thickness t ±0.1

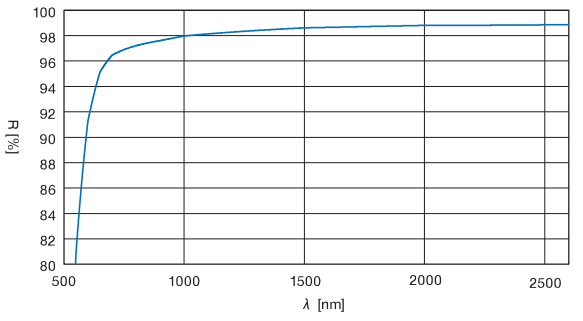
●Square



●Tolerance
Length A$^{0}_{-0.1}$
Thickness t ±0.1

Typical Reflectance Data

R: Reflectance



WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

Gold Flat Mirrors

Circle

Part Number	Dimension ϕD [mm]	Thickness t [mm]	Surface Flatness (at 632.8nm)	Surface Flatness (at 10.6μm)	Material	Rear Surface
TFG-20C05-10	ϕ20	5	λ/10	λ/160	BK7	Ground
TFG-25C05-10	ϕ25	5	λ/10	λ/160	BK7	Polished
TFG-30C05-10	ϕ30	5	λ/10	λ/160	BK7	Polished
TFG-40C06-10	ϕ40	6	λ/10	λ/160	BK7	Polished
TFG-50C08-10	ϕ50	8	λ/10	λ/160	BK7	Polished

Square

Part Number	Length A [mm]	Thickness t [mm]	Surface Flatness (at 632.8nm)	Surface Flatness (at 10.6μm)	Material	Rear Surface
TFG-20S05-10	□20	5	λ/10	λ/160	BK7	Ground
TFG-25S05-10	□25	5	λ/10	λ/160	BK7	Ground
TFG-30S05-10	□30	5	λ/10	λ/160	BK7	Ground
TFG-50S08-10	□50	8	λ/10	λ/160	Hard glass	Polished

Gold Silicon Mirrors

Circle

Part Number	Dimension ϕD [mm]	Thickness t [mm]	Surface Flatness (at 632.8nm)	Surface Flatness (at 10.6μm)	Material	Rear Surface
TFGS-30C03-2	ϕ30	3	λ	λ/16	Silicon crystal	Ground
TFGS-40C04-2	ϕ40	4	λ	λ/16	Silicon crystal	Ground
TFGS-50C05-2	ϕ50	5	λ	λ/16	Silicon crystal	Ground

Compatible Optic Mounts

MHG-HS25, -HS30 / MHG-MP50 / MHF-20 / MHAN-40M

Silver Mirrors | TFAG

RoHS Catalog Code W3182

Silver (Ag) coated mirrors have high reflectance over a broad range from visible to infrared wavelengths.
Since it is coated with a protective layer on the silver, it can be used long-term without oxidation.

- For the wavelength range from the visible to infrared, higher reflectance than aluminum mirror can be obtained.
- Incident dependence is smaller than the dielectric multilayer coating, it can use at various incident angles.
- Since it is coated by protective layer, a scratch hardly occurs even if it is rubbed with a cloth.

Specifications

Material	BK7
Coating	Ag + Dielectric multi-layer coating
Wavelength Range	450 – 2000nm
Reflectance	> average 97.5%
Surface Flatness	λ/10
Parallelism	<3′
Surface Quality (Scratch–Dig)	40–20
Clear aperture	90% of Actual Aperture

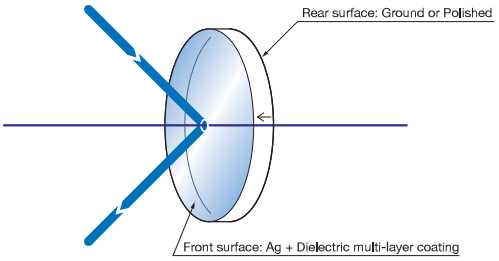
Guide

▶Please contact our Sales Division with your customized products requests.

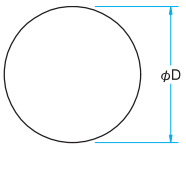
Attention

▶For long-term storage, please use a de-oxidizer to prevent the oxidation of the silver.
▶When a laser is transmitted with multiple mirrors installed, there will be a loss of the amount of light caused by the absorption of the silver coating. Please use 0-45° Wide incidence dielectric mirrors (TFVM) for improved performance. Reference B027
▶Reflectance specification is represented by the average of the reflectance of P polarized light and S polarized light. Reflectance may vary depending on the polarization state of the incident beam.

Schematic



Outline Drawing (in mm)

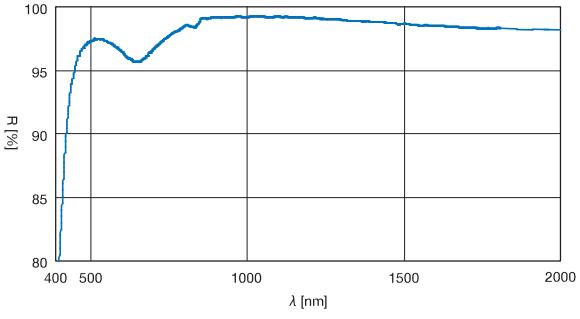


●Tolerance
Diameter $\phi D^{0}_{-0.5}$
Thickness t ±0.1

Specifications

Part Number	Diameter ϕD [mm]	Thickness t [mm]	Rear Surface
TFAG-12.7C05-10	ϕ12.7	5	Ground
TFAG-25.4C05-10	ϕ25.4	5	Polished
TFAG-30C05-10	ϕ30	5	Polished
TFAG-50C08-10	ϕ50	8	Polished
TFAG-50.8C08-10	ϕ50.8	8	Polished

Typical Reflectance Data R: Reflectance

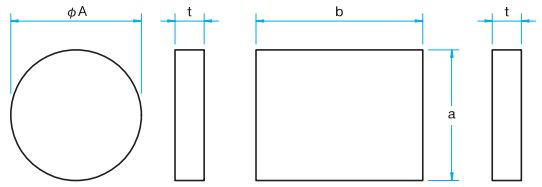


WEB http://www.sigma-koki.com/ E-mail sales@sigma-koki.com

Contact sheet for Special Order for Mirror ☐Estimation ☐Order

Date

☐ To: Sigma Koki Co., Ltd. **FAX +81-3-5638-6550**

Affiliation (Organization Name)					
Department		Name			
TEL		FAX		E-mail	
Country/Address					
Name & Designation	(Tentative name is okay)				
Drawing Number		Estimate	☐ Yes: by Date	☐ No	
Desired Delivery Date		Budget	JP Yen		
Substrates		If you are using a substrate of standard product, please fill in the product number. * If you specify a standard product of the substrate, it is not necessary to fill in fields marked with ▲.			
Material▲	☐ BK7 ☐ Synthetic fused silica ☐ Hard Glass ☐ Other ( )				
Quantity		Laser Damage Threshold▲ (at λ=632.8nm)			
Rear Surface▲	☐ Ground ☐ Polished ☐ No object	Parallelism▲ (enter only when it is necessary)			
Dimensions▲ If you do not specify a dimension tolerance is outside the standard tolerance.		ϕA	mm		
		a	mm		
		b	mm		
		t	mm		
Specifications of Total Reflection Coat Select metallic coating or dielectric multi-layer coating.	☐ Metallic Coating	☐ Al only ☐ Al + MgF_2 ☐ Al + SiO ☐ Al + Dielectric coating ☐ Ag + Dielectric coating ☐ Cr + Au ☐ Pt ☐ Other ( )			
	☐ Dielectric multi-layer coating	Wavelength Range λ = nm	Incident angle θ = °± °		
Specifications of Light Source Used	Wavelength Used	λ = nm	Type		
	Output or Energy	W	Beam size	mm	
		J Pulse width s Repetition frequency Hz			
	Incident angle	θ = °			
	Polarization Conditions	(If nothing is specified, circular polarized light or 45° direction of lineraly polarization are set.)			
Other	* Write more detailed specifications here. (Rough illustration is acceptable.)				

Sigma Koki Co., Ltd.

TOKYO TEL.03-5638-6551 FAX.03-5638-6550 **OSAKA** TEL.06-6307-4835 FAX.06-6307-4834 **KYUSHU** TEL.092-481-4300 FAX.092-481-4310

Contact sheet for laser cavity mirror ☐Estimation ☐Order

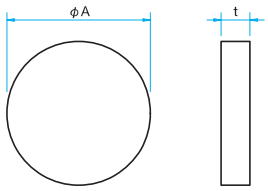
Date

☐ To: Sigma Koki Co., Ltd. **FAX +81-3-5638-6550**

Affiliation (Organization Name)					
Department		Name			
TEL		FAX		E-mail	
Country/Address					
Name & Designation					(Tentative name is okay)
Drawing Number		Estimate	☐ Yes: by Date		☐ No
Desired Delivery Date		Budget	JP Yen		
Substrates		If you are using a substrate of standard product, please fill in the product number. * If you specify a standard product of the substrate, it is not necessary to fill in fields marked with ▲.			
Material▲	☐ BK7 ☐ Synthetic fused silica ☐ Other ( )				
Quantity					

Dimensions▲
If you do not specify a dimension tolerance is outside the standard tolerance.

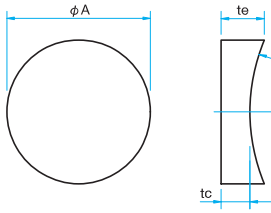
Flat Mirror Type



* The back is basically a polished surface.

ϕA	mm
t	mm
Laser Damage Threshold▲ (at λ=632.8nm)	
Parallelism▲ (enter only when it is necessary)	

Concave Mirror Type



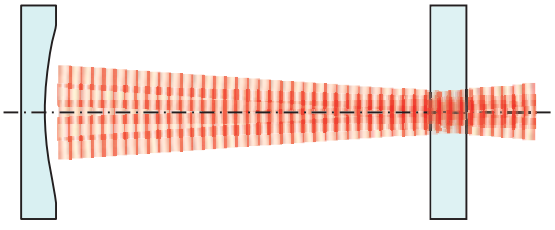
* The back is basically a polished surface.

ϕA	mm
te	mm
tc	mm
r	mm

Standard Curvature Radius [mm]	10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100, 120, 150, 200, 250, 300, 400, 500, 600, 700, 800, 1000, 1500, 2000, 2500, 3000, 4000, 5000, 10000, 20000, 30000	(Caution) In other than the above curvature radius, tooling costs may be required.

Specifications of Coating	Dielectric multi-layer coating	Wavelength Used	λ = nm	Incident angle	θ = °± °	Reflectance	R = % or more
		Reflective Coating	λ = for nm				

Sigma Koki Co., Ltd.



Laser cavity mirrors for the laser oscillator used in coating technology and high-quality high-precision polishing technology are required. In accordance with the specifications received from customers, we manufacture high quality mirror cavity with a high degree of accuracy. We will propose to use a substrate such as a mirror that has been standardized, the method that best meets your budget. To confirm the specifications for the quotation, we may contact to the customer.