

Spherical Lenses

Cylindrical Lenses

Lens Kits

Achromatic Doublets

Multi-Element

Micro Optics

Mirrors

Prisms

Substrates & Windows

Beamsplitters

Polarizers

Filter & Apertures

Microlenses

- Microlenses for a variety of demanding miniaturization applications
- Diameters down to 0.06 inches, focal lengths to less than 2mm
- Plano convex, plano concave, biconvex and biconcave lens shapes available as standard
- Precision polished to $\lambda/2$ surface figures
- Ideal for coupling fibers and laser diodes to each other or to systems
- Mounting of microlenses in aluminum housings available



These very small lenses are made from high index optical glass. They are precision polished to very high tolerances so that they can be mounted into complex imaging systems. These lenses are supplied uncoated.

Specifications & Tolerances

Focal length: $\pm 5\%$ Surface accuracy: $\lambda/2$ @633nm

Surface quality: 20-10

Bevel: 0.2mm typical

Diameter: +0, -0.1mm

Thickness: ± 0.2 mmCentration: ± 0.04 mm

Material: LaSFN9 or SK2 or BK7

Plano Convex Microlenses

Focal Length (mm)	Diameter, D (mm)	Thickness		Back Focal Length (mm)	Radius (mm)	Material	Price	PART NUMBER
		Center,tc (mm)	Edge,te (mm)					
1.0	1.50	0.80	0.35	0.56	0.85	LaSFN9	\$ 105.00	011-0020
1.5	1.50	1.90	1.65	0.44	1.25	LaSFN9	\$ 95.00	011-0025
1.5	2.00	1.90	1.40	0.44	1.25	LaSFN9	\$ 80.00	011-0040
2.0	2.00	1.50	1.18	1.19	1.71	LaSFN9	\$ 80.00	011-0050
2.5	2.00	1.60	1.35	1.64	2.14	LaSFN9	\$ 80.00	011-0060
3.0	2.00	1.30	1.10	2.30	2.57	LaSFN9	\$ 80.00	011-0070
2.5	3.00	2.10	1.49	1.37	2.14	LaSFN9	\$ 76.00	011-0080
3.0	3.00	2.00	1.52	1.92	2.57	LaSFN9	\$ 76.00	011-0090
4.0	3.00	1.30	0.95	3.29	3.42	LaSFN9	\$ 70.00	011-0110
6.0	3.00	1.40	1.08	5.13	3.66	SK2	\$ 70.00	011-0120
4.0	4.00	2.50	1.46	2.45	2.44	SK2	\$ 65.00	011-0150
6.0	4.00	1.30	0.71	5.19	3.66	SK2	\$ 65.00	011-0160
8.0	4.00	1.50	1.07	7.07	4.88	SK2	\$ 50.00	011-0170
10.0	4.00	1.50	1.16	9.07	6.10	SK2	\$ 45.00	011-0180

Biconvex Microlenses

Focal Length (mm)	Diameter, D (mm)	Thickness		Back Focal Length (mm)	Radius	Material	Price	PART NUMBER
		Center,tc (mm)	Edge,te (mm)					
3.0	3.0	1.80	1.07	2.35	3.25	SK2	\$ 75.00	013-0010
4.0	3.0	1.80	1.18	3.35	3.81	BK7	\$ 75.00	013-0020
6.0	3.0	1.50	1.12	5.48	5.95	BK7	\$ 55.00	013-0030
4.0	4.0	2.20	1.24	3.23	4.40	SK2	\$ 65.00	013-0060
6.0	4.0	1.90	1.20	5.38	5.91	BK7	\$ 51.00	013-0070
8.0	4.0	1.70	1.19	7.42	8.00	BK7	\$ 48.00	013-0080

ORDERING
&
TECHNICAL SUPPORT
(949) 851-5881
FAX (949) 851-5058

E-MAIL
sales@optosigma.com

WEB
www.optosigma.com



- Spherical Lenses
- Cylindrical Lenses
- Lens Kits
- Achromatic Doublets
- Multi-Element
- Micro Optics**
- Mirrors
- Prisms
- Substrates & Windows
- Beamsplitters
- Polarizers
- Filter & Apertures

Plano Concave Microlenses

Focal Length (mm)	Diameter, D (mm)	Thickness Center,tc (mm)	Thickness Edge,te (mm)	Back Focal Length (mm)	Radius	Material	Price	PART NUMBER
-4.0	2.0	0.80	0.95	-4.40	-3.40	LaSFN9	\$ 65.00	015-0020
-6.0	3.0	0.80	1.03	-6.39	-5.10	LaSFN9	\$ 60.00	015-0022
-8.0	4.0	0.80	1.10	-8.37	-6.80	LaSFN9	\$ 57.00	015-0024

Biconcave Microlenses

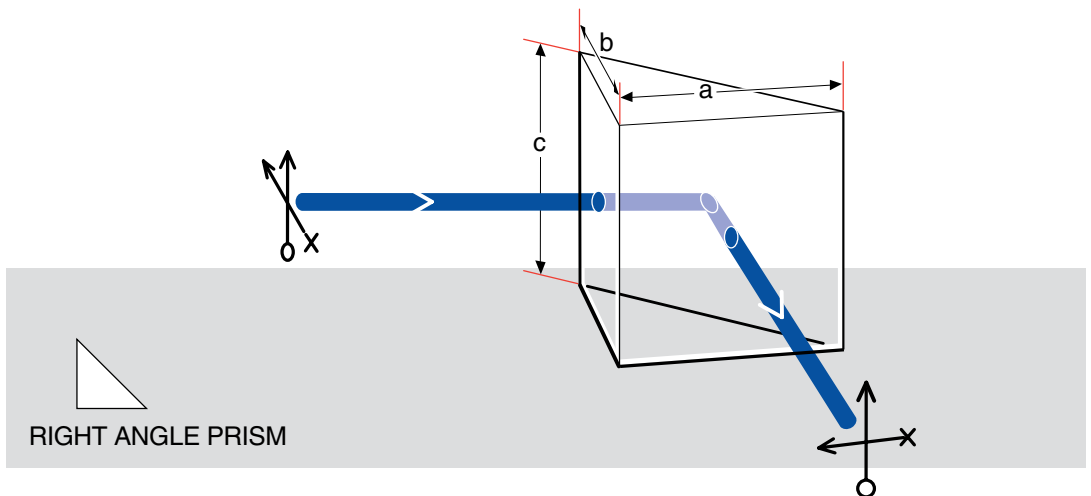
Focal Length (mm)	Diameter, D (mm)	Thickness Center,tc (mm)	Thickness Edge,te (mm)	Back Focal Length (mm)	Radius	Material	Price	PART NUMBER
-2.0	2.0	0.70	0.99	-2.13	-3.50	LaSFN9	\$ 90.00	017-0022
-3.0	3.0	0.80	1.24	-3.16	-5.23	LaSFN9	\$ 68.00	017-0023
-4.0	4.0	0.80	1.39	-4.16	-6.94	LaSFN9	\$ 65.00	017-0024

Micro Prisms

Specifications & Tolerances

Dimensions: ± 0.1 mm
 Surface flatness: $\lambda/8$
 Surface quality: 20-10
 Angles: ± 3 arcmin

Clear aperture: 85%
 Bevel: unbeveled
 Material: BK7, grade A



Micro Prisms

Sides a = b = c (inch)	Sides a = b = c (mm)	Material	Price	PART NUMBER
0.039	1.0	BK7	\$ 53.00	055-0010
0.059	1.5	BK7	\$ 50.00	055-0015
0.079	2.0	BK7	\$ 47.00	055-0020
0.118	3.0	BK7	\$ 47.00	055-0030
0.157	4.0	BK7	\$ 45.00	055-0040
0.200	5.0	BK7	\$ 36.00	055-0110

ORDERING
&
TECHNICAL SUPPORT
 (949) 851-5881
 FAX (949) 851-5058
 E-MAIL
 sales@optosigma.com
 WEB
 www.optosigma.com



Aspheric Microlenses

- Molded glass aspheric microlenses
- Corrected for use with laser diodes
- Diffraction limited performance
- Mounting flanges built in

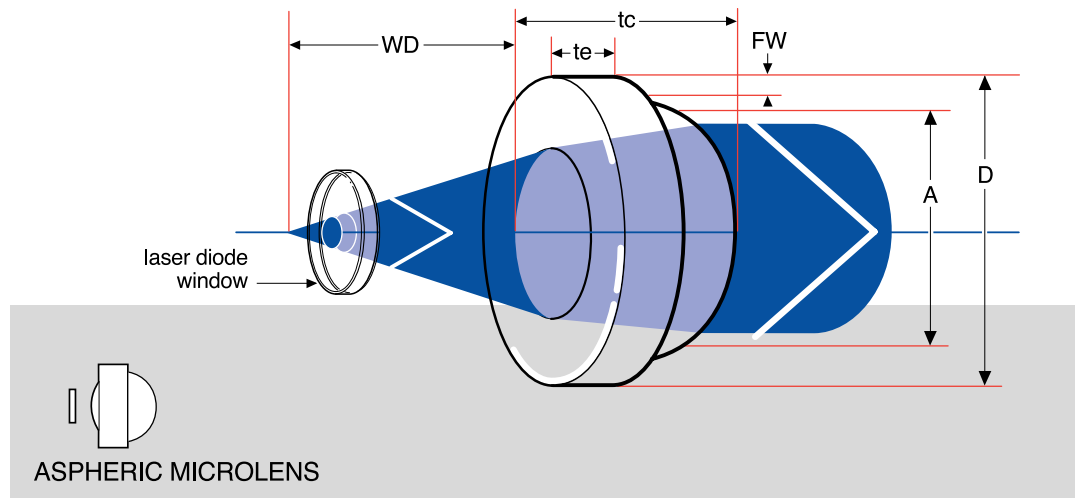


These aspheric lenses are manufactured by precision molding of optical crown glass. Aspheric surfaces permit a higher degree of correction than spherical surfaces thereby providing for improved performance out of a simple, single element lens. This range of microlenses have been corrected for use with a standard laser diode window and are primarily intended for the collection and collimation of laser diode radiation. They have diffraction limited performance at any wavelength in the laser diode spectrum and can be Anti-Reflection coated upon request. Since the lenses have been molded a mounting flange has been built in to the lens removing the need for costly and inconvenient mounting cells. A range of numerical apertures are offered and this should be selected according to the application.

Specifications & Tolerances

Focal length: $\pm 2\%$ @780nm
 Surface accuracy: $\lambda/2$ @780nm
 Surface quality: 40-20
 Window: BK7- 0.25mm
 Coating: Optional AR (see pages 18 and 19)

Diameter: ± 0.2 mm
 Thickness: ± 0.2 mm
 Centration: ± 0.1 mm
 Material: Corning C0550



Aspheric Microlenses

Numerical Aperture	Focal Length (mm)	Diameter, D (mm)	Thickness Center, tc (mm)	Thickness Edge, te (mm)	Flange Width, FW (mm)	Clear Aperture, A (mm)	Working Distance, WD (mm)	Price	PART NUMBER
0.15	18.40	6.50	2.2	1.8	0.35	5.5	17.1	\$ 65.00	023-5515
0.25	11.11	7.20	5.0	4.2	0.40	5.5	8.0	\$ 70.00	023-5525
0.30	6.16	4.70	3.5	2.9	0.30	3.7	4.4	\$ 72.00	023-5530
0.40	6.24	7.20	5.4	4.2	0.65	5.0	3.5	\$ 86.00	023-5540
0.50	2.00	3.00	2.0	1.4	0.30	2.0	1.1	\$ 76.00	023-5550
0.55	4.51	6.33	2.9	1.6	0.55	5.0	2.9	\$ 86.00	023-5555

For Anti-Reflection coatings see the table on pages 18 and 19 - append coating suffix and specify surfaces to be coated.

- Spherical Lenses
- Cylindrical Lenses
- Lens Kits
- Achromatic Doublets
- Multi-Element
- Micro Optics**
- Mirrors
- Prisms
- Substrates & Windows
- Beamsplitters
- Polarizers
- Filter & Apertures

Microspheres



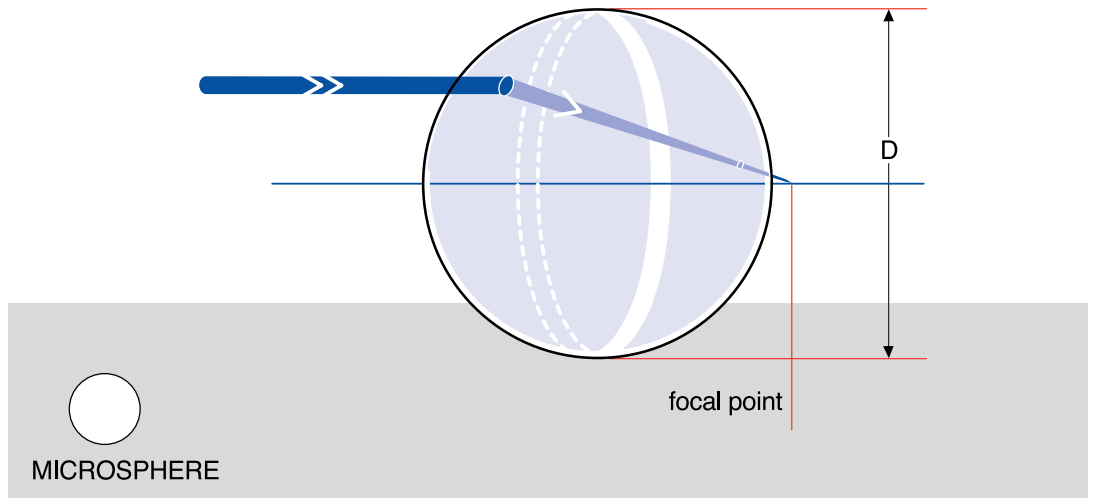
- Ideal for coupling optical fibers to laser diodes and detectors
- $\lambda/4$ surface figure for high performance
- Single layer MgF_2 coated for visible or infrared uses - uncoated also available
- Coating axis is identified for ease of mounting
- Focal lengths from 1 to 3mm - diameters from 2 to 5mm

Microspheres are convenient for coupling light into or out of fibers as well as for relaying images in compact areas. The focal point of a sphere is very close to its surface so the sphere can be placed in contact with the fiber or another sphere for almost perfect coupling. Three different coatings are available. All are single layer MgF_2 coatings which have been optimized for the visible range or either of the two diode laser bands. If a coated microsphere is chosen it will be necessary to maintain the coating axis when in use. This axis is marked with a removable black dot for ease of location.

Specifications & Tolerances

Focal length: $\pm 1\%$ @ 633nm
 Sphericity: $\lambda/4$ @ 633nm
 Material: LaSFN9

Diameter: ± 0.001 mm
 Surface quality: 20-10



Microspheres

Focal Length (mm)	Diameter, D		Price	PART NUMBER
	(inches)	(mm)		

0.5	0.04	1.0	\$ 19.00	025-0110
1.1	0.08	2.0	\$ 12.50	025-0120
1.7	0.12	3.0	\$ 14.00	025-0130
2.8	0.20	5.0	\$ 15.00	025-0140
4.5	0.31	8.0	\$ 25.00	025-0150

For **Single Layer AR Anti-Reflection coatings** append appropriate suffix and add \$15 to the price.

- for 400-700nm **append -A27**
- for 700-900nm **append -A38**
- for 1300-1550nm **append -A68**

Please ask us to quote for OEM quantities.

ORDERING
&
TECHNICAL SUPPORT
(949) 851-5881
FAX (949) 851-5058
E-MAIL
sales@optosigma.com
WEB
www.optosigma.com

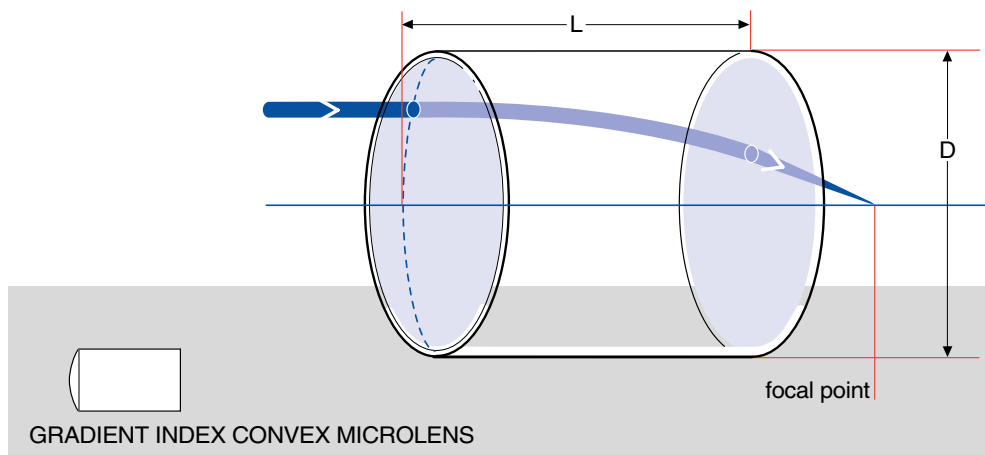
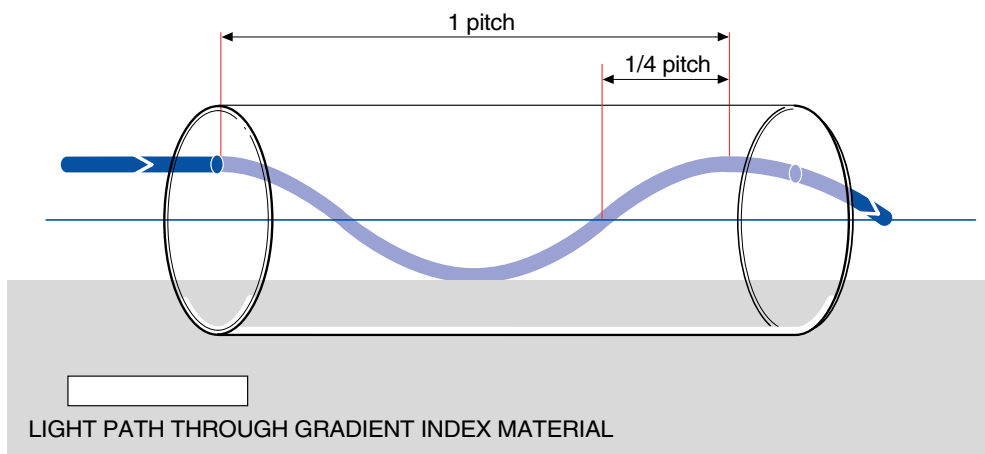


Gradient Index Microlenses

- Cylindrical shape is easy to mount, easy to align
- Available with both plano and convex end profiles
- Available for popular visible and IR laser wavelengths
- Perfect solution for optical data transmission applications
- Also available with the focal plane falling outside the lens for non-contact use



Optical glass with a refractive index gradient provides a very efficient and simple way to produce high quality imaging lenses. The material used in these microlenses is Selfoc[®]. This material has a radial index gradient which causes focusing to occur within the material. The index variation is defined by and is normally specified by the constant \sqrt{A} . The simplest form of gradient index lens is a simple cylinder of Selfoc[®]. Collimated light incident on one end of the lens will be focused as it travels along the length of the cylinder. These microlenses are particularly useful for fiber and diode coupling since they can be mounted in close proximity to the source. They are ideal for use in optical data transmission. We offer gradient index microlenses with plano end faces and also in a convex configuration for greater imaging power. The convex lenses have a spherical radius on one end only. Normally these lenses are a quarter pitch so that they focus a collimated input at the remote face of the lens. However, we also offer lenses having slightly less than 1/4 pitch so that they focus just outside the lens. This is often more convenient since contact with the source or detector may be physically impossible. Two different numerical apertures are offered, 0.46 and 0.6. These lenses are wavelength specific. They are supplied for the wavelengths 633, 830, 1300 and 1560 nm and are Anti-Reflection coated for these wavelengths. They will work at other wavelengths but their focusing characteristics will vary from the published figures and the coatings will not be optimized.



Specifications & Tolerances

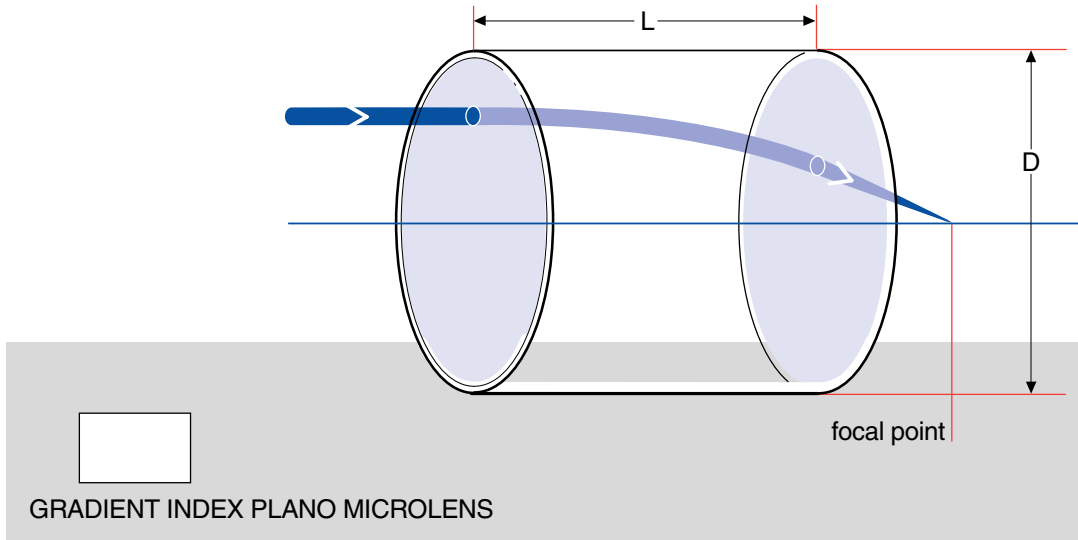
Diameter: $\pm 0.02\text{mm}$
 Length: $+0, -0.04\text{mm}$
 Parallelism: $\leq 10\text{arcmin}$
 Index gradient: $\pm 0.75\%$
 Clear aperture: 70% of diameter
 Material: Doped borosilicate glass
 Coating: NMAR V-coat

ORDERING
&
TECHNICAL SUPPORT
(949) 851-5881
FAX (949) 851-5058
E-MAIL
sales@optosigma.com
WEB
www.optosigma.com

- Spherical Lenses
- Cylindrical Lenses
- Lens Kits
- Achromatic Doublets
- Multi-Element
- Micro Optics**
- Mirrors
- Prisms
- Substrates & Windows
- Beamsplitters
- Polarizers
- Filter & Apertures

Gradient Index Convex Microlenses

Wavelength Range (nm)	N.A.	Diameter, D (inches) (mm)		Length, L (mm)	Pitch	Refractive Index (axial)	Index Constant \sqrt{A} (mm^{-1})	Price	PART NUMBER
830	0.46	0.07	1.8	4.7	0.25	1.60	0.33	\$ 47.00	024-1110
830	0.60	0.07	1.8	3.0	0.20	1.65	0.42	\$ 47.00	024-1130
1300	0.46	0.07	1.8	4.8	0.25	1.59	0.33	\$ 47.00	024-1140
1300	0.60	0.07	1.8	3.0	0.20	1.64	0.42	\$ 47.00	024-1160
1560	0.46	0.07	1.8	4.8	0.25	1.59	0.33	\$ 47.00	024-1170
1560	0.60	0.07	1.8	3.0	0.20	1.63	0.42	\$ 47.00	024-1190



Gradient Index Plano Microlenses

Wavelength Range (nm)	N.A.	Diameter, D (inches) (mm)		Length, L (mm)	Pitch	Refractive Index (axial)	Index Constant \sqrt{A} (mm^{-1})	Price	PART NUMBER
633	0.46	0.04	1.0	2.6	0.25	1.61	0.61	\$ 23.00	024-0130
633	0.46	0.07	1.8	4.6	0.25	1.61	0.40	\$ 23.00	024-0140
633	0.46	0.07	1.8	4.3	0.23	1.61	0.40	\$ 23.00	024-0160
633	0.60	0.07	1.8	3.7	0.25	1.66	0.40	\$ 23.00	024-0180
633	0.46	0.08	2.0	5.2	0.25	1.61	0.30	\$ 23.00	024-0220
830	0.46	0.04	1.0	2.6	0.25	1.60	0.60	\$ 23.00	024-0330
830	0.46	0.07	1.8	4.7	0.25	1.60	0.33	\$ 23.00	024-0340
830	0.46	0.07	1.8	4.4	0.23	1.60	0.33	\$ 23.00	024-0360
830	0.60	0.07	1.8	3.7	0.25	1.65	0.33	\$ 23.00	024-0380
830	0.46	0.08	2.0	5.3	0.25	1.60	0.30	\$ 23.00	024-0440
1300	0.46	0.04	1.0	2.6	0.25	1.59	0.60	\$ 23.00	024-0460
1300	0.46	0.07	1.8	4.8	0.25	1.59	0.33	\$ 23.00	024-0470
1300	0.46	0.07	1.8	4.4	0.23	1.59	0.33	\$ 23.00	024-0490
1300	0.60	0.07	1.8	3.8	0.25	1.64	0.33	\$ 23.00	024-0560
1300	0.46	0.08	2.0	5.3	0.25	1.60	0.30	\$ 23.00	024-0580
1560	0.46	0.04	1.0	2.6	0.25	1.59	0.60	\$ 23.00	024-0660
1560	0.46	0.07	1.8	4.8	0.25	1.59	0.33	\$ 23.00	024-0670
1560	0.46	0.07	1.8	4.4	0.23	1.59	0.33	\$ 23.00	024-0690
1560	0.60	0.07	1.8	3.8	0.25	1.63	0.33	\$ 23.00	024-0780
1560	0.46	0.08	2.0	5.3	0.25	1.59	0.29	\$ 23.00	024-0880

Selfoc® is a registered trademark of Nippon Sheet Glass Company

Spherical Lenses

Cylindrical Lenses

Lens Kits

Achromatic Doublets

Multi-Element

Micro Optics

Mirrors

Prisms

Substrates & Windows

Beamsplitters

Polarizers

Filter & Apertures

Gradient Index Imaging Microlenses

- Available in diameters from 0.25 to 1.0mm
- Magnifications from 5 to 20X
- High resolution performance, 200 line-pairs per mm



These gradient index microlenses are optimized for imaging applications. They form an image at one face of the lens of an object at a working distance of 5mm from the opposite face of the lens. This image may be viewed directly by a 100X microscope or transferred to the distal end of a coherent fiber bundle or gradient index relay lens. The lenses are supplied uncoated and no coatings are offered.

Specifications & Tolerances

Diameter: +0, -0.05mm

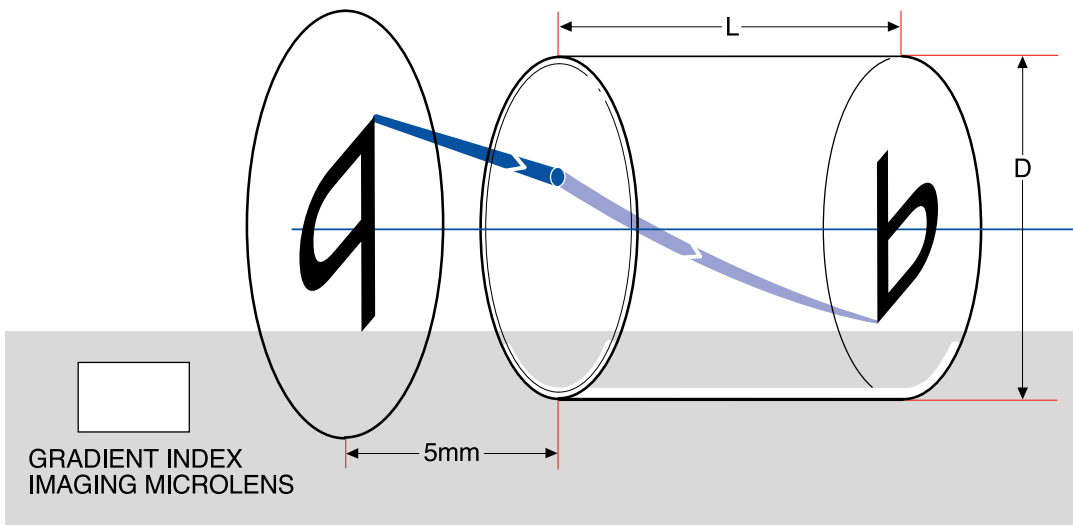
Resolution: 200 line-pairs/mm

Surface quality: 10-5

Length: $\pm 10\%$

Field curvature: 0.1mm (max)

Material: Doped borosilicate glass



Gradient Index Imaging Microlenses

Diameter, D (inches) (mm)	Length, L (mm)	Field of View (degrees)	Magnification	Price	PART NUMBER
0.01 0.25	0.7	50	19.0	\$ 49.00	024-2230
0.02 0.50	1.4	50	10.0	\$ 49.00	024-2250
0.04 1.00	3.0	50	5.0	\$ 49.00	024-2270
0.02 0.50	1.1	70	13.0	\$ 58.00	024-2360
0.04 1.00	2.2	70	6.5	\$ 58.00	024-2380

THESE LENSES CONTAIN SUBSTANCES WHICH MAY BE TOXIC IF INGESTED, SWALLOWED OR INSERTED INTO A LIVING CREATURE. THE PURCHASER IS REQUIRED TO PAY SPECIAL ATTENTION TO THIS POSSIBILITY – HOWEVER UNLIKELY.

- Spherical Lenses
- Cylindrical Lenses
- Lens Kits
- Achromatic Doublets
- Multi-Element

Micro Optics

- Mirrors
- Prisms
- Substrates & Windows
- Beamsplitters
- Polarizers
- Filter & Apertures

If you need a gradient index lens quickly, just let us know. Our next-day delivery option costs a little extra, but your system will be up and running that much sooner. And if you don't see exactly the lens that you need give us a call. We have a wide range of special focal lengths and diameters available.

ORDERING
&
TECHNICAL SUPPORT
(949) 851-5881
FAX (949) 851-5058
E-MAIL
sales@optosigma.com
WEB
www.optosigma.com

Gradient Index Relay Microlenses

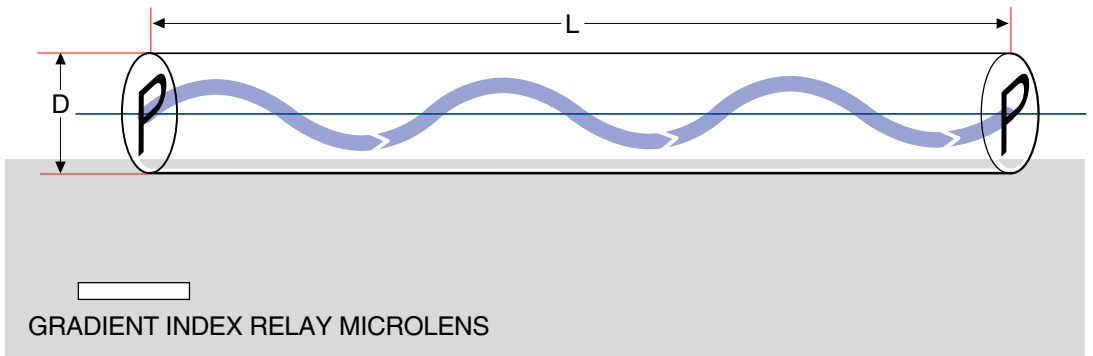


These microlenses are formed from gradient index glass as rods whose length is equal to an integral number of pitches. In this way an image formed on one end of the lens is transferred to the remote end from where it may be viewed or transferred to another medium.

These are used in rigid endoscopes and other applications which require the transfer of images. They are ideal for use with the gradient index imaging microlenses described previously.

Specifications & Tolerances

Diameter: +0, -0.05mm Length: ±3%
Surface quality: 20-10 Material: Doped borosilicate glass



Gradient Index Relay Microlenses

Diameter, D (inches) (mm)		Length, L (mm)	Pitch	Price	PART NUMBER
0.02	0.5	30.2	1.00	\$ 189.00	024-3380
0.02	0.5	60.4	2.00	\$ 221.00	024-3390
0.02	0.5	90.6	3.00	\$ 257.00	024-3440
0.04	1.0	44.7	1.00	\$ 168.00	024-3490
0.04	1.0	89.4	2.00	\$ 226.00	024-3550
0.04	1.0	134.1	3.00	\$ 273.00	024-3560
0.08	2.0	100.5	1.00	\$ 168.00	024-3660
0.08	2.0	201.0	2.00	\$ 236.00	024-3670
0.08	2.0	301.5	3.00	\$ 326.00	024-3680

We can supply assembled combinations of imaging and relay microlenses. Please call to discuss your special requirements.

THESE LENSES CONTAIN SUBSTANCES WHICH MAY BE TOXIC IF INGESTED, SWALLOWED OR INSERTED INTO A LIVING CREATURE. THE PURCHASER IS REQUIRED TO PAY SPECIAL ATTENTION TO THIS POSSIBILITY – HOWEVER UNLIKELY.

