Lensed & Tapered Fibers
Production Capabilities
Presentation
We make Custom Lensed Fibers
Types of Fibers:
Corning, Nufern, and Fiber Core Fibers.

Single Mode: SMF-28, 1060-HP, 1060-XP, 980-HP, 630-HP, 450-HP

Multi Mode: 50/125; 62.5/125; 105/125; 200/240

Polarization Marinating Fibers: PM-1550, PM-980

Plastic Optical Fibers
LaseOptics Lensed Fibers SMF-28 with AR coating and Metallization

One side Ball Lens
Other side FC Connector

Metallization 1.2 ~ 1.3 micron, 10mm length, Ni: 1µm + Au: 0.25~0.3um

Ball Lens 300 µm

AR coating required place

One side Conical Lens
Other side FC Connector

Conical Lens

Spot size 1-2 µm

LaseOptics Corporation
780 nm of Conical and Spherical Lensed Fibers with Metal/Glass Ferrule for Water Application

Bare Fiber 1 meter length

Ball Lensed Fiber (Bare Fiber)

Conical tip (Bare Fiber)

Conical Lens Tip 12 um

Metal or Glass Ferrule inside Lensed Fiber

Hemispherical Lens

Confidential LaseOptics Proprietary Information
Wedge/Chisel (Screw Driver) Lensed Fiber (Bare Fiber) SMF-28: 9/125/250

Metallization: Ni: 2~3 µm + Au: 0.1~0.2 µm
7mm length,

Bare Fiber
1 meter length

Lens Tip thickness 2µm

Wedge/Chisel Lensed Fibers with Metallization
SMF-28 fiber with GIF fiber for long working distance
800nm 2x2 couple with One port Lensed fiber with Ferrule

SS Ferrule OD 800μm 20mm long

Lens 1mm out of the ferrule

800nm Fiber

SMF-28 Fiber ½ meter
Single Mode Lensed Fiber Coupler (1 x 2) FC/PC

- One Input with FC/PC
- 50:50 Split
- Two Tapered Fibers
- If you want we can put on Silicon V-Grooves Chip 2CH/ MTP Connector
LaseOptics Multi Mode fiber of 200 core one end with 1.8mm Ball Lens on other side plain cleaved or connector
SMF-28 Fiber with Sharp Conical Tip with FC Connector

125μm cladding

2μm spot size

4mm

1mm

Bare fiber mode

Fresnel lens focal spot

1 μm
Sharp Conical tip by removing 2 claddings and making 2 micron spot size on core

Double Clad Fiber - Sharp Conical Tip
Collimated Beam Lens System for long working distance

Grin Lens Option -I

FC or LC Connector

Grin Lens OD: 2-2.5mm

Collimated Beam diameter 160 µm

Ferrule OD 3.5mm

Kovar Ferrule

5mm

10mm

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Grin Lens System for long working distance

FC/APC Connector

Grin Lens OD: 140 μm

Beam waist: 30-42 μm Diameter

3mm

7mm
Nufern 460-HP fiber, Conical lens formation with 8 μm spot size pigtail assembly

First Process

460-HP-Fiber with 4μm core diameter

Second Process

SMF-28 Fibe with 9μm core diameter 2mm long

460-HP-Fiber with 4μm core diameter

SMF-28 fiber 9μm core diameter 2mm long and then making conical lens 7-8 μm spot size
Plastic Optical Fiber tapered of 980 micron core

Ball Lensed Fiber (Bare Fiber)

Hemispherical Lens

Bare Fiber 1 meter length

Conical tip (Bare Fiber)

Conical Lens Tip 90 um
980μm Optical Fiber Tapered Conical & Ball

- One side Ball Lens, other side Conical Lens (Bare Fiber)
- Ball Lens out side of the FC Connector
- One side Half Ball Lens and other side Conical Lensed Fiber (Bare Fiber)
LaseOptics - GLZ Ball Lensed Fibers pigtail with Steel Ferrule

50/125 MM fiber with 900 microns buffer

ST/PC Connector
2 meter length Cable

Steel Ferrule 10mm long
OD: 812μm & ID: 260 μm

Working distance 1mm

Ball Lens 275-280μm
Ball Lensed Fiber (Bare Fiber) 480 SM PM

FC/APC Connector
1 meter length

Metal Ferrule
Ball Lens 275µm

Kovar Ferrule

Semi Ball

If you want we can do Metallization: Ni: 2~3 µm +Au:
0.1~0.2 µm 15mm length,

LaseOptics Lensed Fibers with Kovar Ferrule or Metallization
Ball Lens Fibers with Titanium Ferrule (Supplied by Customer) SLB-Japan

- 900 um hytrel sleeve
- Protecting Sleeve
- Titanium Ferrule 50mm long OD: 1.8µm & ID: 225µm
- ID 900µm for 10 mm long backside of ferrule
- Front end of the ferrule
- Ball Lens 275-300µm
Hemispherical Lensed Fiber with Glass Ferrule

FC/APC Connector

Hemispherical Lens with long WD and 2mm outside the ferrule

Glass Ferrule 1mm OD, 13mm long

900 um tight jacket

LaseOptics Lensed Fibers with Kovar Ferrule or Metallization
Multiple input sources to single output

Any connector with 1 output

50 cm
100 Fiber Arrays one Output

100 individual fibers

100 fibers with One output Connector
LaseOptics Center-Tapered Fiber

SMF-28 Single Mode Fiber, total length of fiber 4 inches

Tapered length 1 mm

Tapered diameter 6-8 µm

125 µm diameter

250 µm diameter
Polarization Maintaining fiber with polarizer isolator with conical lens with FC/APC connector

1-1.5 µm Spot Size and 1.1 mm WD
SMF-28 - Single Mode + 50µm Core Multi mode Tapering
980μm Optical Fiber with Semi Ball & Conical lens slightly out side the Ferrule
LaseOptics-Lensed Fiber-Perpendicular

Mirror ensuring high reflectivity
Transmission needed > 90%

Working Distance ~ 10's of μm
Please also advise:
Focal spot size 8 – 10 μm

125 μm lensed SMF-28 fiber
1550 nm
Mirror coating on micro-polished angle fibers to bring high reflectivity transmission (95%)
Perpendicular Lensed Fiber Array on V-grooves 4 channel
Perpendicular Lensed Fiber Array on V-grooves 12 channel
Perpendicular Lensed Fiber on Light coupling from Chip
One side Perpendicular Lens other end we can put any connectors
Mirror reflective coating 36 degree angle perpendicular to light for total 45 degree angle. With 8 degree of arriving light.

Light output 8 degrees angle.

Focal point coincides with base of fiber block assembly.
250 µm Ball Diameter

250 µm Ball Diameter
Angled Micro-Polished and Mirror Coating

900 µm tight jacket

SS Metal Ferrule
OD: 0.51mm & 17mm L

Mark on the Ferrule

720-830µm working distance and spot size
40-45µm

Perpendicular Lensed Fiber
Micro-Polished

PD Chip

One side Perpendicular Lens with Ferrule with mark other side FC/PC
LaseOptics Single Mode Lensed Fibers

Conical Lensed Fiber Array SMF-28

- Conical Lenses with 6-8µm spot size
- 250µm distance
- Spot size 6-8 µm
- SMF-28
- Low NA Lens
- High NA Lens
- WD 500µm

This is the lens design for long working distance

Long Working Distance Lensed Fibers
Fiber Array 4 Channel with 40° angle with reduced clad to 92.5um 3.5mm long (same 20 channels)
Single fiber with 40° angle with reduced clad to 92.5µm of 3.5mm long

![Diagram of single fiber with 40° angle and reduced clad dimensions](image)
Single fiber with $40^\circ$ angle with reduced clad RCPM80µm of 200mm long with PM1300 fiber.
Multi Mode Fiber

LaseOptics-Curvature with Flat Polish Lensed Fiber
LaseOptics Ball Lens with Flat Polish on Image Conduit

Optical Fiber

Ball Lens 300um diameter
With Flat Polish

6.4mm diameter

152 mm length

OR This One
Multi Mode Fiber
Double Wedge Lens
not Conical Tip

LaseOptics-Side firing fiber with 45 degree Angle Mirror Coated
SMF-28 Coupler with Fiber Polarizer with Collimated Lens

SMF-28 Fiber ½ meter

SMF-28 Fiber ½ meter

½ Meter

SMF-28 Fiber

PM Fiber

75mm
LaseOptics-Side firing fiber with 45 degree Angle Mirror Coated with Grin Lens

Multi Mode Fiber

Glass Ferrules

Mirror coating

Perpendicular traveled

GRIN Lens
LaseOptics-Side firing fiber with 41 degree Angle Mirror Coated with Grin Lens

Fiber end facet: side view

Reflective coating

Light beam

Fiber core

No reflective coating

Light beam

41°

90°

41°

8°
LaseOptics-half ring firing fiber with 41 degree Angle Mirror Coated with Grin Lens

$150^\circ \leq \alpha \leq 160^\circ$

Clear Bulb

Diffusing "inner surface"

$\Omega = 15\text{mm}$

$\Omega = 10\text{mm}$

$200\text{mm}$

SMA 905 Female
Ring Side Firing Lensed Fibers of 600/660/710 MM Fiber

600 μm Bare Fiber

900 μm

Side Firing Lensed Fiber (Bare Fiber)
Circular Side Firing & Straight focus Lensed Fibers of 500/550/675 MM Fiber
Circularly/Ring focused Lensed Fibers SMF-28

- 250 µm Bare Fiber
- 125 µm
- Light coming circularly
- Metal coated tip
LaseOptics-Ferrule with any Lensed Fibers Packaging
300µm Diameter Ball Lensed Fiber Arrays in Matrix Square Package

The distance between each fiber would be ~500 micron

100/110/140 Multi Mode Fiber with 49 Ball Lenses in square package
We can make any type of fibers and with any distance between the fiber arrays.

The distance between each fiber would be \( \sim 1000 \) micron.

100/110/140 Multi Mode Fiber with 49 Ball Lenses in square package.
100/110/140 Multi Mode Fiber with 33 x 33 Ball Lenses in square package
100/110/140 Multi Mode Fiber with 33 x 33 Ball Lenses in square package
Ball Lensed Fiber Array 10 Channels

Conical Lensed Fiber Array 10 Channels

Lensed Fiber Arrays on Silicon V-grooves 4, 6, & 10 Channels
Arrays Silicon V-grooves Top & Cross Section View
Lensed Fiber Arrays on V-grooves with skipping some channels
Angled Conical Lensed Fiber Array 5 Channels
Angled Array Conical Lensed Fiber 5 Channels
Ball Lensed 2D Fiber Arrays 4 or 6 or 8 or 10 Channels

Lensed Fiber Arrays on Silicon V-grooves  4, or 2D Arrays
PM-1550 Lensed Fiber with V-Groove of 125 µm pitch slow axis alignment
SMF-28 Lens with V-Groove of 125 µm and length of Chip 600 µm
Conical tip (900/125/9 Bare Fiber) or Conical tip (250/125/9 Bare Fiber)

Chip & Fiber
V-Groove is 125μm
V-Groove length 600μm

SMF-28 Lens with V-Groove of 125 μm and length of Chip 600 μm
THANK YOU