

SELFOC® MICRO LENS(SML), Standard

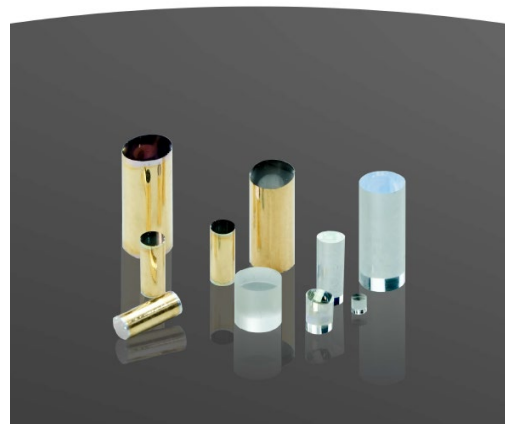
There are two categories of lenses, both distinguished by a different numerical aperture: SLW (wide) and SLH (high). Each NA type is appropriate for different applications and exhibits different alignment sensitivities.

While the numerical aperture is a maximum at the center of the lens aperture, the actual NA is a function of the ray parameters (height and angle) for each ray that strikes the lens' Surface (see technical note for detail).

C18 is optimized for Single Mode Fiber application to have better coupling efficiency. So, when you consider the usage of SMF, C18 have better Insertion Loss performance than W18.

Applications:

- Laser diode-to-fiber coupling
- Fiber-to-detector coupling
- Fiber-to-fiber coupling
- Focusing and collimating



Optical Parameters:

| Lens Type | | W10 | W18 | W20 | W30 | W40 | C18 | H18 | |
|------------|----------------|------------|--------|--------|--------|---------|--------|------------|--|
| Diameter | | Φ1.0mm | Φ1.8mm | Φ2.0mm | Φ3.0mm | Φ4.0mm | Φ1.8mm | Φ1.8mm | |
| Wavelength | NA(2θ) | 0.46 (55°) | | | | | | 0.60 (74°) | |
| 630nm | N ₀ | 1.607 | | | 1.635 | | - | 1.658 | |
| | √A | 0.608 | 0.339 | 0.304 | 0.207 | 0.154 | - | 0.430 | |
| | Z @0.25P | 2.58mm | 4.63mm | 5.17mm | 7.60mm | 10.24mm | - | 3.65mm | |
| 830nm | N ₀ | 1.599 | | | 1.625 | | - | 1.646 | |
| | √A | 0.601 | 0.332 | 0.298 | 0.203 | 0.151 | - | 0.423 | |
| | Z @0.25P | 2.61mm | 4.73mm | 5.27mm | 7.75mm | 10.43mm | - | 3.71mm | |
| 1310nm | N ₀ | 1.592 | | | 1.617 | | 1.592 | 1.636 | |
| | √A | 0.597 | 0.327 | 0.295 | 0.199 | 0.148 | 0.324 | 0.418 | |
| | Z @0.25P | 2.63mm | 4.80mm | 5.32mm | 7.87mm | 10.59mm | 4.85mm | 3.76mm | |
| 1550nm | N ₀ | 1.590 | | | 1.615 | | 1.590 | 1.634 | |
| | √A | 0.596 | 0.326 | 0.294 | 0.199 | 0.148 | 0.323 | 0.417 | |
| | Z @0.25P | 2.64mm | 4.82mm | 5.34mm | 7.89mm | 10.62mm | 4.86mm | 3.77mm | |

NA: Calculated value on axis

N₀: On-axis refractive index / not guaranteed

√A: Index gradient constant nominal value

Z: Lens length with 0.25 pitch at lens center, nominal value



Common Characteristics :

| Item | Specification | Notes |
|---|--------------------------------------|--|
| Transmittance | 89% min. | Wavelength : 380-2000nm, 5mm, uncoated |
| Polarization Preservation | 0.99 | Non-stressed state |
| Effective diameter | Approx. 60-70% of lens Diameter | |
| Index Gradient Constant \sqrt{A} Tolerance | $\pm 2.5\%$ max. | Between ion exchange batches |
| | $\pm 0.75\%$ max. | Within same ion exchange batch |
| Lens Diameter Tolerance | +0.005/-0.01mm | For all SMLs except SLW3.0 and 4.0 |
| | +0/-0.02mm | For SLW-3.0 and SLW-4.0 |
| Lens Length Tolerance | +0/-0.04mm | Machining and polishing tolerance |
| End Facet Perpendicularity | 6 mrad. max. | |
| Ellipticity | 3um | Dmax-Dmin |
| Glass Material | Oxide Glass | |
| Young's Modulus | 6000 - 8000 Kgf/mm ² | Typical |
| Thermal Expansion Coefficient | $10 \times 10^{-6}/^{\circ}\text{C}$ | Typical |

Surface Quality (inspected at x20 mag.) :

| Item | Specification |
|----------------------|--|
| Pinholes / Particles | Defects greater than 30um in diameter are not allowed. Defects smaller than 10um in diameter are allowed. Up to three defects with diameter between 10um and 30um are allowed. |
| Scratches | Scratches wider than 5um are not allowed. Scratches narrower than 2u are allowed. Up to three scratches with 5um max. width and 200um max. length are allowed. |
| Chippings | Chippings are not allowed within the concentric area of 90% of the lens diameter. |

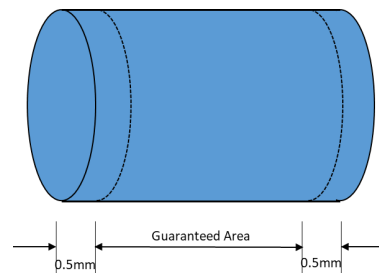
Options :

Metallization

Metallization of the side surface allows the user to solder the lens into a housing. The purpose is to create a hermetic seal and to provide greater bonding strength than epoxy bonding.

We have 2types of Metallization, one is M-Meta that is good for Pb/SN solder(relatively old solder) and other is U-Meta that is good for Au/Sn solder(high temperature).

| Item / Type | M-Type | U-Type |
|-------------------------|--------------------------------|---------------------------------|
| Application | Pb/Sn Solder | Au/Sn Solder |
| Configuration | Cr : $500 \pm 150\text{\AA}$ | Ti : $1000 \pm 200\text{\AA}$ |
| | Pt : $500 \pm 150\text{\AA}$ | Pt : $1500 \pm 200\text{\AA}$ |
| | Au : $6000 \pm 1000\text{\AA}$ | Au : $5000 \pm 1000\text{\AA}$ |
| Max. Solder Temperature | 230°C x 10sec | 380°C x 120sec (in Nitrogen) |

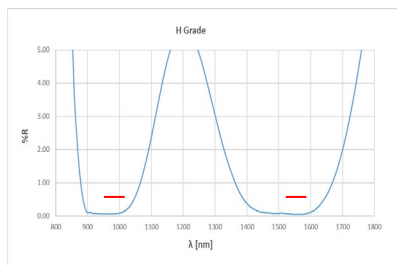
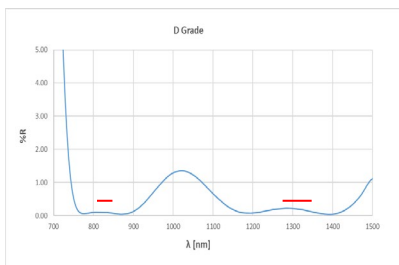
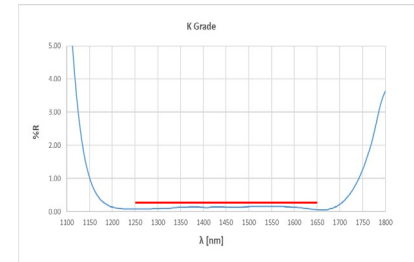
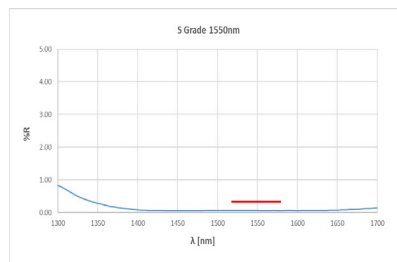
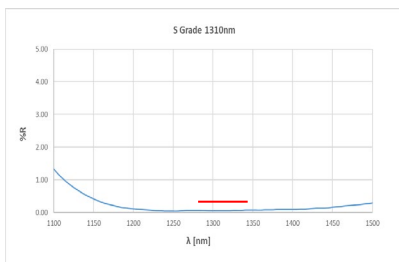
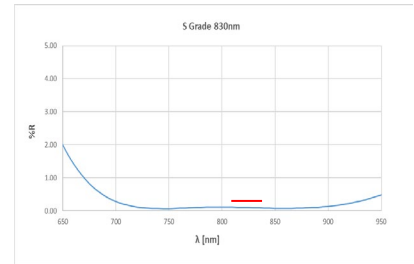
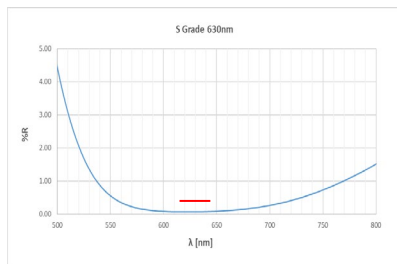
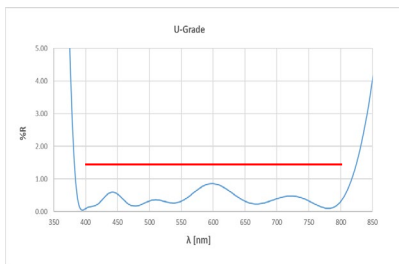


AR Coating

AR coating reduce the amount of light lost due to Fresnel reflection at the lens surfaces. They also help to protect the lens surfaces from humidity, chemical reaction, and physical damage. Five grades of coating(S, K, U, H, D) are available, each with its unique characteristics. The coating are optimized for specific wavelength(s).

| Item / Coating Type | None-Coated | S-Grade | | U-Grade | K-Grade | D-Grade | H-Grade |
|----------------------------------|-----------------------------------|------------------------------|--------------------------------|-------------|--------------|--------------------------------|--------------------------------|
| Wavelength range | - | 630nm ± 15nm 830nm ± 15nm | 1310nm ± 30nm 1550nm ± 30nm | 600 ± 200nm | 1400 ± 200nm | 830 ± 15nm & 1310 ± 30nm | 980 ± 30nm & 1550 ± 30nm |
| Maximum Reflection per surface | 4 ~ 6% | 0.25% | | 1.50% | 0.20% | 0.50% | |
| Coating Structure | Multilayer Metal Oxide | | | | | | |
| Maximum Temperature | 350°C | 200°C x1000hrs | | | | | |
| Maximum Humidity and Reliability | Not recommended for high humidity | 85°C/85%RH 1000hrs | | | | | |

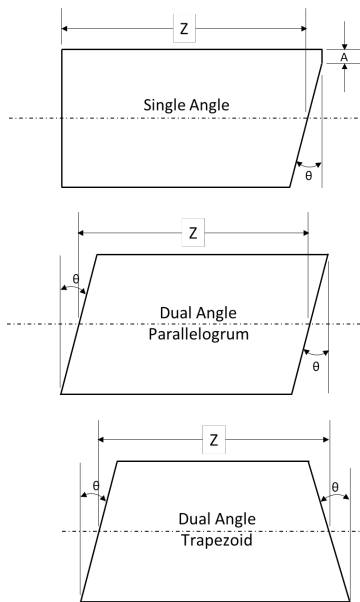
Typical AR Spectrum



Angled Facet

Angling one or more of the lens facets can effectively reduce back reflection from the surface(s). This option is available for all SELFOC Microlens (SML) with OD of 1.0, 1.8 and 2.0mm. There are two types of angled facets available. With the Single-Angle option, one lens facet is tilted while the other remains perpendicular to the optical axis. With the Double-Angle Option, we can offer 'Parallelogram' that is both facets are tilted identically such that they remain parallel to each other and 'Trapezoid' that is

- . Back reflection can be further minimized with the use of AR coating.



Ordering Guide:



SML Type Side Coating Lens Type Lens Diameter Variable Pitch Variable Cutting Wavelength Side A Side B AR Coating Angle A Angle B Shape

| SML TYPE | |
|----------|------------------|
| Code | Code Description |
| P | Plano |
| X | Angled |

| Side Coating | |
|--------------|------------------|
| Code | Code Description |
| N | No Coating |
| U | U-Metallization |
| M | M-Metallization |

| Lens Type | |
|-----------|------------------|
| Code | Code Description |
| C | C-Type |
| W | W-Type |
| H | H-Type |

| Lens Diameter | |
|---------------|------------------|
| Code | Code Description |
| 10 | 1.0 mm |
| 18 | 1.8 mm |
| 20 | 2.0 mm |
| 30 | 3.0 mm |
| 40 | 4.0 mm |

| Variable Pitch | |
|--|------------------|
| Code | Code Description |
| S | Maximum Root A |
| 4 Numeric Value of the Pitch, format follows sample below: | |
| Sample Code | Code Description |
| 0250 | 0.250 Pitch |
| 0245 | 0.245 Pitch |

| Variable Cutting Wavelength | |
|--|------------------|
| 3 Numeric Value of the Cutting Wavelength. | |
| Format follows sample below: | |
| Sample Code | Code Description |
| 063 | 630 nm |
| 083 | 830 nm |
| 131 | 1310 nm |
| 155 | 1550 nm |

| AR Coating Type | |
|-----------------|------------------|
| Code | Code Description |
| 0 | 630 nm |
| 3 | 830 nm |
| 7 | 1310 nm |
| 8 | 1550 nm |
| N | Not Applicable |

| Lens Angle | |
|------------|------------------|
| Code | Code Description |
| 0 | Flat |
| 8 | 8° |

| Angle Shape | |
|-------------|------------------|
| Code | Code Description |
| T | Trapezoid |
| P | Parallel |

| AR COATING | | | |
|------------|---------------------|---------|---------------------------------|
| Code | Center Wavelength | Range | Optical Performance (Each Side) |
| K | 1450 nm | ±200 | R ≤ 0.20 % |
| | 630 nm | ±15 | R ≤ 0.25 % |
| | 830 nm | ±15 | R ≤ 0.25 % |
| | 1310 nm | ±40 | R ≤ 0.25 % |
| S | 1550 nm | ±40 | R ≤ 0.25 % |
| | 830/1310 nm | ±15/±30 | R ≤ 0.50 % |
| H | 980/1550 nm | ±30 | R ≤ 0.50 % |
| U | 600 nm | ±200 | R ≤ 1.50 % |
| P | Passivation Coating | | |
| N | NON COAT | | |

