Fast-Axis Collimation / Fast-Axis Imaging
FAC and FAI lenses

QUALITY STANDARDS

INGENERIC offers Fast-Axis Collimation optics with different quality levels. Due to our frequent development efforts to optimize our processes, we manage to constantly enhance the quality of our products. Based on these developments, today we offer several of our products solely in the premium quality grades – and thanks to our sound manufacturing process without cost impact for our customers.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Angle of +/- D [mrad]</th>
<th>Brightness</th>
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<tbody>
<tr>
<td>HB</td>
<td>High Brightness</td>
<td>power within an angle of +/- D [mrad]</td>
<td>&gt; 85%</td>
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<tr>
<td>XB</td>
<td>Extra-High Brightness</td>
<td>power within an angle of +/- D [mrad]</td>
<td>&gt; 90%</td>
</tr>
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</table>

On request – Contact us to learn more!

SERVICE

We also design, develop and manufacture customized FAC lenses, which have been optimized to meet the specific requirements of your application.

- customized numerical aperture, focal length and back focal length
- customized length (max. 14.0 mm)
- customized coating (app. 400 nm ... 2100 nm, broad or small band)

AUTOMATED ASSEMBLY

In order to simplify mounting, we also offer the FAC lenses with additional surfaces for mounting and/or support structures. Benefit from our automated assembly process.

Advantages

- highest precision and reproducibility by using a camera system
- no damage risk by manual handling process
- no damage risk by assembly devices used during manual handling process
- position accuracy in micrometer range
- assembly and packaging in clean environment
- 100% measurement of dimension
- package usable for automated parts removal

Example Products

FAC08-600 on BT
Dimension of module:
L: 11.00 mm
T: 1.00 mm
H: 2.00 mm

FAC08-600 on BT
Dimension of module:
L: 10.30 mm
T: 1.00 mm
H: 1.50 mm
**GENERAL DESCRIPTION**

The most important optical component in the beam shaping systems in high-power diode lasers is the Fast-Axis Collimation optic. The lenses are manufactured from high-quality glass and have an acylindrical surface. Their high numerical aperture permits the entire diode output to be collimated with outstanding beam quality. The high transmission and excellent collimation characteristics guarantee the highest levels of beam shaping efficiency for diode lasers.

By means of an FAI lens, the emitter can be directly imaged into a fiber or a target plane. The design of INGENERIC’s FAI lenses is optimized for this specific application and allows an efficient and aberration-free imaging of the emitter.

**PRODUCT SPECTRUM**

In order to offer the best solution for your application INGENERIC provides a broad spectrum of Fast-Axis Collimation optics from the shelf. Years of development allow us to provide optimized acylindrical lenses for different applications. Based on our sophisticated technologies and substantial experience we are further able to provide FAC lenses with 90° deflection.

With respect to length or support structures the lenses can be tailored to your specific needs. For details please refer to the technical specifications on the following pages.

**QUALITY**

We operate a strict quality policy. The beam profile, residual divergence and geometry along the longitudinal axis is characterized as it moves along the production line. By conducting measuring operations along the beam path, we ensure that there will be no deviation from these measured beam characteristics when the optic is subsequently used in industrial practice. In conjunction with our advanced manufacturing technology, this guarantees that our lenses are free of side lobes or smile.

Details are available on request.

**ADVANTAGES**

- application-optimized design
- high numerical aperture (NA 0.8)
- diffraction-limited collimation
- transmission up to 99%
- highest level of precision and uniformity
- manufacturing process is highly economical for large quantities
- reliable and stable quality

**SPECIFICATION DATA**

<table>
<thead>
<tr>
<th>Lens Type FAC</th>
<th>NA</th>
<th>EFL [mm]</th>
<th>BFL [mm]</th>
<th>L [mm]</th>
<th>H [mm]</th>
<th>CT [mm]</th>
<th>XB</th>
<th>D [mrad]</th>
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<td>2.47</td>
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<tr>
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<td>x</td>
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**Material**

- FAC06-150: K-VC89 / Standard Optics
- FAC07-300: K-VC89 / Special Solutions
- FAC06-600: K-VC89 / Special Solutions
- FAC06-1500: K-VC89 / Special Solutions

**Lens Type Special Products**

<table>
<thead>
<tr>
<th>Lens Type FAC</th>
<th>NA</th>
<th>EFL [mm]</th>
<th>BFL [mm]</th>
<th>L [mm]</th>
<th>H [mm]</th>
<th>CT [mm]</th>
<th>Mag. Image Dist. [mm]</th>
<th>XB</th>
<th>D [mrad]</th>
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<tbody>
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<td>FAC06-1500</td>
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<td>0.97</td>
<td>14.0</td>
<td>2.30</td>
<td>3.71</td>
<td>x</td>
<td>0.36</td>
<td></td>
</tr>
</tbody>
</table>

**Material**

- FAC06-1200: K-VC89
- FAC06-1500: K-VC89 / Standard Optics
- FAC06-1500: K-VC89 / Special Solutions
- FAC06-1200: K-VC89 / Special Solutions

**Quality specification for laser bar with divergence of 35° (FWHM)**

**NA:** Numerical aperture
**EFL:** Effective focal length @ 808 nm
**BFL:** Back focal length @ 808 nm
**Coating:** Standard AR 780-1020 nm
**Transmission:** > 99%
**L:** Length [± 0.10 mm] according to customer specification
**H:** Height (N-LaF21: ± 0.01 mm; K-VC89: ± 0.02 mm)
**CT:** Center Thickness (N-LaF21: ± 0.01 mm; K-VC89: ± 0.02 mm)
**Material:** K-VC89, N-LaF21
**Refractive Index n @ 808 nm:** 1.77584

* available as of 2019
** Collimation of SA for Single Emitter

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FAC and FAI Lenses
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<th>H [mm]</th>
<th>CT [mm]</th>
<th>XB</th>
<th>D [mrad]</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAC06-150</td>
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<td>0.03</td>
<td>tbd.</td>
<td>0.70</td>
<td>0.22</td>
<td>x</td>
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<tr>
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<td>0.08</td>
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<td>0.49</td>
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<td>0.70</td>
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Material: K-VC89 / Special Solutions

Material N-LaF21

**Lens Type Special Products**

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<th>Lens Type Special Products</th>
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<th>BFL [mm]</th>
<th>L [mm]</th>
<th>H [mm]</th>
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<th>Mag. Image Dist. [mm]</th>
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Material: N-LaF21

Material K-VC89

**Material**

- K-VC89 / Standard Optics
- N-LaF21
- Special Solutions

**Refractive Index n @ 808 nm**

- K-VC89: 1.77584
- N-LaF21: 1.78084

**Quality specification for laser bar with divergence of 35° (FWHM)**

<table>
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<th>Lens Type FAC</th>
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<th>BFL [mm]</th>
<th>L [mm]</th>
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**Material**

- K-VC89, N-LaF21

**Collimation of SA for Single Emitter**

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<th>Lens Type FAC</th>
<th>NA</th>
<th>EFL [mm]</th>
<th>BFL [mm]</th>
<th>L [mm]</th>
<th>H [mm]</th>
<th>CT [mm]</th>
<th>HB</th>
<th>XE</th>
<th>D [mrad]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PriFAC-06-1200-TIR</td>
<td>0.60</td>
<td>1.20</td>
<td>0.15</td>
<td>14.0</td>
<td>1.93</td>
<td>2.25</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Material**

- K-VC89, N-LaF21

**Collimation of SA for Single Emitter**

**Material**

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**Material**

- K-VC89, N-LaF21
**Fast-Axis Collimation / Fast-Axis Imaging**

**FAC and FAI lenses**

**QUALITY STANDARDS**

INGENERIC offers Fast-Axis Collimation optics with different quality levels. Due to our frequent development efforts to optimize our processes, we manage to constantly enhance the quality of our products. Based on these developments, today we offer several of our products solely in the premium quality grades – and thanks to our sound manufacturing process without cost impact for our customers.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Angular Range</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB</td>
<td>High Brightness</td>
<td>power within an angle of +/- D [mrad]</td>
<td>&gt; 85%</td>
</tr>
<tr>
<td>XB</td>
<td>Extra-High Brightness</td>
<td>power within an angle of +/- D [mrad]</td>
<td>&gt; 90%</td>
</tr>
</tbody>
</table>

On request – Contact us to learn more!

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Angular Range</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXB</td>
<td>Super-High Brightness</td>
<td>power within an angle of +/- D [mrad]</td>
<td>&gt; 95%</td>
</tr>
</tbody>
</table>

**SERVICE**

We also design, develop and manufacture customized FAC lenses, which have been optimized to meet the specific requirements of your application.

- customized numerical aperture, focal length and back focal length
- customized length (max. 14.0 mm)
- customized coating (app. 400 nm … 2100 nm, broad or small band)

**AUTOMATED ASSEMBLY**

In order to simplify mounting, we also offer the FAC lenses with additional surfaces for mounting and/or support structures. Benefit from our automated assembly process.

**Advantages**

- highest precision and reproducibility by using a camera system
- no damage risk by manual handling process
- no damage risk by assembly devices used during manual handling process
- position accuracy in micrometer range
- assembly and packaging in clean environment
- 100% measurement of dimension
- package usable for automated parts-removal

**Example Products**

**FAC08-600 on BT**
Dimension of module:
L: 11.00 mm
T: 1.00 mm
H: 2.00 mm

**FAC08-600 on BT**
Dimension of module:
L: 10.30 mm
T: 1.00 mm
H: 1.50 mm