

## a|BeamTuning

The next level of beam expansion and beam shaping.

**tu·ning** [*ˈtjuːnɪŋ*], to adjust something for maximum usability or performance

asphericon BeamTuning means beam expansion and beam shaping at the highest level. Therefore, we developed a comprehensive range of laser beam processing elements. Discover the world's first aspheric and diffraction-limited beam expansion system as well as some brand new beam shaping components. With an intelligent mounting concept, no adjustment is needed. All BeamTuning elements can be combined according to your requirements, e.g. in the field of metrology and laser material processing.



## a|BeamExpander

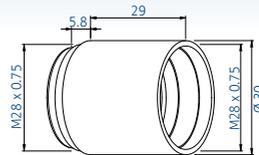
The world's first aspheric BeamExpanders are the right choice when it comes to high-power beam expansion or reduction with outstanding quality. Combine BeamExpanders with all elements of the BeamTuning selection for highest accuracy and choose between different design wavelengths [532 nm / 632 nm / 780 nm / 1064 nm] to achieve up to 32x diffraction-limited beam expansion. Also benefit from beam tuning optimized for Nd:YAG laser [355 nm] with the BeamExpander UV made of Suprasil.

### Key features

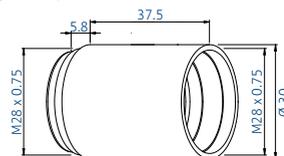
- = Monolithic beam expander with just one aspheric lens for the highest level of precision
- = Available with expansions of 1.5 | 1.75 | 2.0
- = Combining up to five expanders for up to 32x beam expansion and over 230 intermediate stages - completely diffraction-limited
- = Laser induced damage threshold: 12 J/cm<sup>2</sup>, 100 Hz, 6 ns, 532 nm
- = Input aperture 10.6 - 14.7 mm, output aperture 22.5 mm
- = Intelligent assembly concept for easy handling

### Technical dimensions [mm]

a|BeamExpander [532 nm - 1064 nm]



a|BeamExpander UV [355 nm]



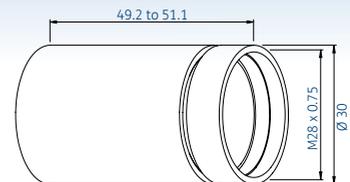
## a|Waveλdapt

The Waveλdapt allows the use of BeamExpanders with wavelengths other than one of the four basic wavelengths [532 nm / 632 nm / 780 nm / 1064 nm]. This element adjusts divergence and corrects wavefront deformation while retaining the beam diameter. Due to its metric fine thread the Waveλdapt, like all BeamTuning elements, can be easily integrated into any optical system.

### Key features

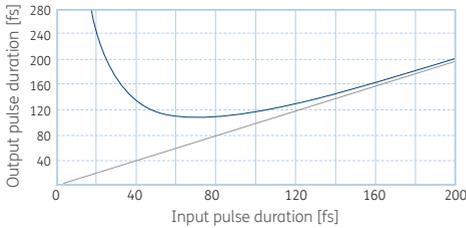
- = Optimized adaptation to any wavelength from 500 nm to 1600 nm
- = Compensation of divergent incoming beams up to 1 mrad
- = Combinable with up to five BeamTuning elements - completely diffraction-limited
- = Preservation of adjusted magnification
- = Input aperture 22.5 mm, output aperture 22.5 mm
- = Easy and flexible handling

### Technical dimensions [mm]



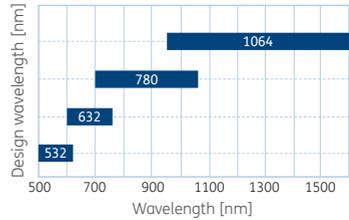
### Effect on ultrashort laser pulses

Broadening of a femtosecond pulse after propagation through one BeamExpander for a wavelength range from 500 nm to 1600 nm.



### Wavelength range

Covered range of wavelengths for the design wavelengths [nm] 532, 632, 780, 1064 when using the corresponding Waveλdapt.



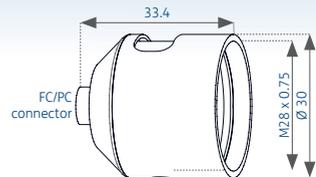
## a|AspheriColl

The AspheriColl, an adjustable fiber collimation device, enables the perfect alignment of FC/PC patch fibers to beam expansion set up. When combining this element with BeamTuning or other beam shaping elements you can get any desired output beam while maintaining a diffraction-limited wavefront. Choosing from the two available focal lengths the basic beam diameter is set as shown in the graph below.

### Key features

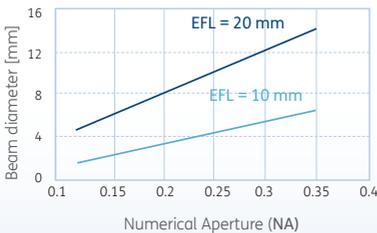
- = Flexible choice of output beam diameter in combination with BeamExpanders and other BeamTuning elements
- = Simple mounting via metric fine thread
- = Perfectly aligned lateral position
- = Completely diffraction-limited performance (Strehl > 0.95) when used with FC/PC patch fibers
- = Focal length  $f = 10$  mm,  $\varnothing_e = 10$  mm;  $f = 20$  mm,  $\varnothing_e = 14$  mm

### Technical dimensions [mm]



### Output beam diameter

Collimation of output of single mode fiber with NA of 0.12 until 0.35; pre-aligned for the wavelengths [nm] 532, 632, 780 and 1064.



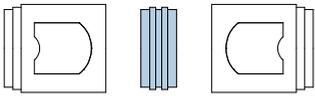
### Wavelength range

Covered range of wavelengths of the AspheriColl for the design wavelengths [nm] 532, 632, 780, 1064.

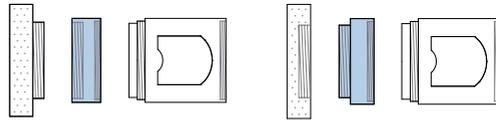


## a|Adapter

Connect the BeamTuning elements conveniently to any optical setup with the matching Adapters. Utilize the intra-system Adapters to use BeamExpanders in both functional directions (expansion or reduction of beam diameter). The cross-system Adapters (C-Mount, SM1, 1.2" circumference) guarantee a high level of compatibility with the setup of other optical systems – without additional adjustment.



a|Adapter intra-system



a|Adapter cross-system (female/female, male/female)

### Key features

- = Intra-system adapters enable easy combination of BeamTuning elements
- = Easy integration of the BeamExpander into any optical system through a variety of mounting concepts by using asphericon cross-system adapters (e.g. with systems from Qioptiq, Edmund Optics or Owis)

### a|Adapters cross-system

Adapter type	Product code	Thread type
C-Mount male	UAM25-28-C-MIO	female/male
C-Mount female	UAM25-28-C-MII	female/female
SM1 male	UAM25-28-SM1-MIO	female/male
SM1 female	UAM25-28-SM1-MII	female/female
1.2" circumference	UAM25-28-1.2in-MII	female/female
Intra-System	UAM25-28-A-MOO	male/male

## Certificate / Configurator

### Certificate

For each BeamTuning component a certificate based on high-resolution wavefront measurement (300 x 400 pts) guarantees diffraction-limited performance.



### a|BeamExpander Configurator

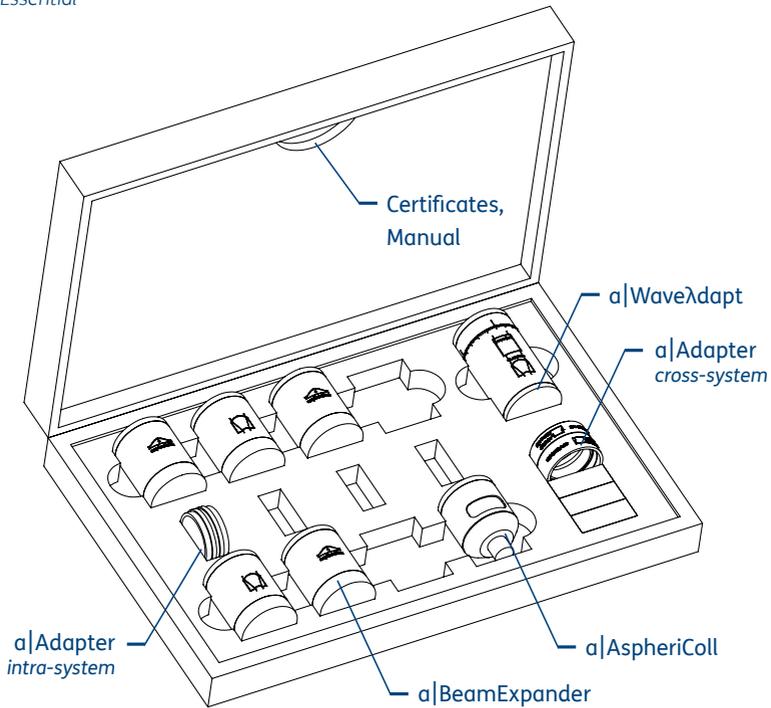
Selected expansion steps and the combination of BeamExpanders required.	Expansion	1.5	1.75	2.0
3.00x	1	-	1	
5.25x	1	1	1	
10.5x	1	1	2	
21.0x	1	1	3	
32.0x	-	-	5	

- Download our configurator and easily find the appropriate combination of BeamExpanders for your application:
- = Calculate combinations close to your target expansion
  - = Calculate combinations by a given number of lenses
  - = Calculate the required lenses to get a target expansion

## α|BeamBox

Combine BeamExpander with matching adapters, AspheriColl and/or Waveλdapt. With our BeamBoxes, all BeamTuning elements can be flexibly assembled in a set for your individual application.

Example:  
α|BeamBox Essential



### α|BeamBox variations

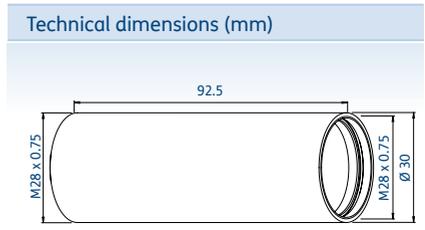
Beam Box	Content (individually combinable)
α BeamBox Essential 355	1 - 8 BeamExpander 355 nm, AspheriColl, Adapter
α BeamBox Essential 532	1 - 8 BeamExpander 532 nm, AspheriColl, Waveλdapt, Adapter
α BeamBox Essential 632	1 - 8 BeamExpander 632 nm, AspheriColl, Waveλdapt, Adapter
α BeamBox Essential 780	1 - 8 BeamExpander 780 nm, AspheriColl, Waveλdapt, Adapter
α BeamBox Essential 1064	1 - 8 BeamExpander 1064 nm, AspheriColl, Waveλdapt, Adapter
α BeamBox TopShape	1 - 5 BeamExpander, TopShape, AspheriColl, Adapter, MountedAspheres/Axicons
α BeamBox AiryShape	1 - 6 BeamExpander, AiryShape, AspheriColl, Adapter, MountedAspheres

# a|TopShape

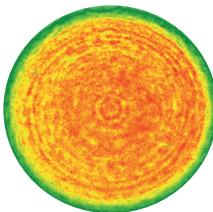


The TopShape is an innovative beam shaper, which transforms collimated Gaussian beams into collimated Top-Hat beams. Not only as a supplement of the BeamExpander, it convinces with its compact design and unbeatable optical performance (homogeneity > 95 %). asphericon's TopShape is the perfect support for your application, e.g. in the field of metrology or microscopy.

Key features
= Unbeatable optical performance (homogeneity > 95 %)
= Large spectral range (350 nm to 1600 nm)
= Accepts varying input beam diameter ( $\pm 10\%$ )
= Stable beam profile > 300 mm (with inhomogeneity < 10%)
= Extremely short overall length (92.5 mm)
= Plug-and-play due to scalable input and output beam in combination with BeamTuning elements
= Perfectly aligned with AspheriColl and BeamExpander
= input beam diameter @ $1/e^2 = 10$ mm; output beam diameter @ FWHM = 14.8 mm (@ 632 nm)
= Laser induced damage threshold: 12 J/cm <sup>2</sup> , 100 Hz, 6 ns, 532 nm

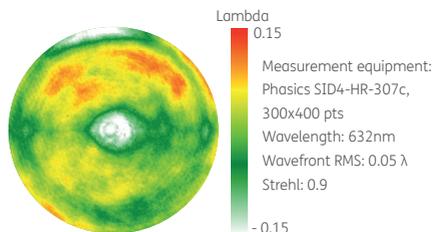


Beam profile measurement
Measured beam profile after passing 12 surfaces, including six aspheres, at a working distance of 100 mm.

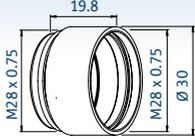


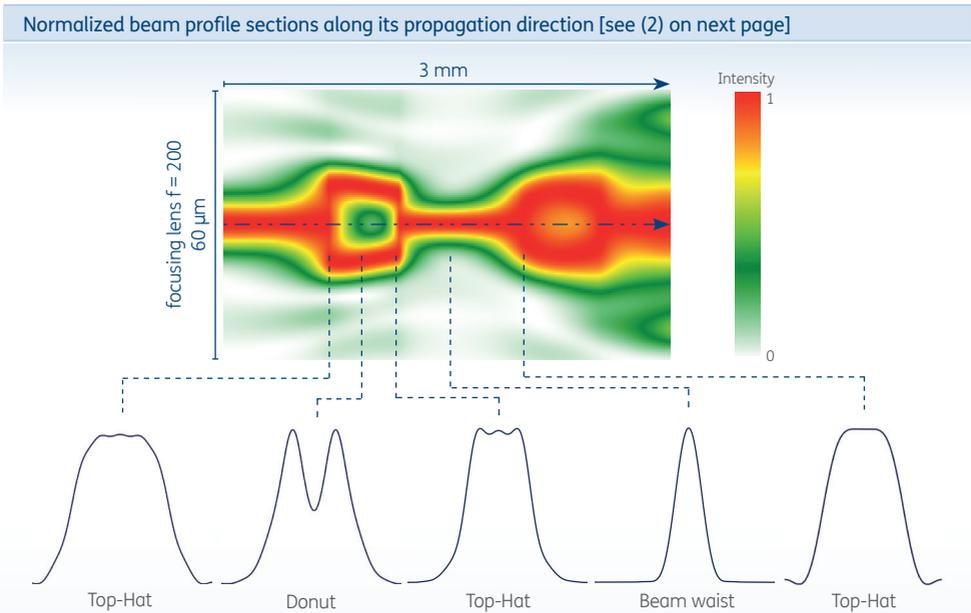
$\lambda = 635$  nm  
ISO Plateau Uniformity = 0.133  
ISO Edge Steepness = 0.4

Wavefront measurement
Measured wavefront after passing 14 surfaces, including seven aspheres [see (1) on last page].



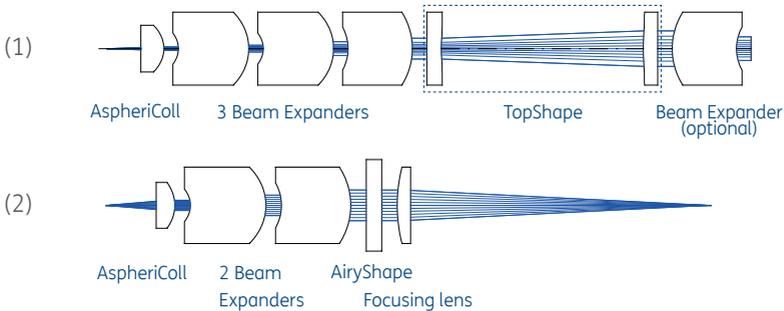
Another beam shaping element optimized for wavelengths from 300 nm up to 1600 nm is the asphericon AiryShape. This beam shaper enables in combination with a focusing lens the transformation of collimated Gaussian beams into different focused beam profiles (e.g. Top-Hat, Donut). Conveniently, use this perfectly aligned BeamTuning element for your application, e.g. in the field of material processing.

Key features	Technical dimensions (mm)
<ul style="list-style-type: none"> <li>= Generation of different beam profiles</li> <li>= Profile size easily scalable by focal length</li> <li>= Optimized for wavelengths from 300 nm to 1600 nm</li> <li>= Easy integration into existing set-ups</li> <li>= Flexible adaption of input and output beam diameter with BeamExpander and AspheriColl</li> <li>= Perfect alignment by high-precision mounting</li> <li>= Compact design</li> <li>= input beam diameter @ <math>1/e^2 = 10</math> mm; output beam diameter <math>d_{\text{Airy}} = 10</math> mm</li> <li>= Laser induced damage threshold: 12 J/cm<sup>2</sup>, 100 Hz, 6 ns, 532 nm</li> </ul>	



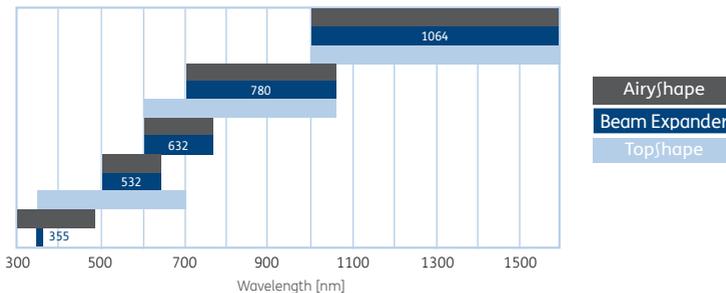
## Perfect Mix & Match

Easily combine TopShape or AiryShape with elements of the BeamBox including a perfect fiber coupling solution. For more possible combinations or an individual solution contact us!



## Wavelength range

Based on the BeamTuning elements the new TopShape and AiryShape cover a wide wavelength range for your challenging application.



Looking for a custom solution?  
Individual optical designs on request.

### asphericon Inc.



+1 - 941 - 564 0890



+1 - 941 - 584 4071



sales@asphericon.com



www.asphericon.com

5500 Bee Ridge Road, Suite 104  
Sarasota, FL 34233  
USA