

These TFL-mount equipped lenses are compact and robust ideal for factory automation applications under harsh conditions. Optimized for high resolution large format sensors, up to 24mm image size and with the Broadband AR coating they can be used in visible (400 to 700 nm) or in NIR (700 to 1000 nm) range. This highspeed lens is ideal for inspection systems and metrology.

## Key features

- Compact
- Robust
- Up to 24 mm image circle
- Anti shading

## Applications

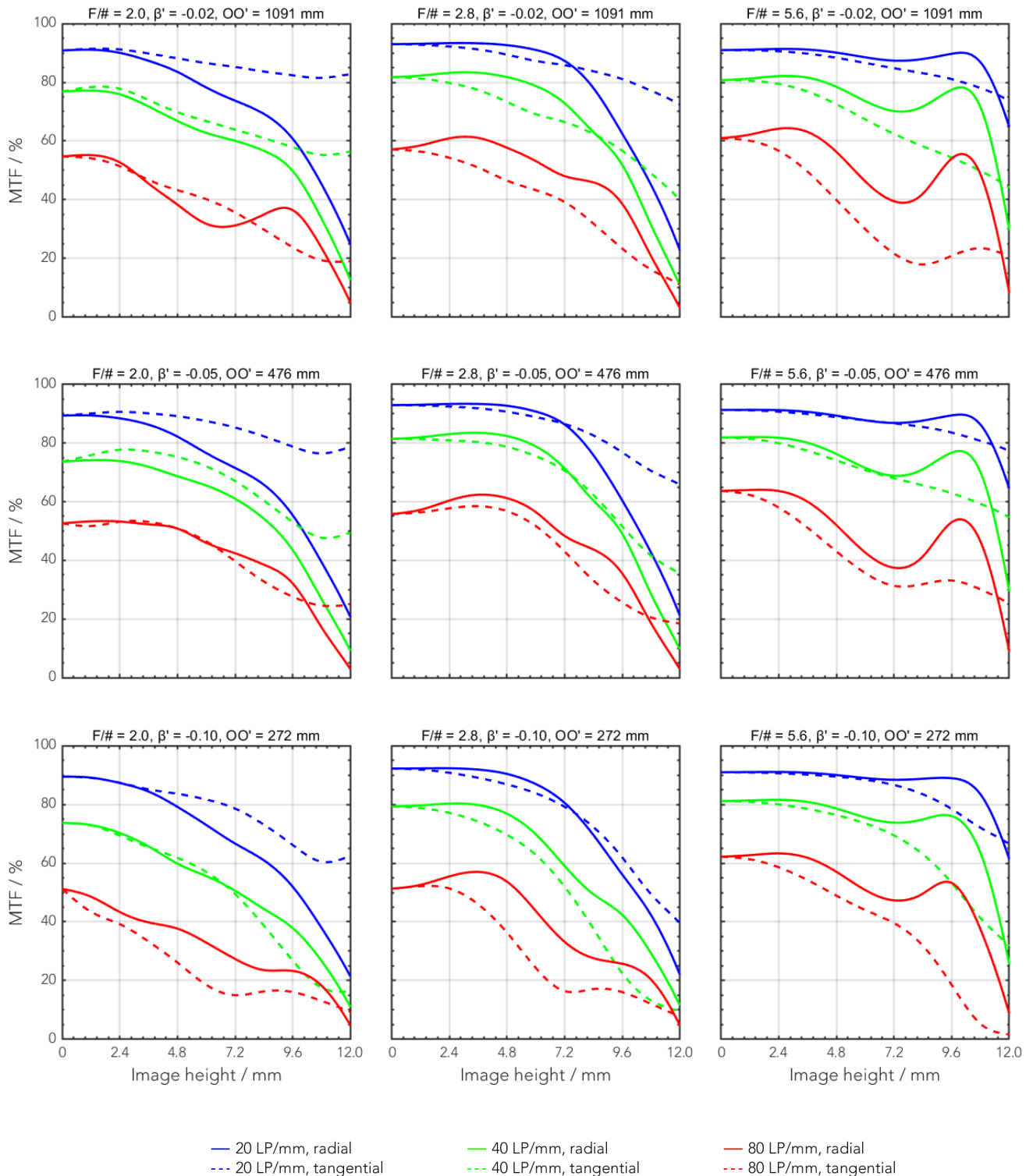
- 3D measurement
- Robotics
- Automation
- Inspection systems

## Technical specifications

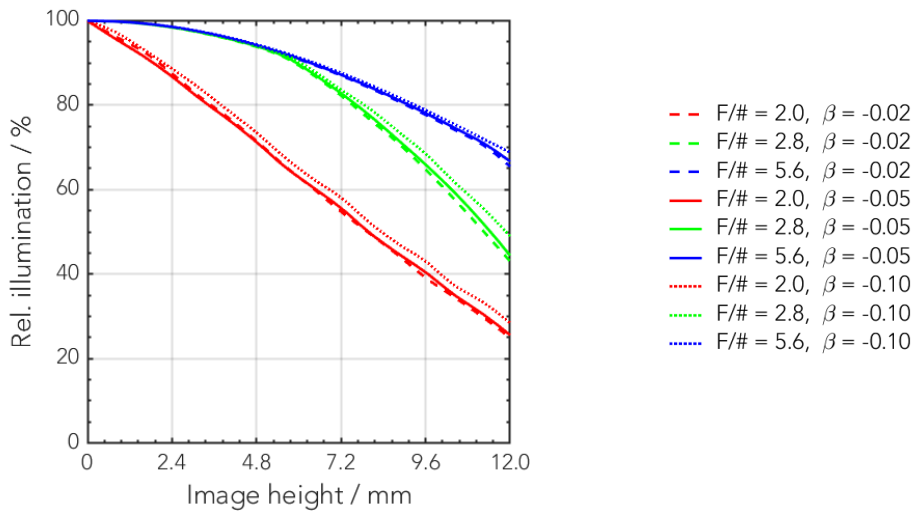
Type	-0021
ID	1098778
Interface	TFI-Mount
Focal length [mm]	20
F/# range	F/2 ... F/16
Numerical aperture	0.24
Max. sensor size [mm]	24
Max. angle of view [°]	62
Rec. magnification range	-0.1 ... 0
Rec. working distance range [mm]	194 ... ∞
Max. mechanical focus travel [mm]	-
Filter thread [mm]	M35.5 x 0.5
Storage temperature [°C]	-25 ... +70
Net. weight [g]	450
Additional info	-
f'eff [mm]	20.52
SF [mm]	5.62
S'F' [mm]	25.02
HH' [mm]	23.19
β'P	2.97
SEP [mm]	12.53
S'AP [mm]	-36.75
Σd [mm]	45.68

## MTF charts

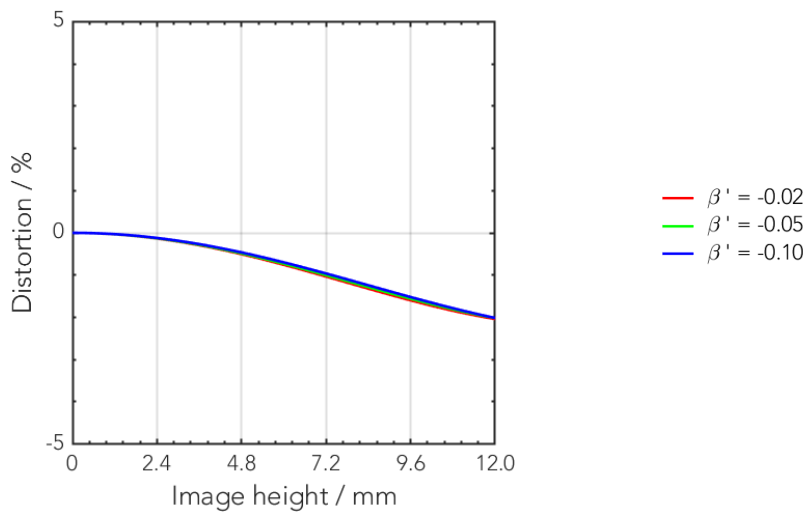
Spectrum name	VIS					
Wavelengths [nm]	425	475	525	575	625	675
Rel. weights [%]	8	16	23	22	19	13



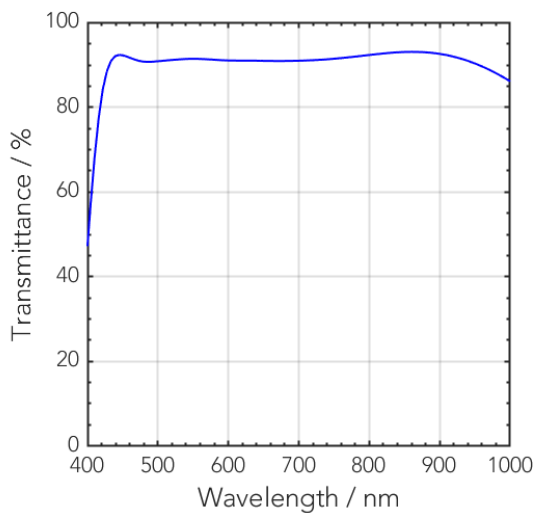
## Rel. illumination vs. image height



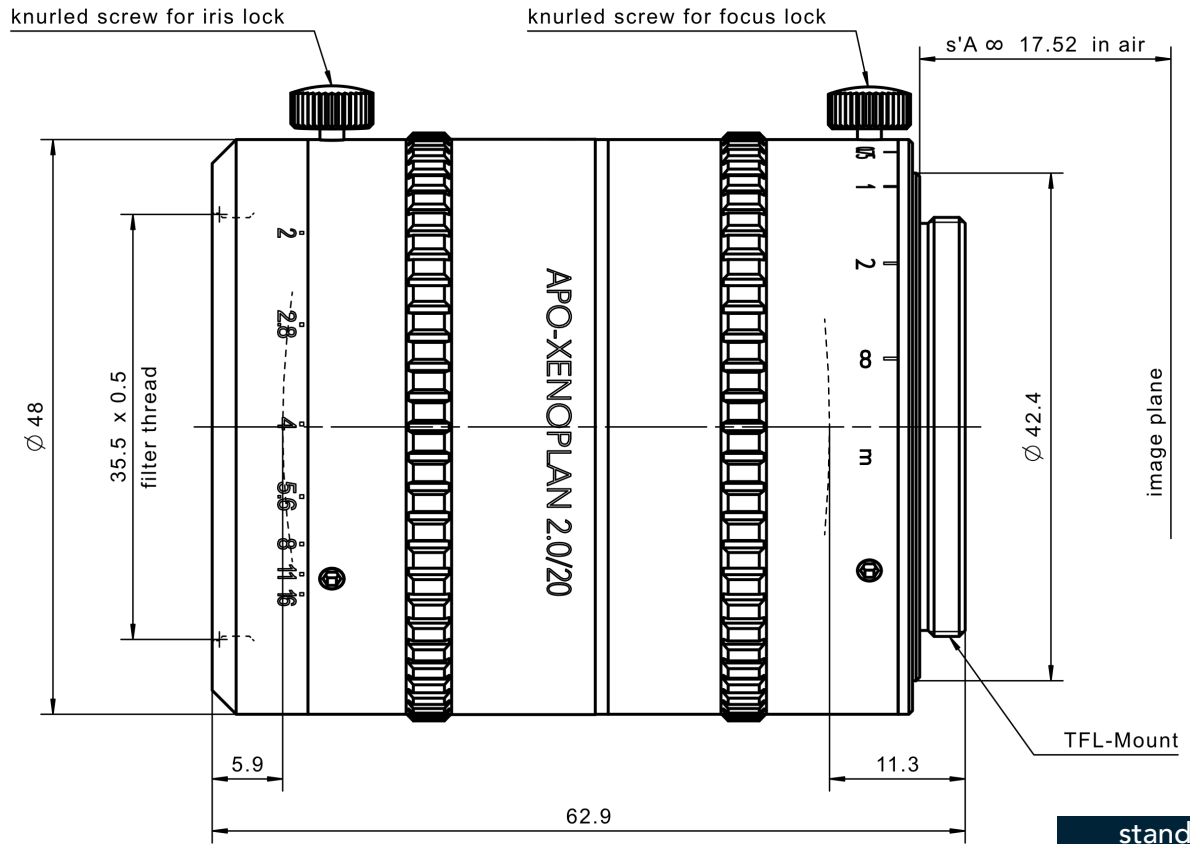
## Distortion vs. image height



## Transmittance vs. wavelength



## Technical drawings



Annotation	
Focal length	Nominal focal length
F/# range	Image space F-number range for infinity focus position
Numerical aperture	Maximum real numerical aperture (depending on recommended magnification range either for infinity or respective fixed magnification)
Max. sensor size	Image circle diameter
Max. angle of view	Angle of view associated with maximum sensor size (depending on recommended magnification range either for infinity or respective fixed magnification)
Rec. magnification range	Magnification range as recommended by Schneider-Kreuznach
Rec. working distance range	Working distance, i.e. distance between object and first mechanical element, associated with recommended magnification range
Max. mechanical focus travel	Maximum possible movement of the lens from infinity position (depending on recommended magnification range either for infinity or respective fixed magnification)
Net weight	weight of unpacked lens without lens cap
$f'_{\text{eff}}$	Effective focal length
SF	Distance between vertex of first lens surface and object space focal point
S'F'	Distance between vertex of last lens surface and image space focal point (back focal distance at infinity)
HH'	Distance between principal planes
$\beta'P$	Pupil magnification (= exit pupil diameter / entrance pupil diameter)
SEP	Distance between vertex of first lens surface and entrance pupil
S'AP	Distance between vertex of last lens surface and exit pupil
$\Sigma d$	Distance between vertices of first and last lens surface
s'A	Flange focal distance (in air) for infinite object distance (depending on recommended magnification range either for infinity or respective fixed magnification)
$\beta'$	Magnification (= image size / object size), negative value because image is inverted
OO'	Distance between object and image

Unless otherwise stated all dimensions in this data sheet are in mm.

## Headquarters Europe

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## Key features

- Compact
- Robust
- Up to 24 mm image circle
- High resolution

## Applications

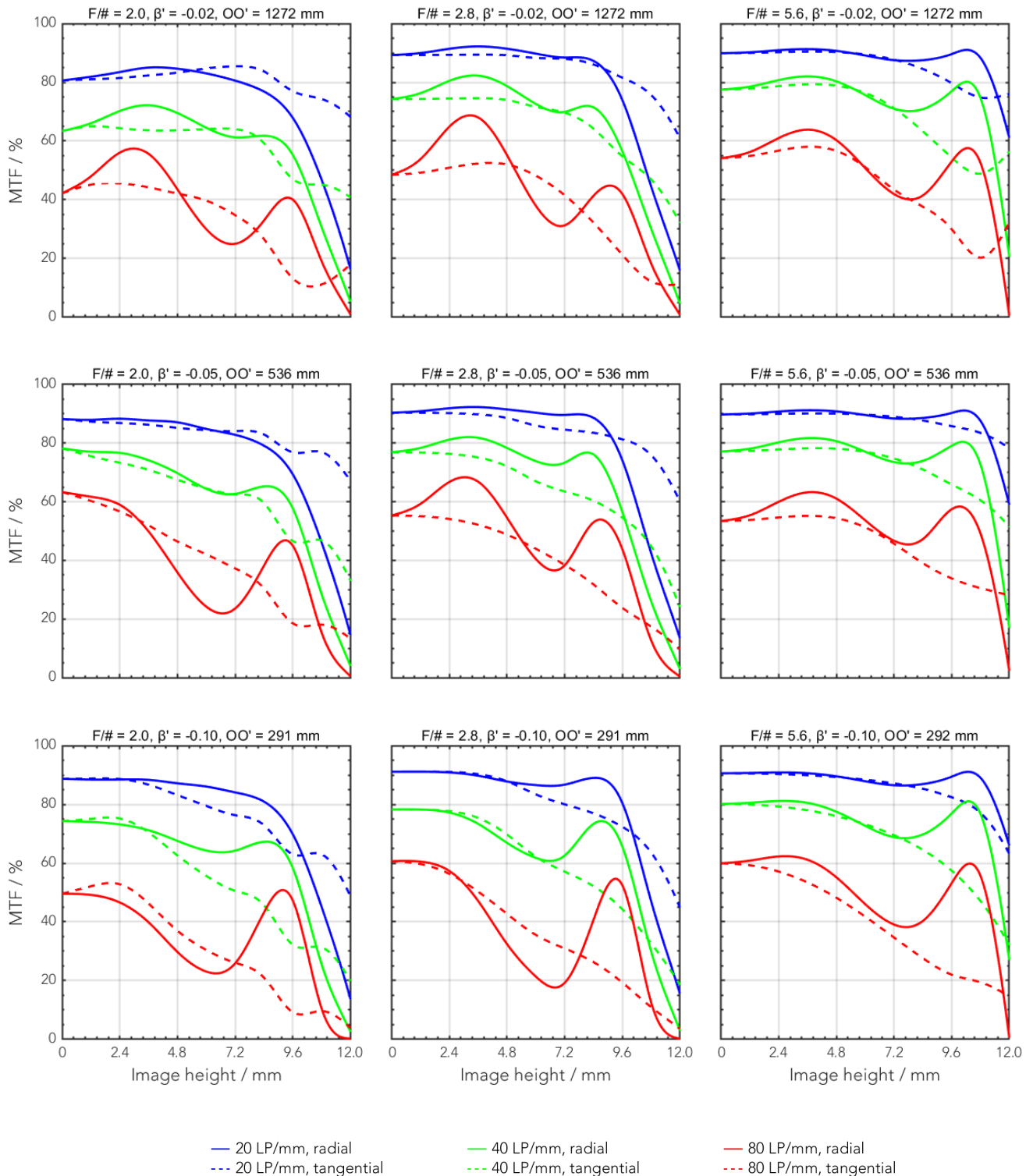
- 3D measurement
- Robotics
- Automation
- Inspection systems

## Technical specifications

Type	-0010
ID	1098692
Interface	TFL-Mount
Focal length [mm]	24
F/# range	F/2 ... F/16
Numerical aperture	0.25
Max. sensor size [mm]	24
Max. angle of view [°]	53
Rec. magnification range	-0.2 ... 0
Rec. working distance range [mm]	111 ... ∞
Max. mechanical focus travel [mm]	5
Filter thread [mm]	M37 x 0.75
Storage temperature [°C]	-25 ... +70
Net. weight [g]	120
Additional info	-
f'eff [mm]	24.51
SF [mm]	0.86
S'F' [mm]	17.73
HH' [mm]	-5.73
β'P	1.94
SEP [mm]	13.51
S'AP [mm]	-29.77
Σd [mm]	26.42

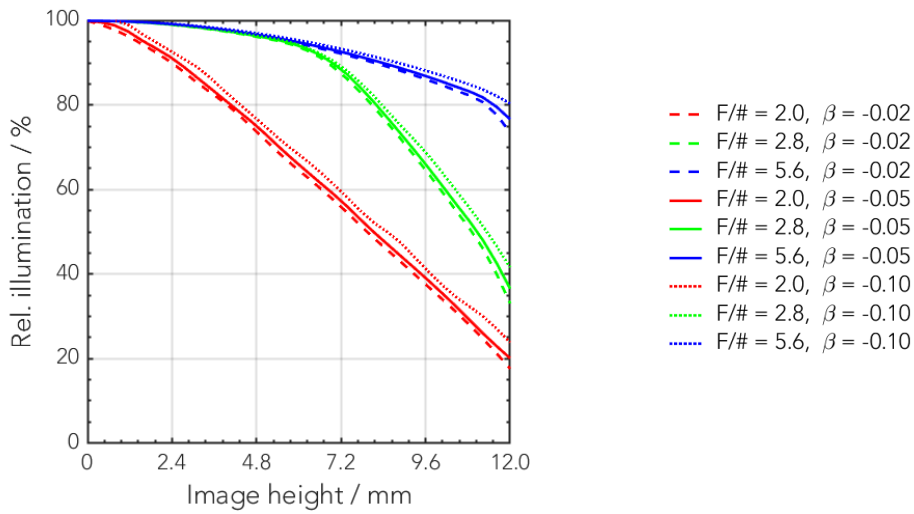
## MTF charts

Spectrum name	VIS					
Wavelengths [nm]	425	475	525	575	625	675
Rel. weights [%]	8	16	23	22	19	13

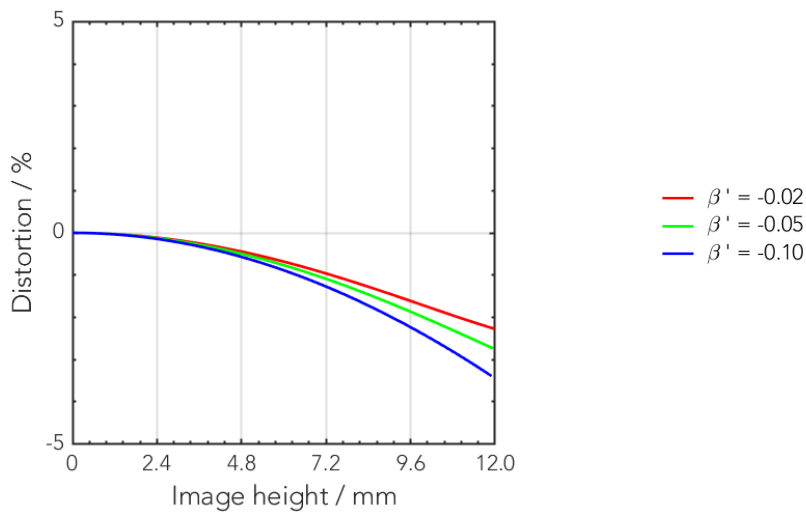




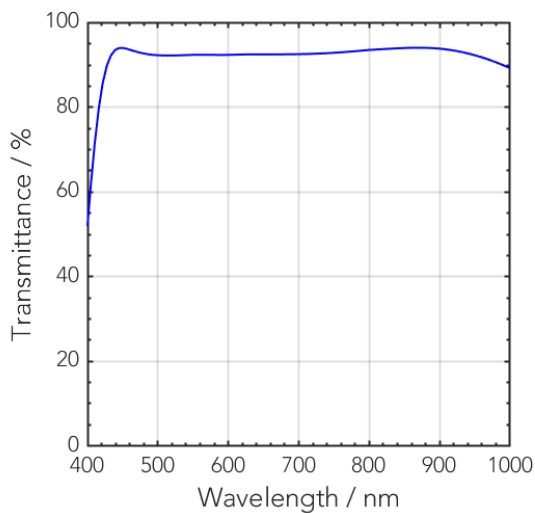
## Rel. illumination vs. image height



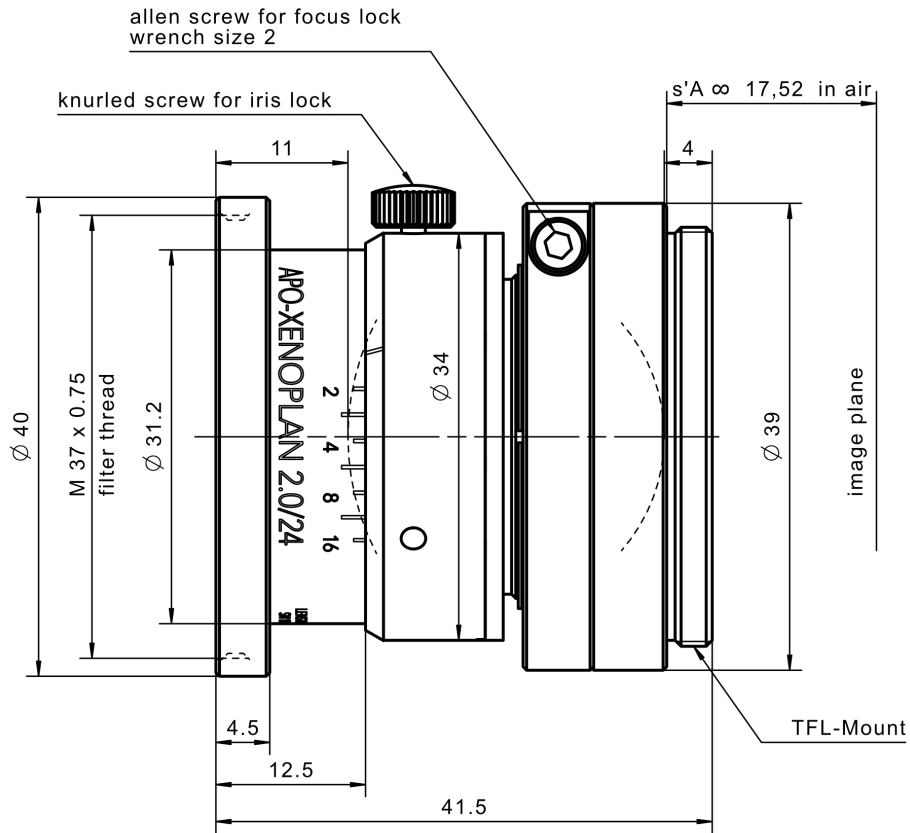
## Distortion vs. image height



## Transmittance vs. wavelength



## Technical drawings



standard

Annotation	
Focal length	Nominal focal length
F/# range	Image space F-number range for infinity focus position
Numerical aperture	Maximum real numerical aperture (depending on recommended magnification range either for infinity or respective fixed magnification)
Max. sensor size	Image circle diameter
Max. angle of view	Angle of view associated with maximum sensor size (depending on recommended magnification range either for infinity or respective fixed magnification)
Rec. magnification range	Magnification range as recommended by Schneider-Kreuznach
Rec. working distance range	Working distance, i.e. distance between object and first mechanical element, associated with recommended magnification range
Max. mechanical focus travel	Maximum possible movement of the lens from infinity position (depending on recommended magnification range either for infinity or respective fixed magnification)
Net weight	weight of unpacked lens without lens cap
$f'_{\text{eff}}$	Effective focal length
SF	Distance between vertex of first lens surface and object space focal point
S'F'	Distance between vertex of last lens surface and image space focal point (back focal distance at infinity)
HH'	Distance between principal planes
$\beta'P$	Pupil magnification (= exit pupil diameter / entrance pupil diameter)
SEP	Distance between vertex of first lens surface and entrance pupil
S'AP	Distance between vertex of last lens surface and exit pupil
$\Sigma d$	Distance between vertices of first and last lens surface
s'A	Flange focal distance (in air) for infinite object distance (depending on recommended magnification range either for infinity or respective fixed magnification)
$\beta'$	Magnification (= image size / object size), negative value because image is inverted
OO'	Distance between object and image

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## Key features

- Compact
- Robust
- Up to 24 mm image circle
- High resolution

## Applications

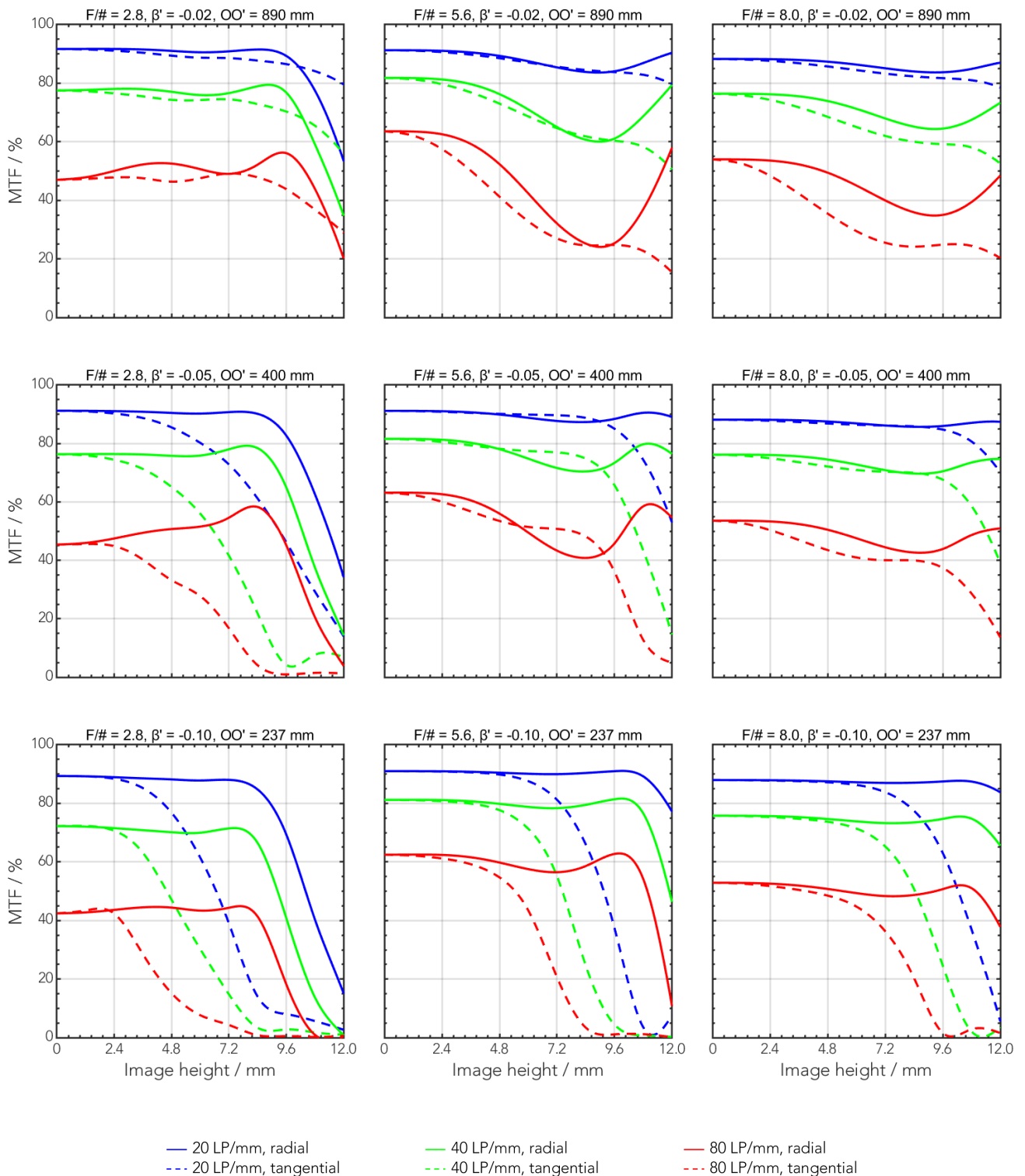
- 3D measurement
- Robotics
- Automation
- Inspection systems

## Technical specifications

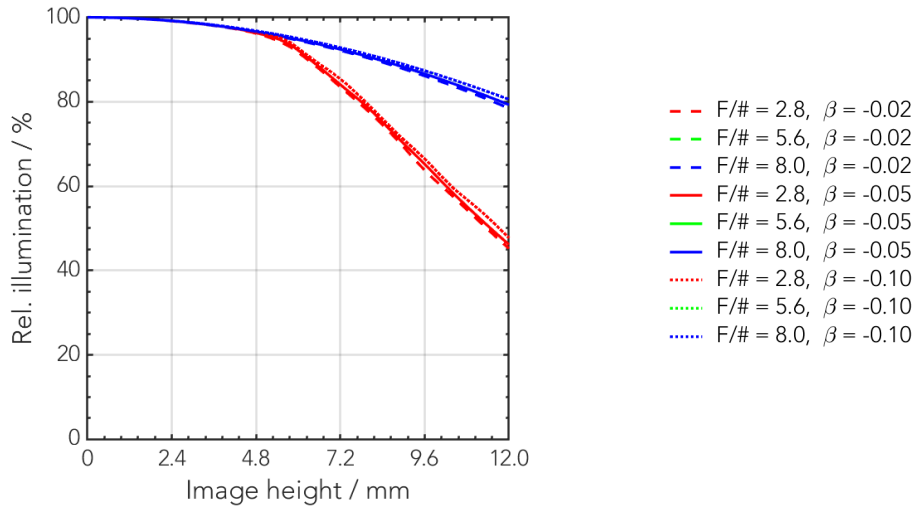
Type	-0004
ID	1098691
Interface	TFL-Mount
Focal length [mm]	16
F/# range	F/2.8 ... F/16
Numerical aperture	0.17
Max. sensor size [mm]	24
Max. angle of view [°]	75
Rec. magnification range	-0.1 ... 0
Rec. working distance range [mm]	150 ... ∞
Max. mechanical focus travel [mm]	4.5
Filter thread [mm]	-
Storage temperature [°C]	-25 ... +70
Net. weight [g]	204
Additional info	-
f'eff [mm]	16.37
SF [mm]	13.14
S'F' [mm]	17.93
HH' [mm]	38.42
β'P	3.43
SEP [mm]	17.92
S'AP [mm]	-38.16
Σd [mm]	66.36

## MTF charts

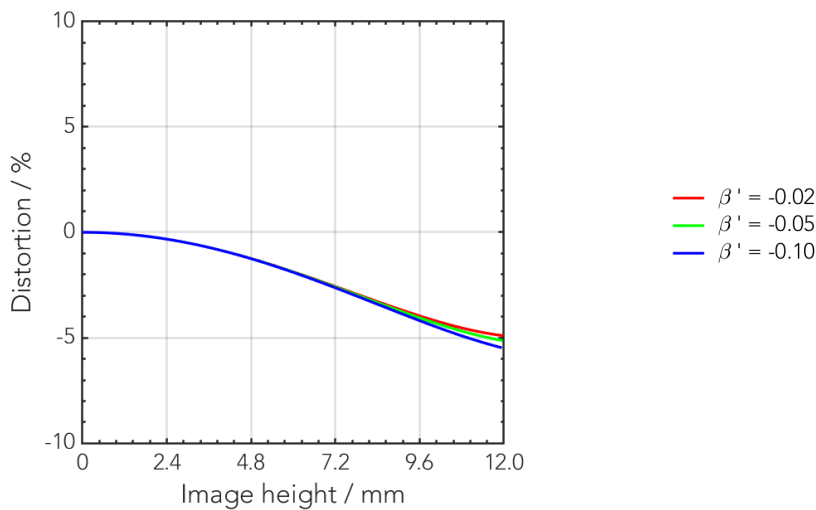
Spectrum name	VIS					
Wavelengths [nm]	425	475	525	575	625	675
Rel. weights [%]	8	16	23	22	19	13



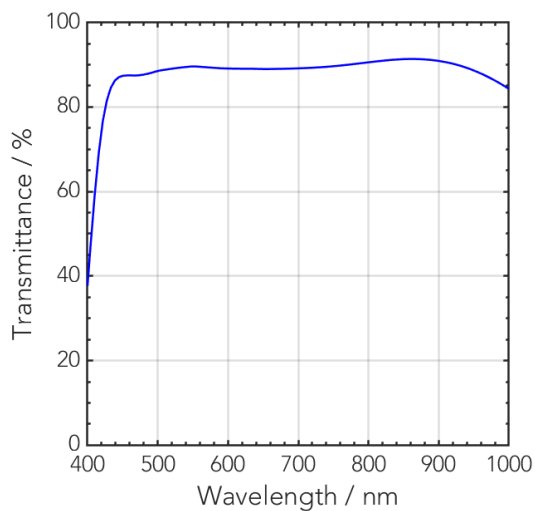
## Rel. illumination vs. image height



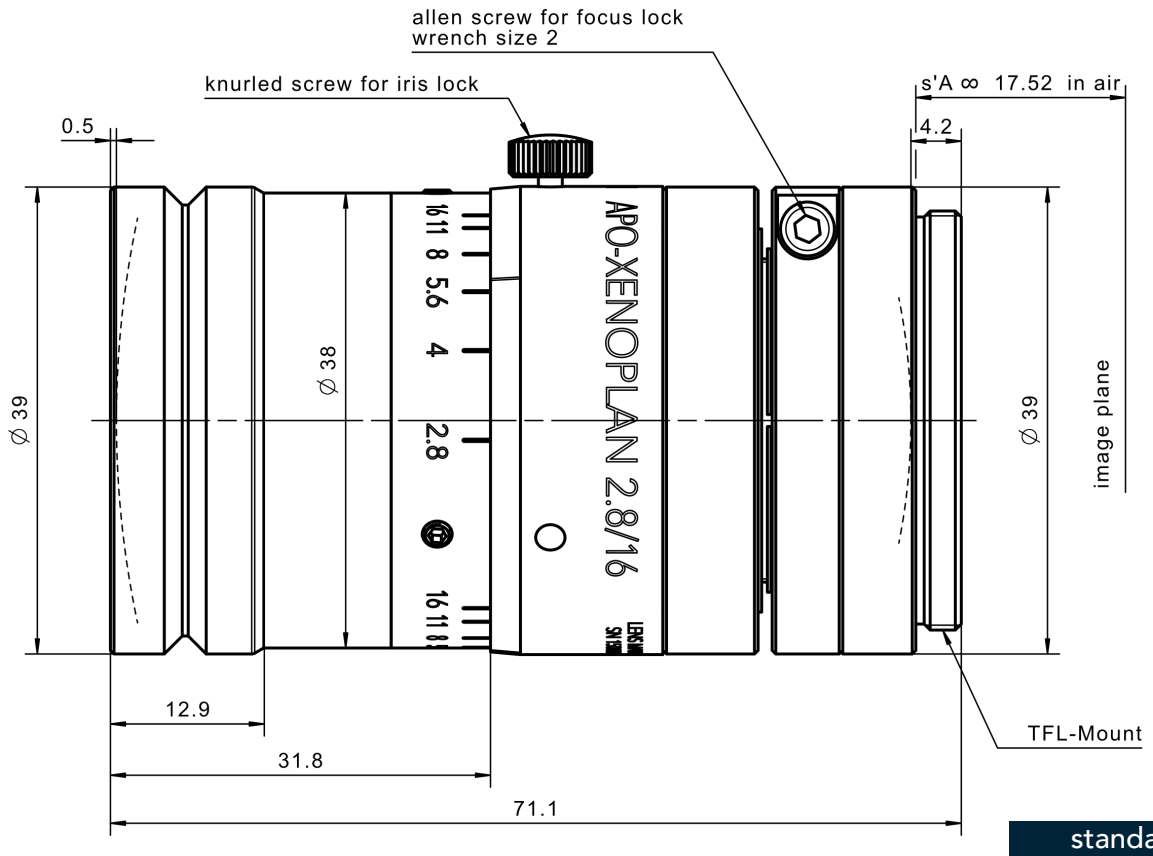
## Distortion vs. image height



## Transmittance vs. wavelength



## Technical drawings





Accessories	Mount	Eff. length	ID
Filter Holder	M49x0.75		1086400

Annotation	
Focal length	Nominal focal length
F/# range	Image space F-number range for infinity focus position
Numerical aperture	Maximum real numerical aperture (depending on recommended magnification range either for infinity or respective fixed magnification)
Max. sensor size	Image circle diameter
Max. angle of view	Angle of view associated with maximum sensor size (depending on recommended magnification range either for infinity or respective fixed magnification)
Rec. magnification range	Magnification range as recommended by Schneider-Kreuznach
Rec. working distance range	Working distance, i.e. distance between object and first mechanical element, associated with recommended magnification range
Max. mechanical focus travel	Maximum possible movement of the lens from infinity position (depending on recommended magnification range either for infinity or respective fixed magnification)
Net weight	weight of unpacked lens without lens cap
$f'_{\text{eff}}$	Effective focal length
SF	Distance between vertex of first lens surface and object space focal point
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$\beta'P$	Pupil magnification (= exit pupil diameter / entrance pupil diameter)
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$\Sigma d$	Distance between vertices of first and last lens surface
s'A	Flange focal distance (in air) for infinite object distance (depending on recommended magnification range either for infinity or respective fixed magnification)
$\beta'$	Magnification (= image size / object size), negative value because image is inverted
OO'	Distance between object and image

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- High resolution

## Applications

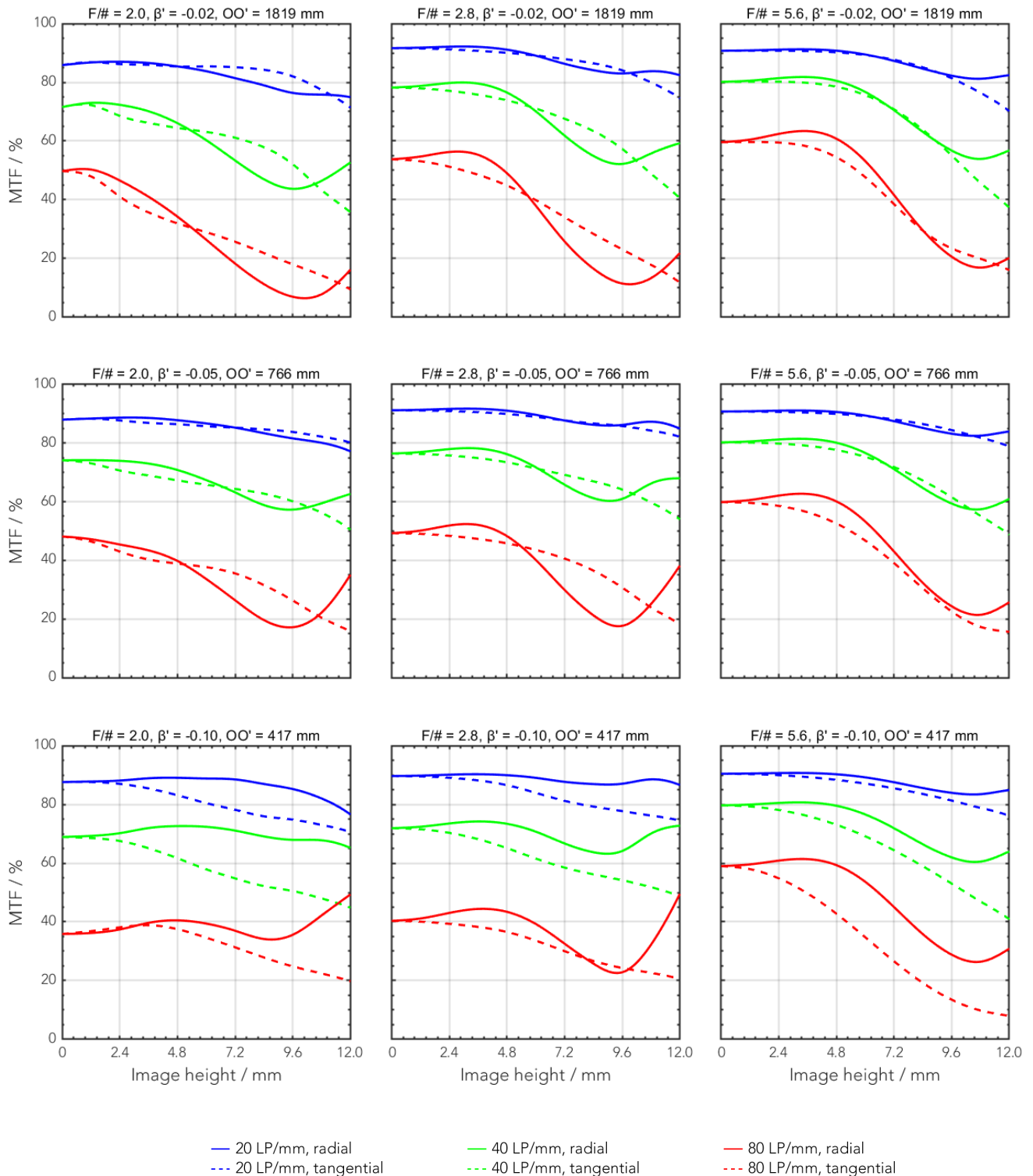
- 3D measurement
- Robotics
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## Technical specifications

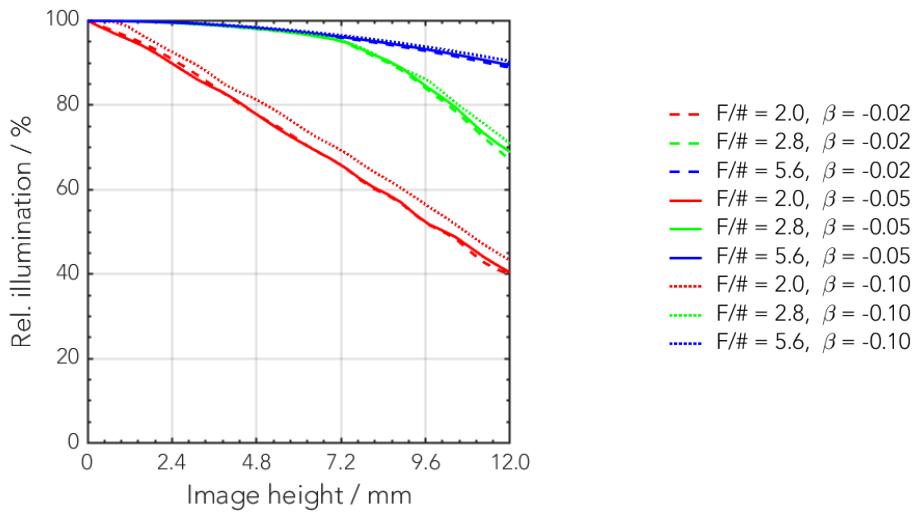
Type	-2003
ID	1098690
Interface	TFL-Mount
Focal length [mm]	35
F/# range	F/2 ... F/22
Numerical aperture	0.23
Max. sensor size [mm]	24
Max. angle of view [°]	38
Rec. magnification range	-0.2 ... 0
Rec. working distance range [mm]	168 ... ∞
Max. mechanical focus travel [mm]	14
Filter thread [mm]	M37 x 0.75
Storage temperature [°C]	-25 ... +70
Net. weight [g]	160
Additional info	-
f'eff [mm]	35.08
SF [mm]	1.63
S'F' [mm]	25.18
HH' [mm]	-8.38
β'P	1.98
SEP [mm]	19.34
S'AP [mm]	-44.29
Σd [mm]	38.22

## MTF charts

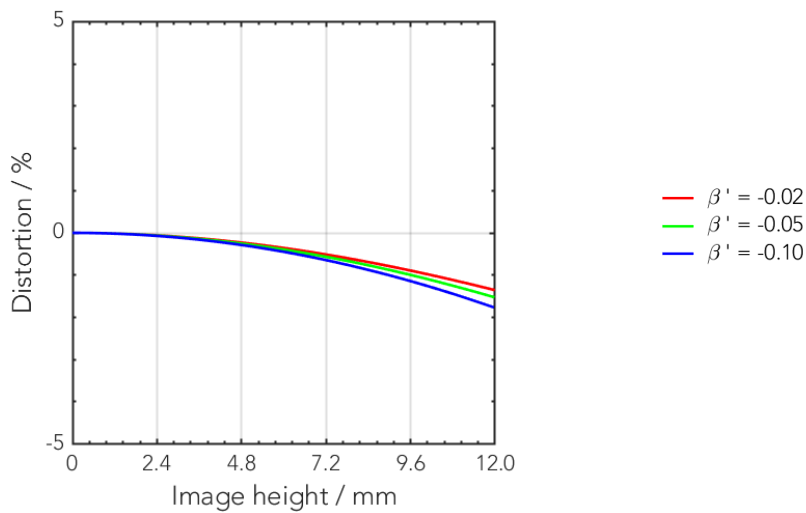
Spectrum name	VIS					
Wavelengths [nm]	425	475	525	575	625	675
Rel. weights [%]	8	16	23	22	19	13



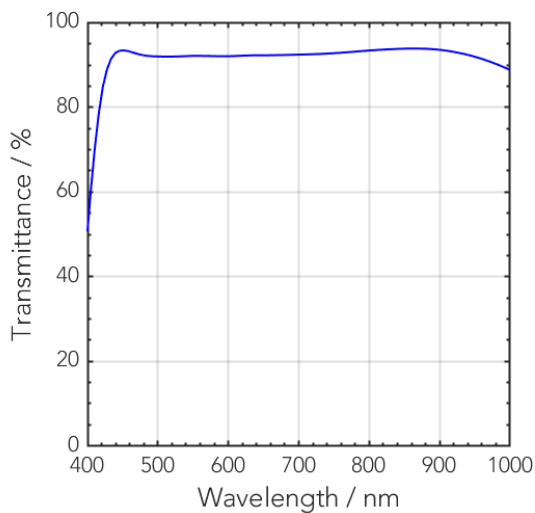
## Rel. illumination vs. image height



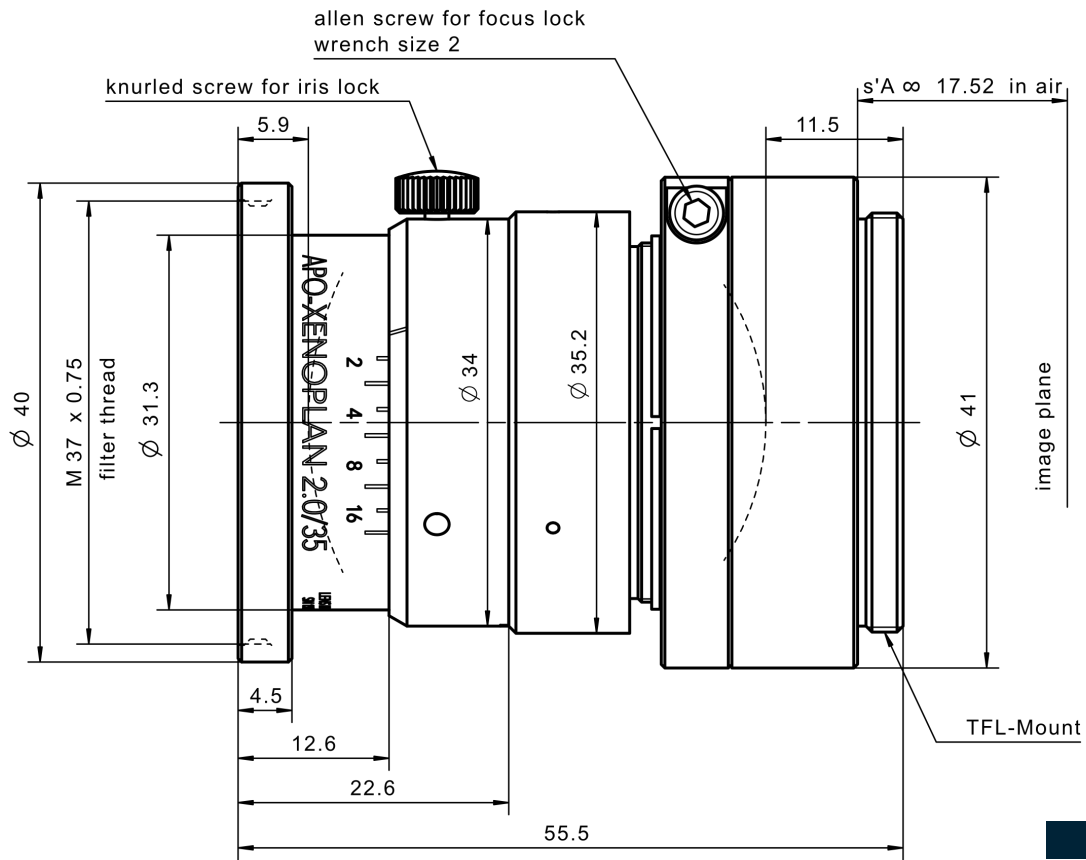
## Distortion vs. image height



## Transmittance vs. wavelength



## Technical drawings



standard

Annotation	
Focal length	Nominal focal length
F/# range	Image space F-number range for infinity focus position
Numerical aperture	Maximum real numerical aperture (depending on recommended magnification range either for infinity or respective fixed magnification)
Max. sensor size	Image circle diameter
Max. angle of view	Angle of view associated with maximum sensor size (depending on recommended magnification range either for infinity or respective fixed magnification)
Rec. magnification range	Magnification range as recommended by Schneider-Kreuznach
Rec. working distance range	Working distance, i.e. distance between object and first mechanical element, associated with recommended magnification range
Max. mechanical focus travel	Maximum possible movement of the lens from infinity position (depending on recommended magnification range either for infinity or respective fixed magnification)
Net weight	weight of unpacked lens without lens cap
$f'_{\text{eff}}$	Effective focal length
SF	Distance between vertex of first lens surface and object space focal point
S'F'	Distance between vertex of last lens surface and image space focal point (back focal distance at infinity)
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$\Sigma d$	Distance between vertices of first and last lens surface
s'A	Flange focal distance (in air) for infinite object distance (depending on recommended magnification range either for infinity or respective fixed magnification)
$\beta'$	Magnification (= image size / object size), negative value because image is inverted
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## Key features

- Compact
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- Up to 24 mm image circle
- Anti shading

## Applications

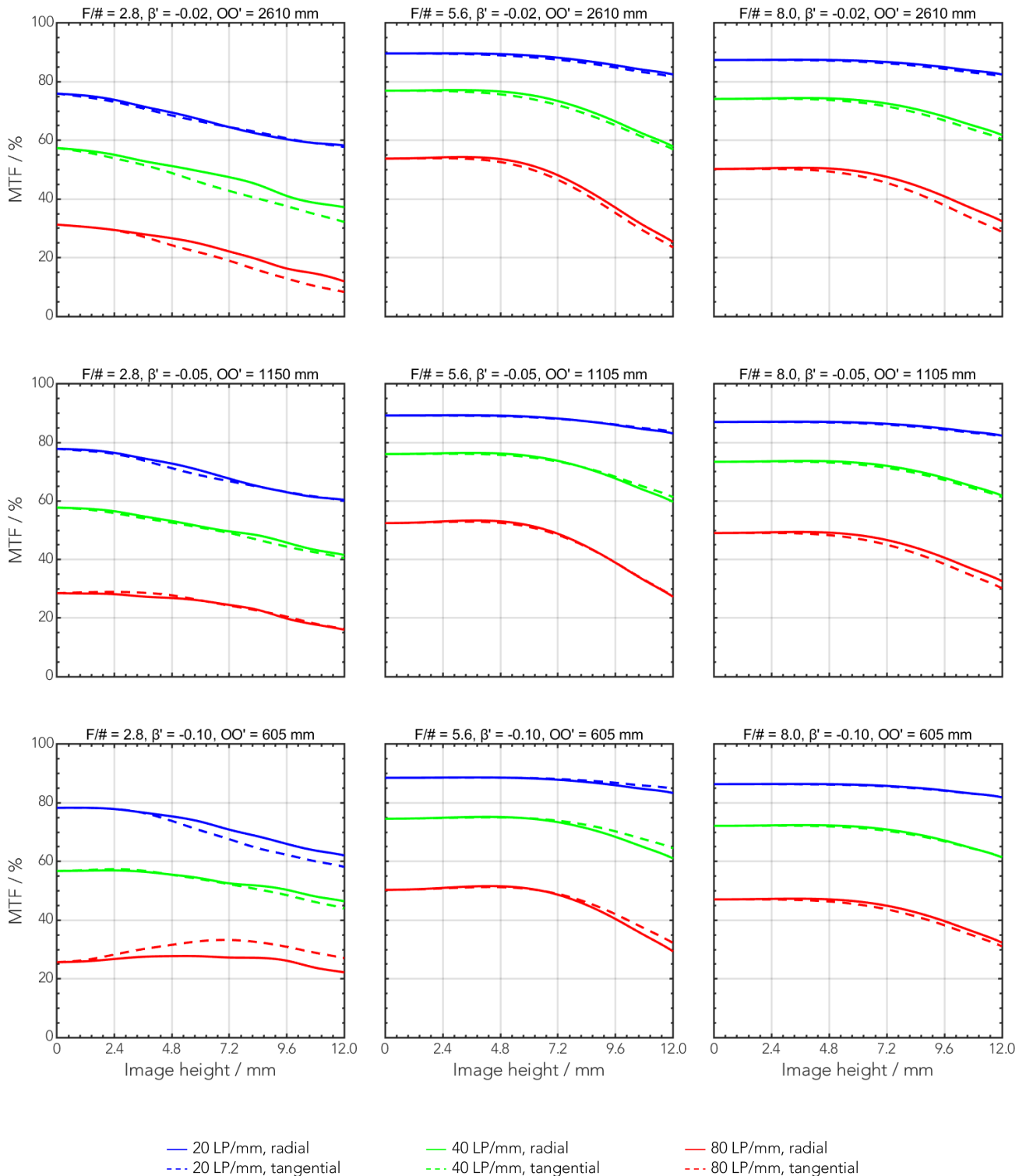
- 3D measurement
- Robotics
- Automation
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## Technical specifications

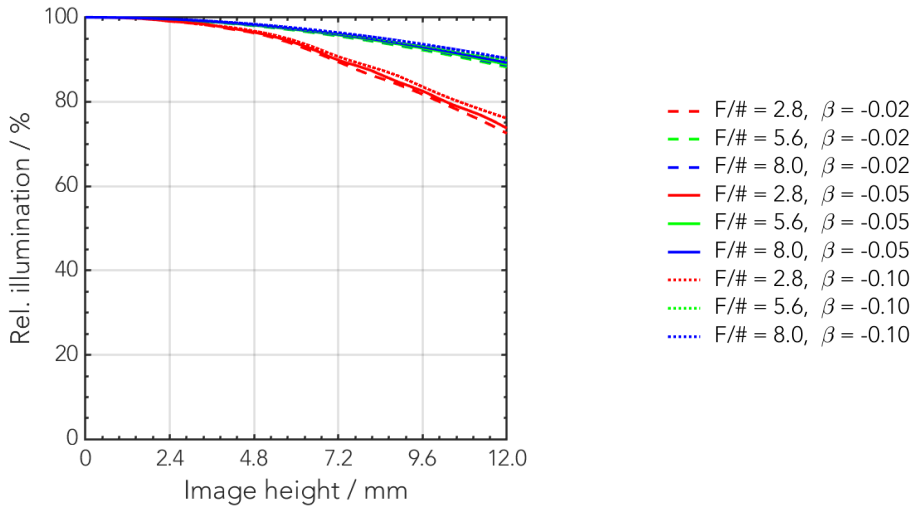
Type	-0932
ID	1098689
Interface	TFL-Mount
Focal length [mm]	50
F/# range	F/2.8 ... F/22
Numerical aperture	0.17
Max. sensor size [mm]	24
Max. angle of view [°]	27
Rec. magnification range	-0.5 ... 0
Rec. working distance range [mm]	131 ... ∞
Max. mechanical focus travel [mm]	7.5
Filter thread [mm]	M30,5 x 0.5
Storage temperature [°C]	-25 ... +70
Net. weight [g]	135
Additional info	-
f'eff [mm]	50.15
SF [mm]	-33.61
S'F' [mm]	31.68
HH' [mm]	-3.07
β'P	0.94
SEP [mm]	19.56
S'AP [mm]	-15.61
Σd [mm]	31.93

## MTF charts

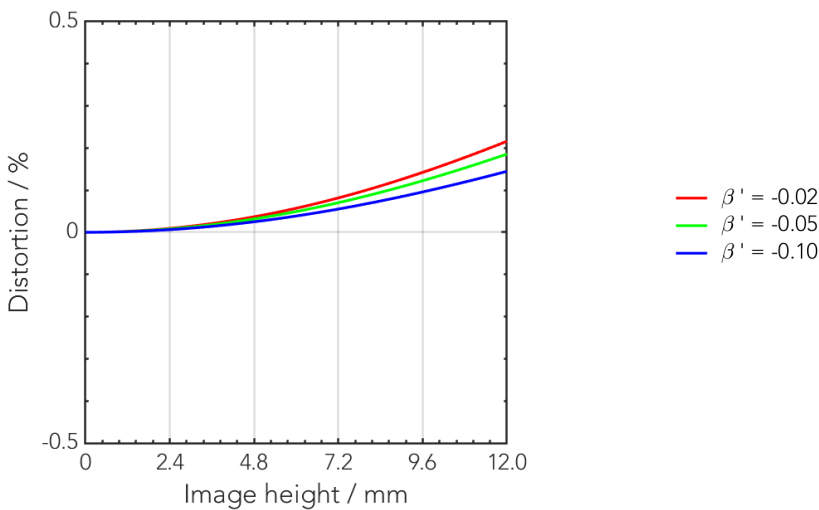
Spectrum name	VIS					
Wavelengths [nm]	425	475	525	575	625	675
Rel. weights [%]	8	16	23	22	19	13



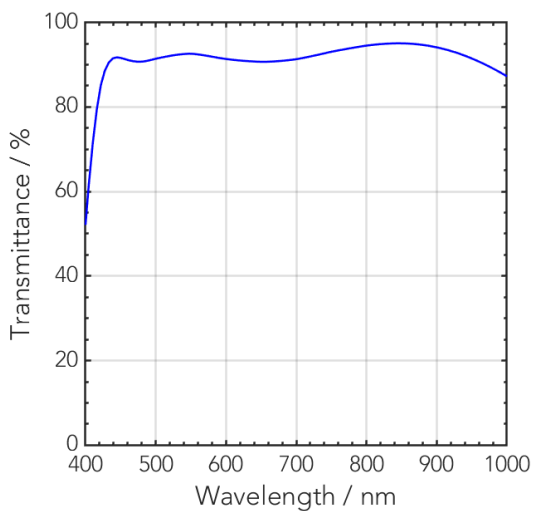
## Rel. illumination vs. image height



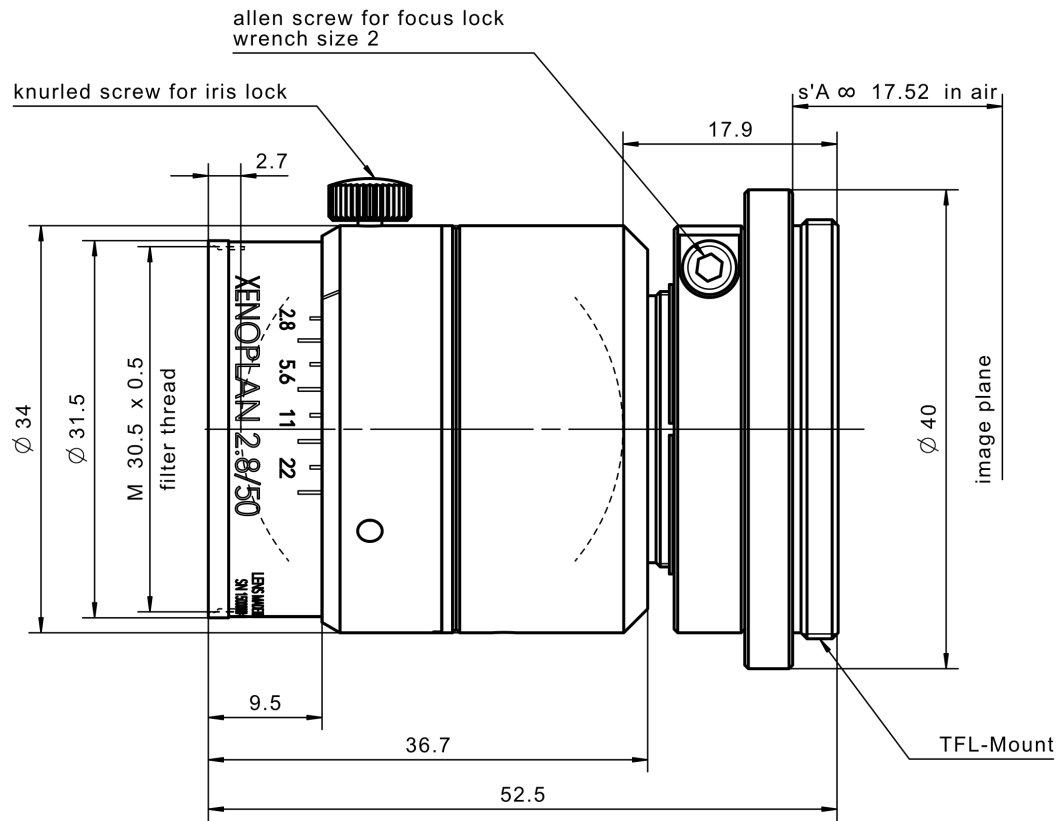
## Distortion vs. image height



## Transmittance vs. wavelength



## Technical drawings



standard

Annotation	
Focal length	Nominal focal length
F/# range	Image space F-number range for infinity focus position
Numerical aperture	Maximum real numerical aperture (depending on recommended magnification range either for infinity or respective fixed magnification)
Max. sensor size	Image circle diameter
Max. angle of view	Angle of view associated with maximum sensor size (depending on recommended magnification range either for infinity or respective fixed magnification)
Rec. magnification range	Magnification range as recommended by Schneider-Kreuznach
Rec. working distance range	Working distance, i.e. distance between object and first mechanical element, associated with recommended magnification range
Max. mechanical focus travel	Maximum possible movement of the lens from infinity position (depending on recommended magnification range either for infinity or respective fixed magnification)
Net weight	weight of unpacked lens without lens cap
$f'_{\text{eff}}$	Effective focal length
SF	Distance between vertex of first lens surface and object space focal point
S'F'	Distance between vertex of last lens surface and image space focal point (back focal distance at infinity)
HH'	Distance between principal planes
$\beta'P$	Pupil magnification (= exit pupil diameter / entrance pupil diameter)
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S'AP	Distance between vertex of last lens surface and exit pupil
$\Sigma d$	Distance between vertices of first and last lens surface
s'A	Flange focal distance (in air) for infinite object distance (depending on recommended magnification range either for infinity or respective fixed magnification)
$\beta'$	Magnification (= image size / object size), negative value because image is inverted
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