

# ScopeCalculator v2

## Variables and Formulas

$afov$	eyepiece apparent field of view
$\theta$	$afov / 2$
$EFL$	eyepiece focal length
$TFL$	telescope focal length
$RD_{afov}$	rectilinear distortion from the flat focal plane and the spherical $afov$ (always positive: pincushion)
$FS_{zero\_RD} = 2 EFL \tan(\theta)$	eyepiece field stop for zero $RD$ (Rutten and van Venrooij, <i>Telescope optics: evaluation and design</i> )
$AMD$	angular magnification distortion (positive = pincushion, negative = barrel)
$FS_{zero\_AMD} = 2 EFL \theta$	eyepiece field stop for zero AMD (Rutten and van Venrooij)
$FS_{known}$	known eyepiece field stop
$BRF$	barlow or reducer factor
$Mag$	magnification
$TFOV_{zero\_AMD}$	true field of view when AMD is zero
$TFOV_{AMD}$	true field of view corrected for AMD

The inputs of the spreadsheet are the telescope and eyepiece focal length (*TFL* and *EFL*), the afov of the eyepiece (*afov*), the known field stop of the eyepiece (*FS<sub>known</sub>*, if available) and any eventual barlow or reducer factors (*BRF*). The blue versions of the formulas (below) are used in the spreadsheet.

$$\theta = \frac{afov}{2}$$

$$FS_{zero\_RD_{afov}} = 2 EFL \tan(\theta) = 2 EFL \tan\left(\frac{afov}{2}\right)$$

$$RD_{afov} = \frac{\tan(\theta) - \theta}{\tan(\theta)} = 1 - \frac{\frac{afov}{2}}{\tan\left(\frac{afov}{2}\right)}$$

$$FS_{zero\_AMD} = FS_{zero\_RD_{afov}} = 2 EFL \tan(\theta) (1 - RD_{afov}) = EFL afov$$

$$AMD = \frac{FS_{zero\_AMD} - FS_{known}}{FS_{zero\_AMD}} = 1 - \frac{FS_{known}}{EFL afov}$$

$$RD_{total} = 1 - (1 - RD_{afov}) (1 - AMD) = 1 - \frac{\frac{FS_{known}}{2}}{\tan\left(\frac{afov}{2}\right) EFL}$$

$$Mag = \frac{TFL}{EFL} \cdot BRF = \frac{TFL BRF}{EFL}$$

$$TFOV_{zero\_AMD} = \frac{afov}{Mag} = \frac{afov EFL}{TFL BRF}$$

$$TFOV_{AMD} = \frac{afov}{Mag} \cdot (1 - AMD) = \frac{FS_{known}}{TFL BRF}$$