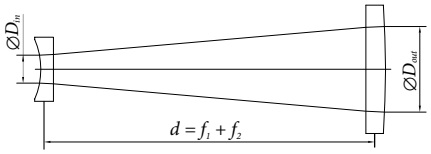
SIMPLE TELESCOPE KIT

Simple lenses are subject to optical aberrations. In many cases these aberrations can be compensated for to a great extent by using a combination of simple lenses with complementary aberrations. A compound lens is a collection of simple lenses of different shapes and made of materials of different refractive indices, arranged one after the other with a common axis.

If two thin lenses are separated in air by some distance d (where d is smaller than the focal length of the first lens), the focal length for the combined system is given by

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 \cdot f_2}$$



The distance from the second lens to the focal point of the combined lenses is called the back focal length (BFL).

$$BFL = \frac{f_2 \cdot (d - f_1)}{d - (f_1 + f_2)}$$

If the separation distance is equal to the sum of the focal lengths $(d = f_1 + f_2)$, the combined focal length and BFL are infinite. This corresponds to a pair of lenses that transform a parallel (collimated) beam into another collimated beam. This type of system is called an afocal system, since it produces no net convergence or divergence of the beam. Two lenses at this separation form the simplest type of optical telescope. Although the system does not alter the divergence of a collimated beam, it does alter the width of the beam. The magnification of such a telescope is given by

$$M = -\frac{f_2}{f_1} = \frac{D_{out}}{D_{in}} \quad \frac{(exit\ diameter)}{(input\ diameter)}$$

which is the ratio of the input beam width to the output beam width. Note the sign convention: a telescope with two convex lenses $(f_1 > 0, f_2 > 0)$ produces a negative magnification, indicating an inverted image. A concave plus a convex lens $(f_1 < 0 < f_2)$ produces a positive magnification and the image is upright.

Coating	Material	Catalogue number	Price, EUR
Uncoated	BK7	140-0008	771
1064 nm, R<0.2%	BK7	141-0008	1075
532 nm + 1064 nm, R<0.5%	BK7	142-0008	1110
400 – 700 nm, R<0.9%	BK7	147-0008	1260
Uncoated	UV FS	140-1008	1170
266 nm, R<0.4%	UV FS	144-1008	1470
266 nm + 355 nm, R<0.6%	UV FS	149-1008	1480
210 – 400 nm, R<1.5%	UV FS	146-1008	1680
355 nm, R<0.25%	UV FS	143-1008	1465
532 nm + 1064 nm, R<0.5%	UV FS	141-1008	1485
350 – 900 nm, R<1.5%	UV FS	145-1008	1685
650 – 950 nm, R<1%	UV FS	148-1008	1645

Any other antireflection coating wavelength region is available on request.

Each kit includes 8 lenses, Aluminium Optical Rail 810-0005-02, two Aluminium Rail Carriers 810-0007-06, Self Centering Lens Mounts 830-0010 and 830-0020, two Rod Holders 820-0050-02 and two Rods 820-0010-02. Net weight: 1.4 kg

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Material: BK7		Material: UV FS		Focal length *f1*, mm	Focal length *f2*, mm	Distance between lenses *d=f1+f2*, mm *	Magnification, M
Lens 1	Lens 2	Lens 1	Lens 2				
BK7 bi/cv Ø12.7 mm	BK7 pl/cx Ø50.8 mm	UV FS bi/cv Ø12.7 mm	UV FS pl/cx Ø50.8 mm				
114-0104	110-0502	114-1104	110-1505	-12.7	+75	62	5.9
	110-0505		110-1509		+100	87	7.7
	110-0507		110-1511		+150	137	11.8
	110-0509		110-1515		+200	187	15.7
	110-0511		110-1517		+250	237	19.7
BK7 bi/cv Ø25.4 mm	BK7 pl/cx Ø50.8 mm	UV FS bi/cv Ø25.4 mm	UV FS pl/cx Ø50.8 mm				
114-0204	110-0502	114-1204	110-1505	-25	+75	50	3
	110-0505		110-1509		+100	75	4
	110-0507		110-1511		+150	125	6
	110-0509		110-1515		+200	175	8
	110-0511		110-1517		+250	225	10
BK7 pl/cv Ø25.4 mm	BK7 pl/cx Ø50.8 mm	UV FS pl/cv Ø25.4 mm	UV FS pl/cx Ø50.8 mm				
112-0209	110-0502	112-1205	110-1505	-50	+75	25	1.5
	110-0505		110-1509		+100	50	2
	110-0507		110-1511		+150	100	3
	110-0509		110-1515		+200	150	4
	110-0511		110-1517		+250	200	5

** Note that distance between lenses d is the distance between focal planes of the lenses and is given theoretically (the thickness of lenses is not included into calculation). It, also, depends on wavelength. The distance should be adjusted ±10 mm in each particular case.*

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