

Five Schott Glass Types

The following tables list the most important optical and physical constants for the five Schott optical glasses: BK 7, SF 11, LaSF N9, Bak 1, and F2. These are the materials used in most Melles Griot simple lens products and prisms. Index of refraction and transmission, as well as the most commonly required chemical characteristics and mechanical constants, are listed. Further numerical data on these glasses and a more detailed discussion of the various testing processes, can be found in the Schott optical glass catalog.

The index of refraction data was obtained by using the constants listed below together with the dispersion formula presented earlier (page A4.4). The constants were determined through the index of refraction measurements of a typical melt for each glass type. Note that the dispersion formula is only valid within the wavelength range

listed. It can be used to interpolate refractive index at other wavelengths within this range (to a precision of 1×10^{-5} or better), but should not be used to extrapolate to wavelengths beyond this range. Furthermore, keep in mind that the actual melt-to-melt tolerance on index of refraction is typically about ± 0.001 .

Internal transmittance values shown are melt-to-melt experimental means, and may be affected by thermal history (coating, annealing, or tempering operations) after manufacture.

For more detailed information of these materials, please refer to the Schott optical glass catalog.

Physical Constants of Five Schott Glasses

	Glass Type				
	BK 7	SF 11	LaSF N9	Bak 1	F 2
Melt-to-Melt Mean Index Tolerance	± 0.001	± 0.001	± 0.002	± 0.001	± 0.001
Homogeneity within Melt	$\pm 1 \times 10^{-4}$	$\pm 1 \times 10^{-4}$	$\pm 1 \times 10^{-4}$	$\pm 1 \times 10^{-4}$	$\pm 1 \times 10^{-4}$
Striae Grade (MIL-G-174-A)	A	A	A	A	A
Stress Birefringence, nm/cm, yellow light	10	10	10	10	10
Abbé Factor (v_d)	64.17	25.76	32.17	57.55	36.37
Constants of Dispersion Formula:					
B_1	1.03961212	1.73848403	1.97888194	1.12365662	1.34533359
B_2	$2.31792344 \times 10^{-1}$	$3.11168974 \times 10^{-1}$	$3.20435298 \times 10^{-1}$	$3.09276848 \times 10^{-1}$	$2.09073176 \times 10^{-1}$
B_3	1.01046945	1.17490871	1.92900751	$8.81511957 \times 10^{-1}$	$9.37357162 \times 10^{-1}$
C_1	$6.00069867 \times 10^{-3}$	$1.36068604 \times 10^{-2}$	$1.18537266 \times 10^{-2}$	$6.44742752 \times 10^{-3}$	$9.97743871 \times 10^{-3}$
C_2	$2.00179144 \times 10^{-2}$	$6.15960463 \times 10^{-2}$	$5.27381770 \times 10^{-2}$	$2.22284402 \times 10^{-2}$	$4.70450767 \times 10^{-2}$
C_3	1.03560653×10^2	1.21922711×10^2	1.66256540×10^2	1.07297751×10^2	1.11886764×10^2
Density (g/cm^3)	2.51	4.74	4.44	3.19	3.61
Coefficient of Linear Thermal Expansion (α):					
-30° to +70° (per °C)	7.1×10^{-6}	6.1×10^{-6}	7.4×10^{-6}	7.6×10^{-6}	8.2×10^{-6}
+20° to +300° (per °C)	8.3×10^{-6}	6.8×10^{-6}	8.4×10^{-6}	8.6×10^{-6}	9.2×10^{-6}
Transformation Temperature	557°C	505°C	703°C	592°C	438°C
Young's Modulus (dynes/mm ²)	8.20×10^9	6.60×10^9	1.09×10^{10}	7.30×10^9	5.70×10^9
Climate Resistance	2	1	2	2	1
Stain Resistance	0	0	0	1	0
Acid Resistance	1.0	1.0	2.0	3.3	1.0
Alkali Resistance	2.0	1.2	1.0	1.2	2.3
Phosphate Resistance	2.3	1.0	1.0	2.0	1.3
Knoop Hardness	610	450	630	530	420
Poisson's Ratio	0.206	0.235	0.286	0.252	0.220

Refractive Index of Five Schott Glasses

Wavelength λ (nm)	Refractive Index, n					Fraunhofer Designation	Source	Spectral Region
	BK 7	SF 11	LaSF N9	BaK 1	F 2			
351.1	1.53894	—	—	1.60062	1.67359		Ar laser	UV
363.8	1.53649	—	—	1.59744	1.66682		Ar laser	UV
404.7	1.53024	1.84208	1.89844	1.58941	1.65064	h	mercury arc	violet
435.8	1.52668	1.82518	1.88467	1.58488	1.64202	g	mercury arc	blue
441.6	1.52611	1.82259	1.88253	1.58415	1.64067		HeCd laser	blue
457.9	1.52461	1.81596	1.87700	1.58226	1.63718		Ar laser	blue
465.8	1.52395	1.81307	1.87458	1.58141	1.63564		Ar laser	blue
472.7	1.52339	1.81070	1.87259	1.58071	1.63437		Ar laser	blue
476.5	1.52309	1.80946	1.87153	1.58034	1.63370		Ar laser	blue
480.0	1.52283	1.80834	1.87059	1.58000	1.63310	F'	cadmium arc	blue
486.1	1.52238	1.80645	1.86899	1.57943	1.63208	F	hydrogen arc	blue
488.0	1.52224	1.80590	1.86852	1.57927	1.63178		Ar laser	blue
496.5	1.52165	1.80347	1.86645	1.57852	1.63046		Ar laser	green
501.7	1.52130	1.80205	1.86524	1.57809	1.62969		Ar laser	green
514.5	1.52049	1.79880	1.86245	1.57707	1.62790		Ar laser	green
532.0	1.51947	1.79479	1.85901	1.57580	1.62569		Nd laser	green
546.1	1.51872	1.79190	1.85651	1.57487	1.62408	e	mercury arc	green
587.6	1.51680	1.78472	1.85025	1.57250	1.62004	d	helium arc	yellow
589.3	1.51673	1.78446	1.85002	1.57241	1.61989	D	sodium arc	yellow
632.8	1.51509	1.77862	1.84489	1.57041	1.61656		HeNe laser	red
643.8	1.51472	1.77734	1.84376	1.56997	1.61582	C'	cadmium arc	red
656.3	1.51432	1.77599	1.84256	1.56949	1.61503	C	hydrogen arc	red
694.3	1.51322	1.77231	1.83928	1.56816	1.61288		Ruby laser	red
786.0	1.51106	1.76558	1.83323	1.56564	1.60889			IR
821.0	1.51037	1.76359	1.83142	1.56485	1.60768			IR
830.0	1.51020	1.76311	1.83098	1.56466	1.60739		GaAlAs laser	IR
852.1	1.50980	1.76200	1.82997	1.56421	1.60671	s	cesium arc	IR
904.0	1.50893	1.75970	1.82785	1.56325	1.60528		GaAs laser	IR
1014.0	1.50731	1.75579	1.82420	1.56152	1.60279	t	mercury arc	IR
1060.0	1.50669	1.75445	1.82293	1.56088	1.60190		Nd laser	IR
1300.0	1.50370	1.74901	1.81764	1.55796	1.59813		InGaAsP laser	IR
1500.0	1.50127	1.74554	1.81412	1.55575	1.59550			IR
1550.0	1.50065	1.74474	1.81329	1.55520	1.59487			IR
1970.1	1.49495	1.73843	1.80657	1.55032	1.58958		mercury arc	IR
2325.4	1.48921	1.73294	1.80055	1.54556	1.58465		mercury arc	IR