SCHOTT

Specification Physical and chemical properties	**PCE - BK** **D 0290**

HC-Weiß 0290 D 0290

Colour: clear

Application: High index glass for corrective lenses

The subsequent properties are based primarily upon the measuring results of the very latest standards and measuring methods, which are defined in corresponding "Measuring and Test Procedures". SCHOTT DESAG retains the right to change the data in keeping with the latest technical standards. Non-toleranced numerical values are reference values of an average production quality.

Values marked with ◊ do not apply to the type of glass or no values are available.

Requirements deviating from these specifications must be defined in writing in a **customer agreement**.

Date of release: December 04, 00

Specification

Physical and chemical properties

PCE - BK
D 0290

1. Optical properties

1.1 Refractive indices (20°C)

Pretreatment of samples
[x] Condition as supplied
[x] annealed at 40°C/h for bifocals *± 0.0003

n_g	1.6181
$n_{F'}$	1.6111
n_F	1.6103
n_e	1.6040 $^{+0.0006*}_{-0.0010}$
n_d	1.6008
n_D	1.6007
$n_{C'}$	1.5974
n_C	1.5967

1.1.1 Abbe value

n_e	43.8 ± 0.6
n_d	44.1

1.2 Transmittance data

1.2.1 Spectral transmittance $t\ (l)$

1.2.1.1 $t\ (l)$ - curve

Plot of spectral transmittance $t\,(l)$ for d = 2.0 mm (l = 300 nm - 1500 nm): see annex

1.2.1.2 $t\ (l)$ - individual values in % (d = 2.0 mm)

$t\,(l)_{max}$ for the l - range 280 - 315 nm	< 0.001
$t\,(l)_{max}$ for the l - range 315 - 350 nm	55
t_{380}	86.5
$t\,(l)_{min}$ for the l - range 450 - 650 nm	◊
$t\,(l)_{min}$ for the l - range 500 - 650 nm	◊

1.2.1.3 Edge wavelength (d = 2.0 mm)

Edge wavelength $l_{C\ (t\,=\,0.46)}$ in nm: 348 ± 2

1.2.2 Luminous transmittance t_v

1.2.2.1 Luminous transmittance t_{vD65} in % at nominal thickness

d = 2.0 mm *** nominal transmittance**: 89.8* ± 0.3

Luminous transmittance as a function of thickness

Thickness in mm	1.4	2.0	3.0	4.0	5.0	6.0
t_{vD65} in %	89.8	89.8	89.8	89.7	89.7	89.6
t_{vA} in %	89.8	89.8	89.8	89.7	89.7	89.6
t_{vC} in %	89.8	89.8	89.8	89.7	89.7	89.6

Specification

Physical and chemical properties

PCE - BK
D 0290

1.2.2.2	**Shade *N* / Filter category**		
	N for mean thickness *d* = mm (t_{vD65} = %)		◊
	N for mean thickness *d* = mm (t_{vD65} = %)		◊
	filter category for nominal transmittance t_{vD65} = 89.8 %		0
1.2.3	**Special transmittance values in % (*d* = 2.0 mm)**		
1.2.3.1	**UV - transmittance**		
		t_{UVA}	43.1
		t_{SUV}	◊
		t_{SUVA}	31.2
		t_{SUVB}	< 0.05
1.2.3.2	**IR - transmittance**	t_{SIR}	91
1.2.3.3	**Solar blue - light transmittance**	t_{sb}	◊
1.3	**Colour**		
1.3.1	**Visual evaluation**		
	The visual evaluation of the admissible colour differences is to be made by using internal reference samples in transmission mode towards an from the backside illuminated opal screen with uniform luminance.		
	Sample thickness *d* in mm for the visual colour comparison		90
1.3.2	**Colorimetry**		
	Chromaticity coordinates	x_{10}	0.314
		y_{10}	0.332
	Chromaticity coordinates (colour locus) are referred to the Standard Illuminant D_{65} according to CIE 10°-observer for the nominal transmittance t_{vD65} = 89.8 % (refer to 1.2.2.1)		
1.3.3	**Signal recognition**		
	Relative visual attenuation coefficient *Q* for signal lights referred to the nominal transmittance t_{vD65} = 89.8 % (refer to 1.2.2.1)	Q_{blue}	1.00
		Q_{green}	1.00
		Q_{yellow}	1.00
		Q_{red}	1.00
1.3.4	**Yellowness index (*d* = 10 mm)**		
		Y_i	2.0

Form 0050/6B

Specification

Physical and chemical properties

PCE - BK

D 0290

2. Thermal properties

2.1 Viscosities and corresponding temperatures

Designation	Viscosity log h in dPas	Temperature J in °C
Strain point	14.5	529
Annealing point	13.0	552
Softening point	7.6	689
Forming temperature	6.0	764
Forming temperature	5.0	827
Forming temperature	4.0	910

2.2 Transformation temperature *Tg* in °C

555

2.3 Coefficient of mean linear thermal expansion

$\alpha_{(20°C\text{-}300°C)}$ in 10^{-6} K^{-1} (Static measurement)

9.3

2.4 Fuseability

Stress-free fusing with lower segments from SCHOTT DESAG, listed in the margin is possible with a maximum birefringence of 70 nm/cm measured 0.5 mm from the fusing area in the major blank.

BS-565
BS-5670
BS-5675
BS-5680

2.5 Mean specific heat capacity $c_{p(20°C\text{-}100°C)}$ in J/(g · K)

◊

Form 0050/6B

Specification Physical and chemical properties		**PCE - BK** **D 0290**
3.	**Mechanical properties**	
3.1	**Density** r **in g/cm³**	2.67
3.2	**Stress optical coefficient** ***C*** **in 1.02** $\times$ 10^{-12} **m²/N**	2.59
3.3	**Breaking strength**	
	A higher mechanical strength can be realized by chemical toughening according to the ion exchange procedure (refer to annex 3.3.1) or by thermal toughening.	
3.3.1	**Chemical toughening**	
	Processing temperature J in °C	450
	Processing time t in h	16
	Compressive stress Ds as birefringence in nm/cm	4780
	Penetration depth Nz up to neutral zone in µm	75
	Further information	see annex
3.3.2	**Thermal toughening**	
	Recommended minimum thickness d in mm for toughened safety glass lenses without corrective effect as per ball drop test (DIN EN 168)	2.5
3.4	**Young´s modulus** ***E*** **in kN/mm²**	86
3.5	**Poisson´s ratio** m	0.240
3.6	**Torsion modulus** ***G*** **in kN/mm²**	34
3.7	**Knoop hardness** HK_{100}	600

Specification

Physical and chemical properties

PCE - BK
D 0290

4. Chemical properties

4.1 Hydrolytic resistance acc. to DIN ISO 719

Hydrolytic class	HGB 3
Equivalent of alkali (Na_2O) per gram of glass grains in µg/g	200

4.2 Acid resistance acc. to DIN 12 116

Acid class	3
Half surface weight loss after 6 hours in mg/dm²	7.5

4.3 Alkali resistance acc. to DIN ISO 695

Class	A 2
Surface weight loss after 3 hours in mg/dm²	112

5. Electrical properties

disregard

6. Other properties

6.1 Minimum value of internal transmittance for *d* = 25 mm

l in nm	400	450	500	560	600	700
t in %	82.7	93.0	97.1	98.7	98.7	98.7

7. Annex (diagrams, curves)

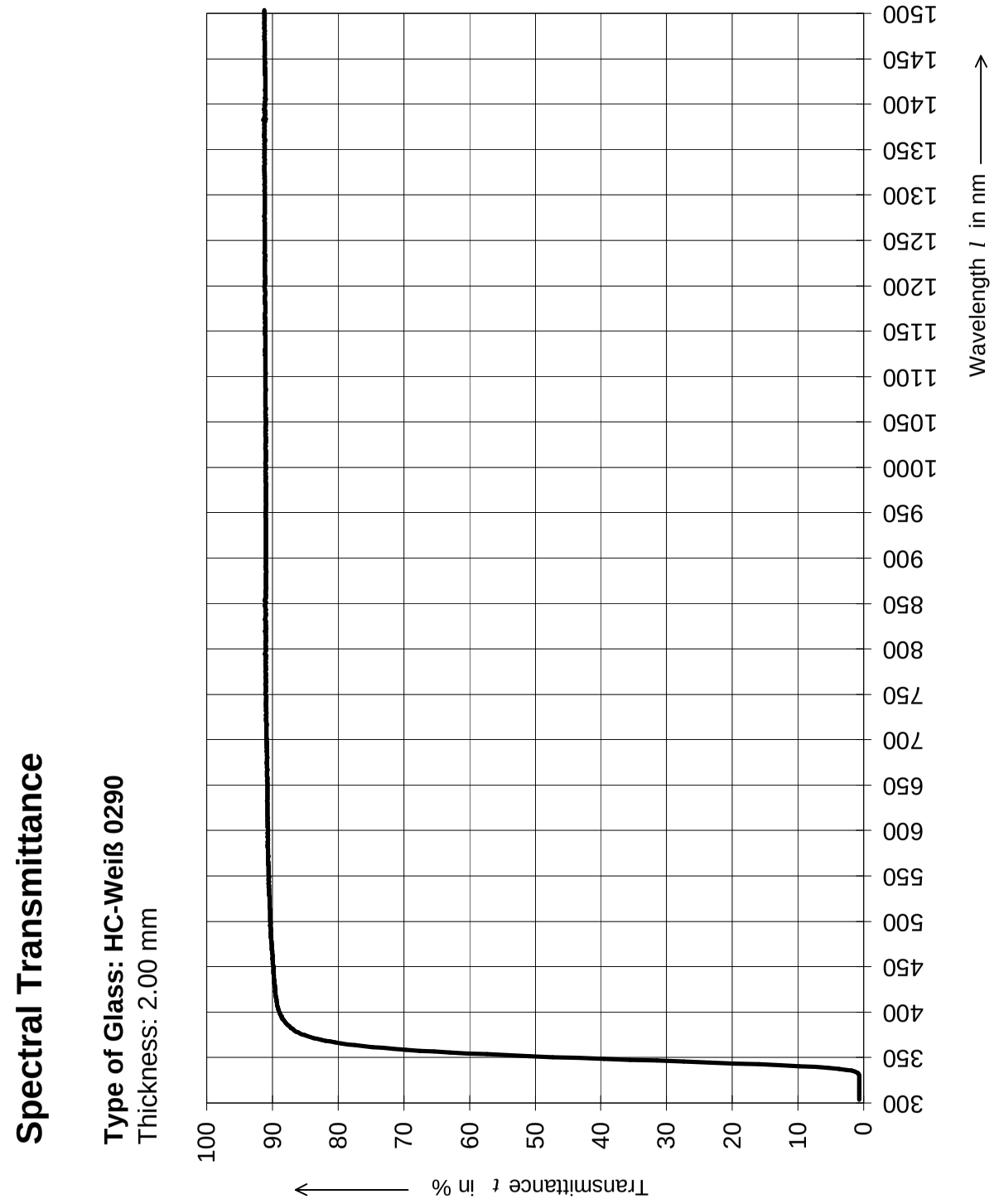
Form 0050/6B

Specification

Physical and chemical properties

PCE - BK

D 0290



Annex 3.3.1

Specification

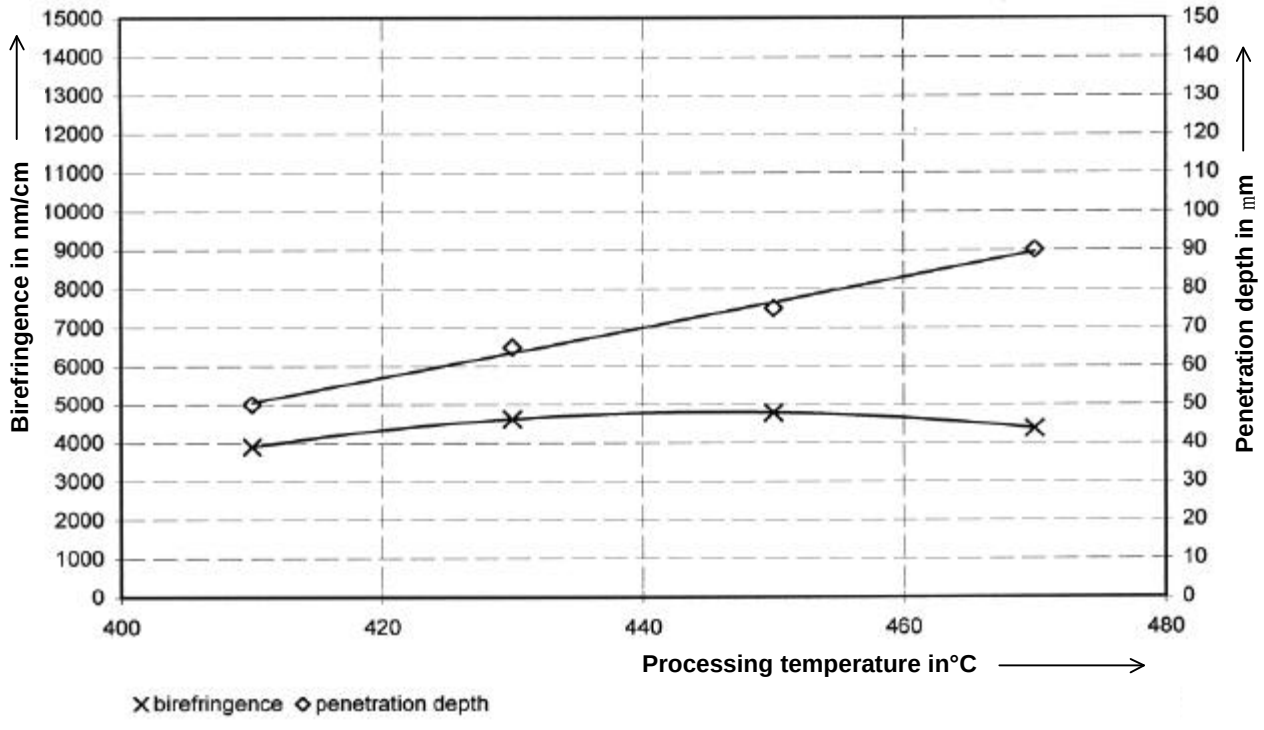
Physical and chemical properties

PCE - BK

D 0290

Chemical toughening parameter

Glass and chemical toughening parameters		
Transformation temperature	°C	555
Glass thickness	mm	2
Processing time	h	16
Processing temperature	°C	450
Salt bath (* weight percentages)	KNO_3 in % *	59.5
	$NaNO_3$ in % *	40.0
	SiO_2 x H_2O in % *	0.5
Chemical toughening results *		
Penetration depth	µm	75
Birefringence	nm/cm	4780
* measured across at a sample piece ground down to 0.3 mm ± 0.05 mm		
Ball drop test acc. FDA	% failed	not carried out
Ball drop test acc. DIN	% failed	not carried out



Form 0050/6B