Specification

Physical and chemical properties

PCP
D 1214

Grau 1214 D 1214

Colour:	grey
Application:	Dark tinted sunglare filter with with IR- and high UV- absorption filter category 3 acc. to DIN EN 1836

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".
We retain 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**.

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1. Optical properties

1.1 Refractive indices (20 °C)

Pretreatment of samples
[x] Condition as supplied
[ ] annealed at 40 °C/h

n_g	1.5361
$n_{F'}$	1.5307
n_F	1.5302
n_e	1.5251
n_d	1.5226
n_D	1.5225
$n_{C'}$	1.5199
n_C	1.5195

1.1.1 Abbe value

ν_e	48.9 ± 0.6
ν_d	49.1

1.2 Transmittance data

1.2.1 Spectral transmittance $\tau(\lambda)$

1.2.1.1 $\tau(\lambda)$ - curve

Plot of spectral transmittance $\tau(\lambda)$ for d = 2.25 mm (λ = 300 nm to 1500 nm): see annex

1.2.1.2 $\tau(\lambda)$ - individual values in % (d = 2.25 mm)

$\tau(\lambda)_{max}$ for the λ - range 280 nm to 315 nm	< 0.001
$\tau(\lambda)_{max}$ for the λ - range 315 nm to 350 nm	< 0.01
τ_{380}	0.6
$\tau(\lambda)_{min}$ for the λ - range 500 nm to 650 nm	8

1.2.1.3 Edge wavelength (d = 2.25 mm)

Edge wavelength $\lambda_{c\ (\tau = 0.46)}$ in nm	◊

1.2.2 Luminous transmittance τ_v

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

d = 2.25 mm — * nominal transmittance: 11.3 * ± 1.5

Luminous transmittance as a function of thickness

Thickness in mm	1.4	2.25	3.0	4.0	5.0	6.0
τ_{vD65} in %	25.0	11.3	5.7	◊	◊	◊
τ_{vA} in %	25.0	11.3	5.7	◊	◊	◊
τ_{vC} in %	25.0	11.3	5.7	◊	◊	◊

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1.2.2.2	**Scale number / Filter category**		
	N for mean thickness *d* = 2.1 mm (τ_{vD65} = 12.6 %)		6 - 3.1
	N for mean thickness *d* = 3.2 mm (τ_{vD65} = 4.7 %)		6 - 4.1
	filter category for nominal transmittance τ_{vD65} = 11.3 %		3
	This "very dark" sunglare filter acc. to DIN EN 172 for *N* = 6 - 3.1 not recommended for driving and for *N* = 6 - 4.1 (extremely dark) not suitable for driving **Reaching filter category 4 acc. DIN EN 1836 this sunglare filter not suitable for driving and road use.**		
1.2.3	**Special transmittance values in % (*d* = 2.25 mm)**		
1.2.3.1	**UV - transmittance**		
		τ_{UVA}	0.2
		τ_{SUV}	< 0.5
		τ_{SUVA}	< 0.5
		τ_{SUVB}	< 0.05
1.2.3.2	**IR - transmittance**	τ_{SIR}	7
1.2.3.3	**Solar blue - light transmittance**	τ_{sb}	8.0
1.3	**Colour**		
1.3.1	**Visual evaluation**		◊
1.3.2	**Colorimetry**		
	Chromaticity coordinates	A x_{10}	0.334_5
		y_{10}	0.374_5
	Chromaticity coordinates (colour locus) are referred to the	B x_{10}	0.340_5
	Standard Illuminant D_{65} according CIE 10°-observer for the	y_{10}	0.374_5
	nominal transmittance τ_{vD65} = 11.3 % (refer to 1.2.2.1)	C x_{10}	0.340_5
		y_{10}	0.379_5
	In case of verification, the measured values may additionally de-	D x_{10}	0.334_5
	viate by the measuring uncertainty of the used measuring devices.	y_{10}	0.379_5
	part of chromaticity coordinates		see annex
1.3.3	**Signal light recognition**		
	Relative visual attenuation coefficient (quotient) *Q*	Q_{blue}	0.98
	for signal light recognition referred to the	Q_{green}	1.01
	nominal transmittance τ_{vD65} = 11.3 %	Q_{yellow}	1.01
	(refer to 1.2.2.1)	Q_{red}	0.92
1.3.4	**Yellowness index (*d* = 10 mm)**		
		Y_i	◊

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2. Thermal properties

2.1 Viscosities and corresponding temperatures

Designation	Viscosity lg η in dPas	Temperature ϑ in °C
Strain point	14.5	450
Annealing point	13.0	479
Softening point	7.6	666
Forming temperature	6.0	773
Forming temperature	5.0	868
Forming temperature	4.0	996

2.2	**Transformation temperature *Tg* in °C**	479
2.3	**Coefficient of mean linear thermal expansion α(20 °C;300 °C) in 10^{-6} K^{-1}** (Static measurement)	10.0
2.4	**Fuseability**	◊
2.5	**Mean specific heat capacity c_p(20 °C to 100 °C) in J/(g · K)**	◊

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3.	**Mechanical properties**	
3.1	**Density ρ in g/cm³**	2.53
3.2	**Stress optical coefficient C in 1.02 · 10^{-12} m²/N**	3.28
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. Both toughening methods may cause slight transmittance - and colourchanges.	
3.3.1	**Chemical toughening**	
	Processing temperature ϑ in °C	360
	Processing time t in h	16
	Compressive stress Ds as birefringence in nm/cm	6000
	Penetration depth Nz up to neutral zone in µm	50
	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**	◊
3.5	**Poisson´s ratio μ**	◊
3.6	**Torsion modulus G in kN/mm²**	◊
3.7	**Knoop hardness HK 0.1/20**	◊

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4.	**Chemical properties**		
4.1	**Hydrolytic resistance acc. to DIN ISO 719**		
		Hydrolytic class	HGB 4
		Equivalent of alkali (Na_2O) per gram of glass grains in µg/g	426
4.2	**Acid resistance acc. to DIN 12 116**		
		Acid class	3
		Half surface weight loss after 6 hours in mg/dm²	1.7
4.3	**Alkali resistance acc. to DIN ISO 695**		
		Class	A 3
		Surface weight loss after 3 hours in mg/dm²	249
4.4	**Hazardous Substances**		
	EC-directive 2002/95/EC (RoHS-directive)		on request
5.	**Electrical properties**		disregarded
6.	**Other properties**		disregarded
7.	**Annex** (diagrams, curves)		

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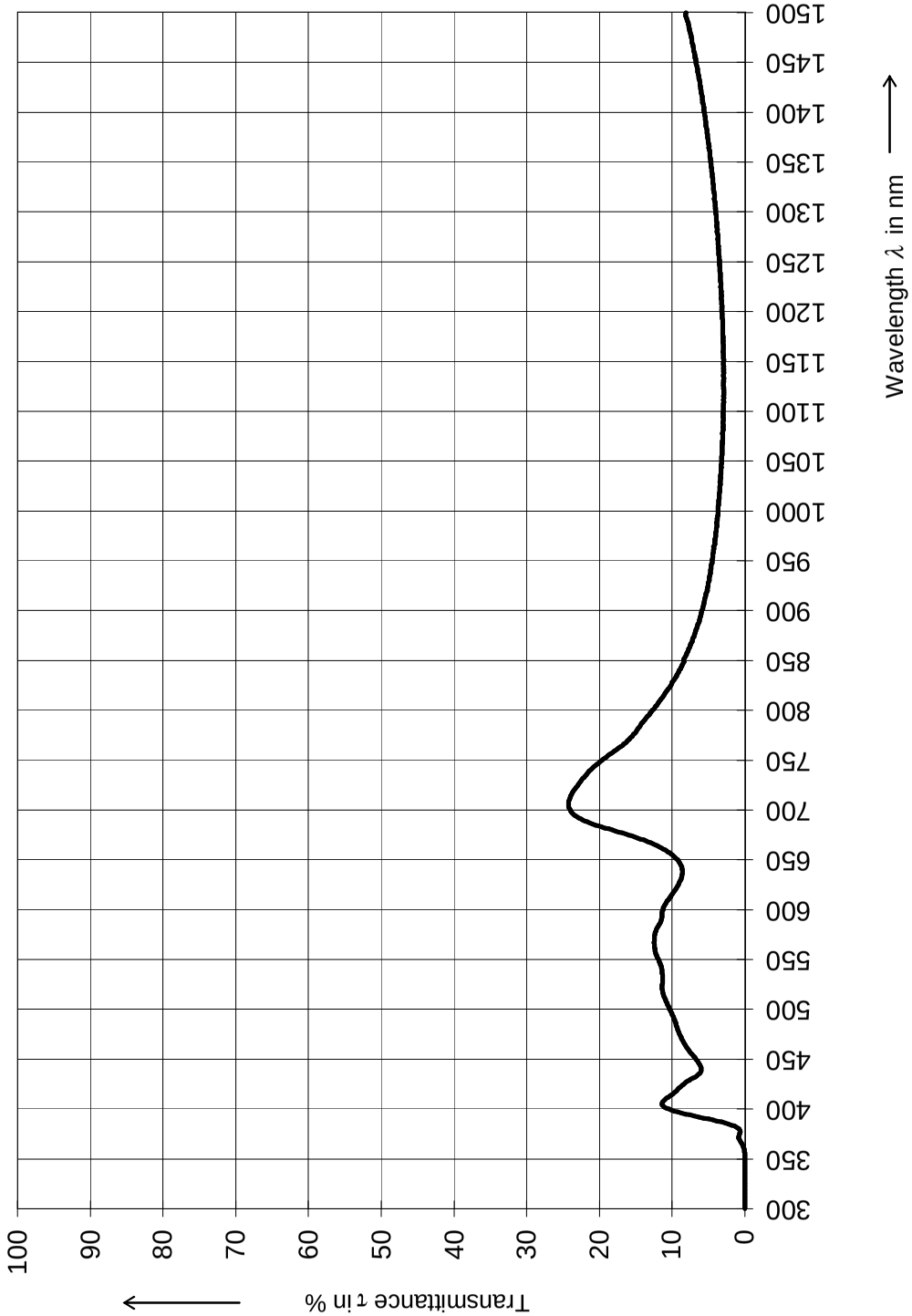
Spectral Transmittance

Type of Glass: Grau 1214
Thickness: 2.25 mm



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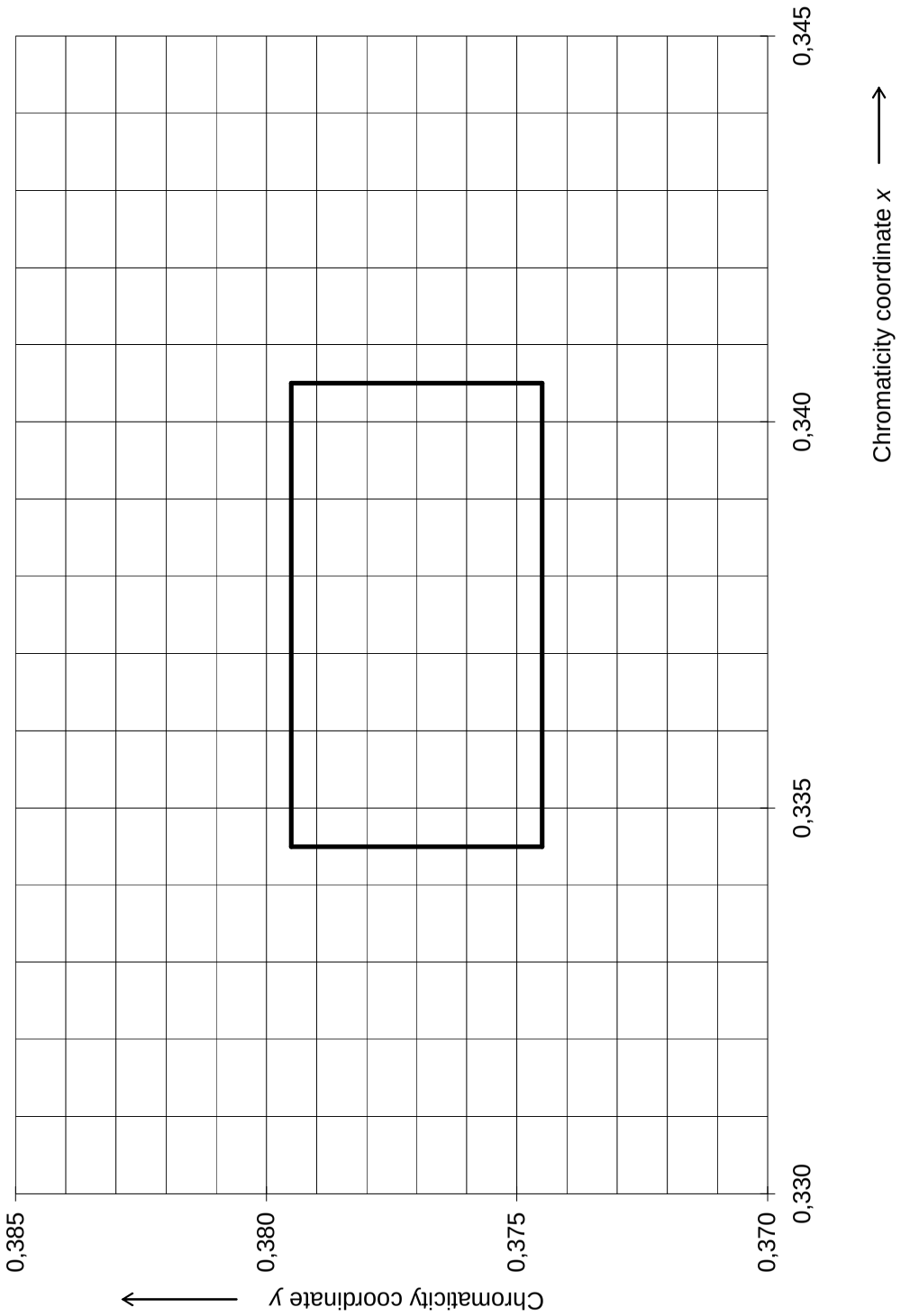
Chromaticity Coordinates

Type of Glass: Grau 1214
Thickness: 2.25 mm



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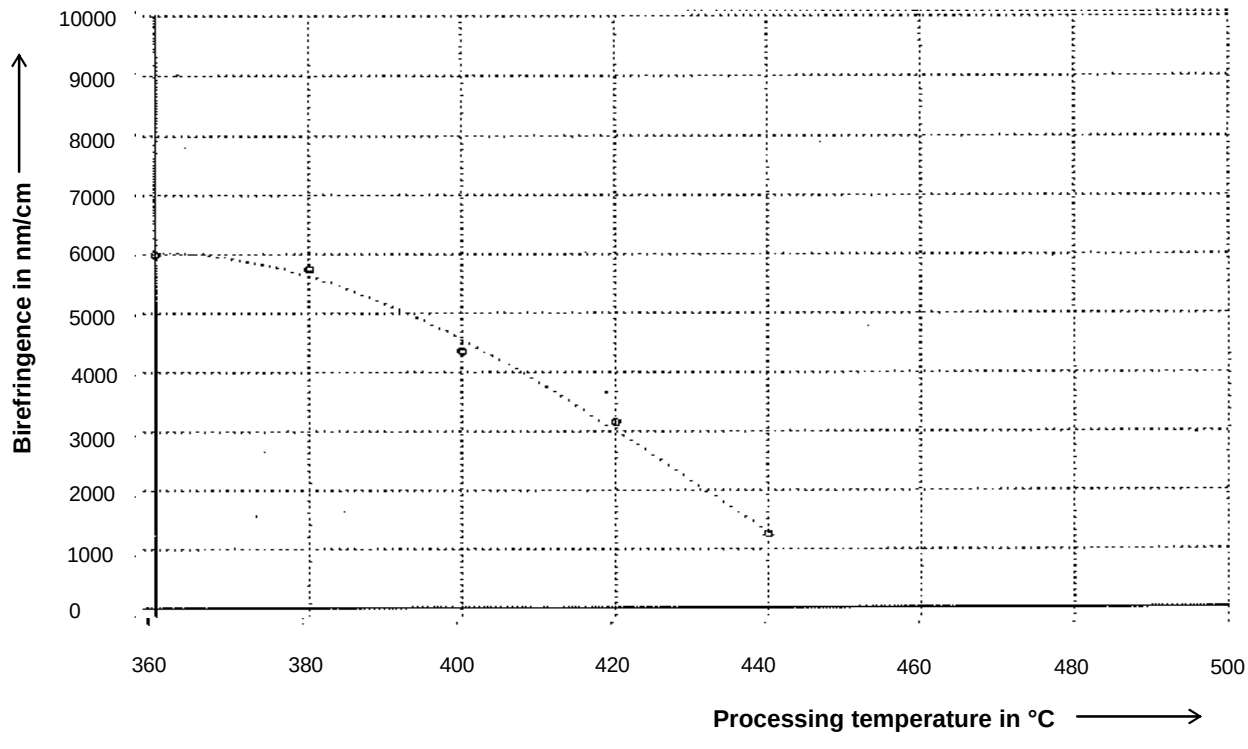
Chemical toughening parameter

Glass and chemical toughening parameters		
Transformation temperature	°C	479
Glass thickness	mm	2
Processing time	h	16
Processing temperature	°C	360
Salt bath (* weight percentages)	KNO_3 in % *	99.5
	SiO_2 x H_2O in % *	0.5

Chemical toughening results *		
Penetration depth	µm	50
Birefringence	nm/cm	6000

* 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



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