Specification

Physical and chemical properties

PCP
D 1520

- p r o v i s i o n a l -

Driver Grey — D 1520

Colour:	grey
Application:	medium tinted sunglare filter with high UV- absorption filter category 2 acc. to DIN EN 1836 (for τ_v < 18 % filter category 3)

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	1.5380
$n_{F'}$	1.5330
n_F	1.5324
n_e	1.5278
n_d	1.5255
n_D	1.5254
$n_{C'}$	1.5230
n_C	1.5225

1.1.1 Abbe value

v_e	52.7
v_d	53.1

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 = 2.0 mm (λ = 300 nm to 1500 nm): see annex

1.2.1.2 $\tau(\lambda)$ - individual values in % (d = 2.0 mm)

$\tau(\lambda)_{max}$ for the λ - range 280 nm to 315 nm	< 0.01
$\tau(\lambda)_{max}$ for the λ - range 315 nm to 350 nm	0.03
τ_{380}	4.1
$\tau(\lambda)_{min}$ for the λ - range 500 nm to 650 nm	16.1

1.2.1.3 Edge wavelength (d = 2.0 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 = 2.0 mm *** nominal transmittance**: 19.5* ± 2

Luminous transmittance as a function of thickness

Thickness in mm	1.4	2.0	3.0	4.0	5.0	6.0
τ_{vD65} in %	◊	19.5	◊	◊	◊	◊
τ_{vA} in %	◊	19.7	◊	◊	◊	◊
τ_{vC} in %	◊	19.5	◊	◊	◊	◊

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1.2.2.2	**Scale number/ Filter category**		
	N for mean thickness *d* = 1.8 mm (τ_{vD65} = 22.8 %)		5 - 2.5
	N for mean thickness *d* = 2.6 mm (τ_{vD65} = 12.6%)		5 - 3.1
	filter category for nominal transmittance τ_{vD65} = 19.5 %		2
1.2.3	**Special transmittance values in % (*d* = 2.0 mm)**		
1.2.3.1	**UV - transmittance**		
		τ_{UVA}	0.9
		τ_{SUV}	0.4
		τ_{SUVA}	0.6
		τ_{SUVB}	< 0.05
1.2.3.2	**IR - transmittance**	τ_{SIR}	31
1.2.3.3	**Solar blue - light transmittance**	τ_{sb}	19.1
1.3	**Colour**		
1.3.1	**Visual evaluation**		◊
1.3.2	**Colorimetry**		
	Chromaticity coordinates	x_{10} y_{10}	0.3227 0.3361
	Chromaticity coordinates (colour locus) are referred to the Standard Illuminant D_{65} according CIE 10°-observer for the nominal transmittance τ_{vD65} = 19.5 % (refer to 1.2.2.1)		
1.3.3	**Signal light recognition**		
	Relative visual attenuation coefficient (quotient) *Q*	Q_{blau}	0.99
	for signal light recognition referred to the	$Q_{grün}$	0.99
	nominal transmittance τ_{vD65} = 19.5 %	Q_{gelb}	1.02
	(refer to 1.2.2.1)	Q_{rot}	1.00
1.3.4	**Yellowness index (*d* = 10 mm)**		
		Y_i	◊

Form 0050/1e

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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	493
Annealing point	13.0	520
Softening point	7.6	690
Forming temperature	6.0	785
Forming temperature	5.0	866
Forming temperature	4.0	975

2.2	**Transformation temperature *Tg* in °C**	524
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** (annealed at 40 °C/h)	2.52
3.2	**Stress optical coefficient *C* in 1.02 · 10^{-12} m²/N**	2.85
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 in slightly transmittance - and colourchange.	
3.3.1	**Chemical toughening**	
	Processing temperature ϑ in °C	430
	Processing time *t* in h	16
	Compressive stress *Ds* as birefringence in nm/cm	5400
	Penetration depth *Nz* up to neutral zone in µm	70
	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**	520

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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	444

4.2 Acid resistance acc. to DIN 12 116

Acid class	S 2
Half surface weight loss after 6 hours in mg/dm²	1.1

4.3 Alkali resistance acc. to DIN ISO 695

Class	A 2
Surface weight loss after 3 hours in mg/dm²	121

4.4 Hazardous Substances

EC-directive 2002/95/EC (RoHS-directive)	on request

5. Electrical properties

disregard

6. Other properties

6.1 Solarization

Reduction of luminous transmittance τ_{vD65} after UV-radiation $\Delta\ \tau_{vD65}$ in %	0.2

Measuring and Test Procedures

The sample will be irradiated with a UV - F 400 floodlamp.
The irradiation time amounts to 7h; the distance between floodlamp and samplefastening is 14 cm.

7. Annex (diagrams, curves)

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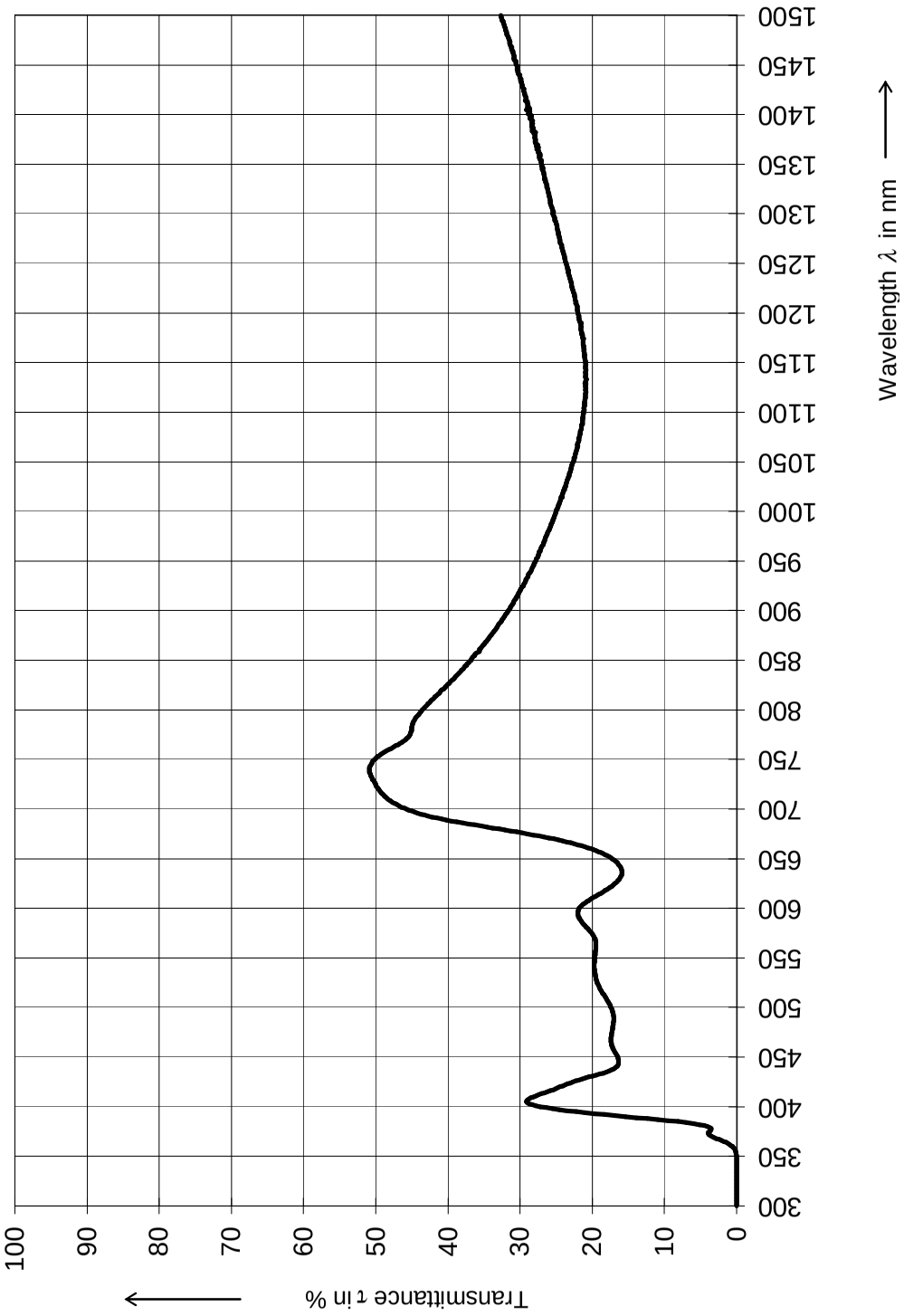
Spectral Transmittance

Type of Glass: Driver Grey
Thickness: 2.0 mm



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Chemical toughening parameter

Glass and chemical toughening parameters		
Transformation temperature	°C	524
Glass thickness	mm	2
Processing time	h	16
Processing temperature	°C	430
Salt bath (* weight percentages)	KNO_3 in % *	99.5
	SiO_2 x H_2O in % *	0.5

Chemical toughening results *		
Penetration depth	µm	70
Birefringence	nm/cm	5400

* 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