SCHOTT

Specification

Technical properties

TP

D 263™ T eco

Description:

D 263™ T eco is a colorless borosilicate glass with a high chemical resistance.
The special composition and the thickness range of this glass substrate with fire-polished surface makes it suitable for a variety of applications.

Applications (e.g.):

Sensors for optical and electrical applications
LCD-Substrates
Image sensor cover glass (CCD/CMOS)
MEMS (Micro-Electro-Mechanical Systems)
Bio-technology
Touch Control Panels
Glass substrate for coatings

Contents:

For physical and chemical properties of D 263™ T eco as well for wafer application (round or square 4 – 12 inch) separate specifications are available.

The subsequent properties are based primarily upon the measuring results of the very latest standards and measuring methods. They 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**.

VW 0050/1e

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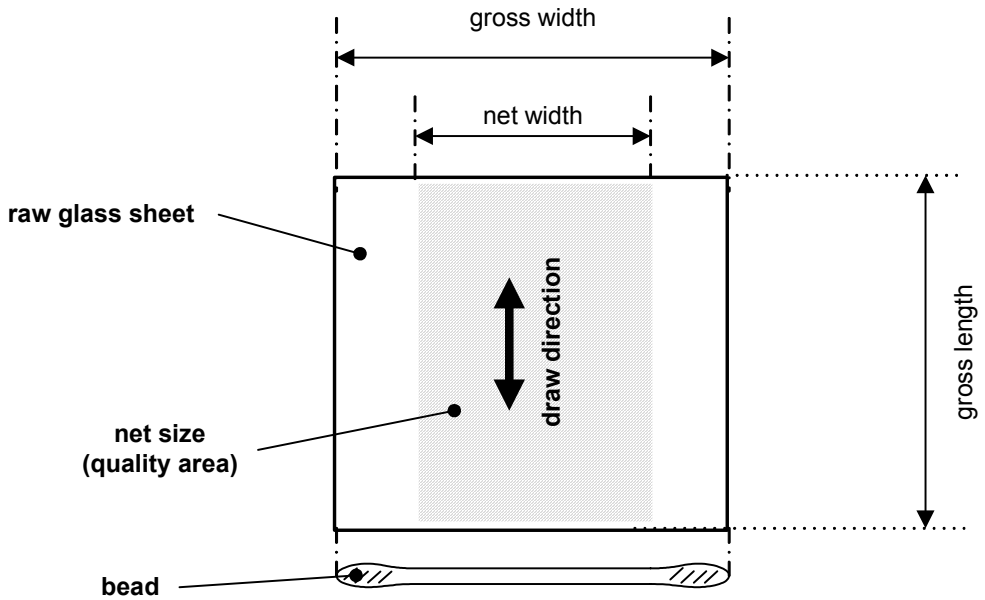
1. Introduction

D 263™ T eco thin glass is produced by down-draw technology. Drawn as a continuous ribbon the glass is separated into sheets by cutting. The size of the raw glass sheet is limited parallel to draw direction by beads and perpendicular to draw direction by cut edges (see Fig. 1).

Depending on thickness raw glass sheets are produced with or without beads (cut off beads by laser cutting process). The size is defined by gross length and gross width. Within this standard area a net size is defined centered to the beads in which subsequent properties and quality items are guaranteed. In general, the sheet glass size is defined by length in draw direction and width across draw direction. The quality area is defined within the net size area as shown in the figure below:



(Fig. 1)

The raw glass is produced in standard size formats (with and without beads). Furthermore special cut to size dimensions can be produced according to customer requirements. Cut to size dimensions are possible in round or rectangular sizes. In addition edges can be treated by an edge grinding process (facet or C-shape).

Cut to size dimensions are defined by length, width or diameter. The length is defined along the drawing direction.

If your requirements do not meet this specification, please contact us under info.gruenenplan@schott.com to design a customized product.

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2. Stock Sheet Glass

Stock sheets glass defines glasses produced according to standard sizes which can be delivered within shortly. Stock sheet glasses are characterized by:

- 100% inspection for visual properties
- cut edges (respectively edge with beads at the width)
- no washing treatment
- stored with paper interleaves
- produced in campaigns.

2.1 Stock Sheet Glass - Sizes

nominal thickness [mm]	width [mm]	length [mm]
0.03	300 +10 / -0	440 ± 10
0.05 – 1.1	360 +10 / -0	

2.2 Geometrical properties

All geometrical properties are related to net size (quality area).

2.2.1 Thickness, thickness variation and warp

nominal thickness [mm]	thickness tolerance variation in lot [mm]	thickness variation ΔD (deltaD) [1] referenced to net width [µm]	flatness deviation warp [2] referenced to net width [µm]
0.03	± 0.008	≤ 10	
0.05	± 0.010	≤ 10	[3]
0.07	± 0.015	≤ 20	
0.10	± 0.015	≤ 20	≤ 4000 (4.0mm)
0.145	± 0.015	≤ 20	≤ 4000 (4.0mm)
0.175	± 0.020	≤ 20	≤ 4000 (4.0mm)
0.21	± 0.020	≤ 20	≤ 1500 (1.5mm)
0.25	± 0.020	≤ 20	≤ 1000 (1.0mm)
0.30	± 0.020	≤ 20	≤ 400
0.40	± 0.020	≤ 20	≤ 400
0.50	± 0.030	≤ 20	≤ 400
0.55	± 0.030	≤ 20	≤ 400
0.70	± 0.050	≤ 30	≤ 400
0.90	± 0.050	≤ 30	≤ 400
1.10	± 0.050	≤ 40	≤ 400

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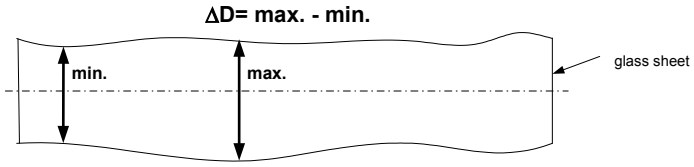
[1] **ΔD** defines thickness variation within one glass sheet measured across drawing direction.



(Fig. 2)

[2] Warp measured on a flat table in a mechanical unconstrained state.

(Fig. 3)

[3] Because of low stiffness of very thin (0.03 to 0.07 mm) and big sized glass sheets the gravity force influences flatness shape significantly. Therefore flatness deviation (warp) can not be specified for this thickness range.

2.2.2 Parallelism and squareness

nominal thickness [mm]	parallelism [%]	squareness [%]
0.03 – 0.07	≤ 1.0	≤ 2.0
0.1 – 1.1	≤ 0.5	≤ 1.0

2.2.3 Waviness

A stylus tip surface waviness tester (Mitutoyo Surftest SV 3000-8) is used for waviness measurements. Typical actual values of waviness for this fire polished glass surfaces are ≤ 400 nm. Waviness is measured perpendicular to the draw direction with an evaluation length of 20 mm, a phase correct 75% filter and edge wavelengths of 0.8 mm and 8.0 mm. Actual values are available for glass thickness ≥0.30 mm. The reproducibility of waviness measurements for thickness <0.3 mm is not yet given by the state of the art waviness measurement methods.

2.2.4 Roughness

The roughness of surface shows typical values below <1 nm (RMS):

2.3 Stock Sheet Glass - Quality properties

All quality properties are related to net size (quality area). A 100% inspection for visual properties is done by an automatic inspection system during hot forming.

2.3.1 Stock Sheet Glass - Bulk defects (inclusions, e.g. bubbles, stones, knots)

nominal thickness	defect size [1]	admissible quantity	conditions
0.03 - 0.07 mm	visibility	none visible	
	< 100 µm	OK (ignore)	
0.10 – 1.10 mm	100 - 200 µm	≤ 2	distance > 25 mm
	> 200 µm	NG (none)	

[1] defect size is defined by the max. dimension of defect

2.3.2 Stock Sheet Glass – Surface defects

type of defect	defect size [1]	admissible quantity
elongated defects e.g. scratches, rubs, sleeks	width < 20 µm and length < 25 mm	OK (ignore)
	width 20 - 50 µm and length < 25 mm	≤ 3
	width > 50 µm or length > 25 mm	NG (none)
spot type defects e.g. digs, pits, open bubbles, not removable particles [2]	< 100 µm	OK (ignore)
	100 - 200 µm	≤ 3
	> 200 µm	NG (none)

[1] defect size is defined by the max. dimension of defect
[2] not removable by standard cleaning process at customer (as specified in Contaminations)

2.3.3 Stock Sheet Glass – Edge defects

type of defect	defect size [1]	admissible quantity
edge defects e.g. chips, protrusions, horn (see Fig. 4)	length < 0.20 mm and width < 0.20 mm	OK (ignore)
	length ≤ 1.0 mm and width ≤ 1.0 mm and depth ≤ 50% of thickness	≤ 3
	length > 1.0 mm or width > 1.0 mm or depth > 50% of thickness	NG (none)
cracks	visible	NG (none)

[1] defect size is defined by the max. dimension of defect

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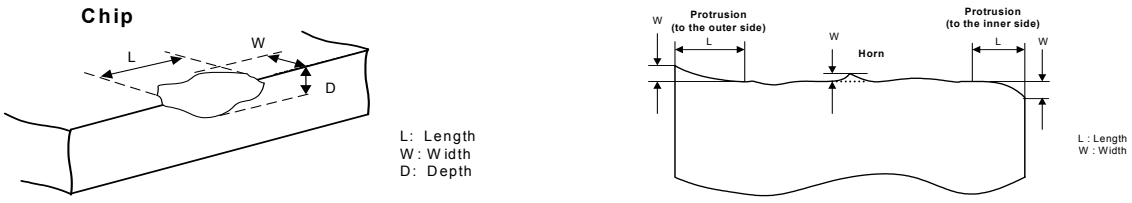

(Fig. 4)

2.3.4 Stock Sheet Glass - Contaminations

Contaminations e.g. finger prints, conveyor belt marks, paper marks, haze, cullets, dust, foreign particles are permissible if they are soluble/cleanable by standard washing processes at customer side for thin glass (depending on thickness e.g. brush roller, ultra sonic, heated DI-water and alkaline detergent, e.g. DECONEX). Cleanable defects will be ignored and are permissible without any size restriction.

2.3.5 Stock Sheet Glass - Quality Assurance

Inspection procedure, inspection level and AQL according ISO 2859 (MIL STD-105-D applicable).

in-process inspections	**100% inspection** of visual properties
	statistical quality control for geometrical properties (SPC, referring 2.2)
final inspections	**inspection procedure for visual properties:** Inspection level „II“, single sampling, normal inspection, AQL 4.0
	inspection procedure for geometrical properties: Inspection level „S3“, single sampling, normal inspection, AQL 2.5

2.4 Stock Sheet Glass - Packaging

Depending on size and thickness glasses are packed with paper interleaves in packs of 20 to 100 pcs between cardboard covers. Usually packs will be shrunk in plastic foil to avoid environmental influences during transportation and storage. Each pack is identified by a waybill or label which includes all needed data to trace back all processing information. Packs will be packed in pallet boxes (made out of cardboard or wood) before they are shipped to customer.

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3. Cut to Customer Size

Maximum size is limited to net width and length of raw glass sheet. Minimum size is limited by technical limitations of cutting capabilities. In general, the processing capability of a specific substrate size will be checked in advance of order acceptance.

3.1 Cut to Customer Size - Sizes

Rectangular Shape

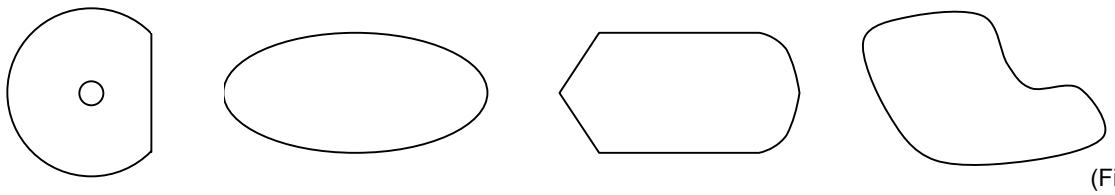
nominal thickness	maximum size		minimum size	
[mm]	length [mm]	width [mm]	length [mm]	width [mm]
0.03	410.0 ± 0.8	300.0 ± 0.8	10.0 ± 0.3	10.0 ± 0.3
0.05 – 0.07		360.0 ± 0.8		
0.10 – 0.30	410.0 ± 0.5	360.0 ± 0.5	1.0 ± 0.1	1.0 ± 0.1
0.40 – 1.10			5.0 ± 0.2	5.0 ± 0.2

Round Shape

nominal thickness	diameter [1)]	
[mm]	max size [mm]	min size [mm]
0.05 – 0.07	150.0 ± 0.5	20.0 ± 0.5
0.1 – 1.1	360.0 ± 0.2	10.0 ± 0.2

Rounds can be provided with:

- flats (straight cut) and holes
- oval shapes
- different edge shape e.g. standard or free shapes or combined



(Fig. 5)

Depending on size and thickness protrusions (noses) occurred between the transition of round and flat area. The position of these protrusions can be influenced by the breaking method. Protrusions will be located either on the round shape or on the flat shape. Protrusions can not be totally avoided, but the customer may define their location.

For these special applications a detailed specification (or drawing) and a feasibility study is necessary to determine a quotation.

3.2 Geometrical properties

Unless otherwise defined below all geometrical properties like thickness tolerance, ΔD (deltaD) and warp are defined according to 2.2.1.

3.2.1 Parallelism and squareness

nominal thickness [mm]	parallelism [%]	squareness [%]
0.03 – 0.07	≤ 0.5	≤ 1.0
0.1 – 1.1	≤ 0.1	≤ 0.25

3.3 Cut to Customer Size - Quality properties

Glass inspection for bulk and surface defects is done by experienced operators. Following inspection conditions are defined:

inspection conditions	
environment	dark inspection box with top light
inspection light	1.5 klux
inspection time	15 seconds

3.3.1 Cut to Customer Size - Bulk and Surface Quality

Thickness range 0.1 – 1.1 mm

defect type	defect size [1]	size range[2] <100mm admissible quantity	size range[2] 100 - 300mm admissible quantity	size range[2] >300mm admissible quantity
bulk and spot type defects e.g. bubbles, stones, knots, digs, pits, open bubbles, not removable particles	< 100 µm	OK (ignore)	OK (ignore)	OK (ignore)
	100 – 200 µm	1	2	3
	> 200 µm	NG (none)	NG (none)	NG (none)
elongated defects e.g. scratches, sleeks, rubs	width < 20 µm **and** length< 25 mm	OK (ignore)	OK (ignore)	OK (ignore)
	width 20 – 50 µm **and** length< 25 mm	1	2	3
	width > 50 µm **or** length> 25 mm	NG (none)	NG (none)	NG (none)

[1] defect size is defined by the maximum dimension of defect
[2] size range is defined by max. edge length or diameter

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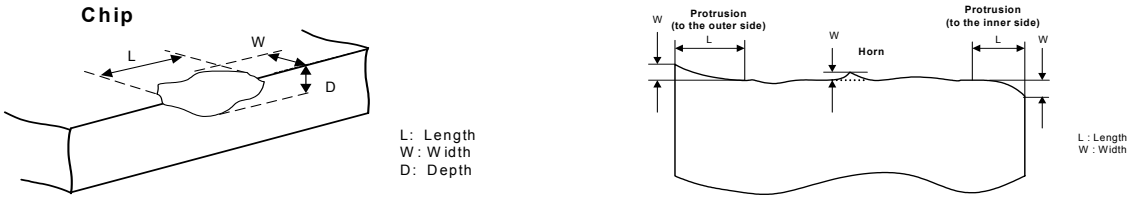
3.3.2 Cut to Customer Size - Edge Quality

defect type	admissible quantity	thickness range 0.03 – 0.1mm	thickness range 0.145 – 0.55mm	thickness range 0.7 – 1.1mm
edge defects e.g. chips, horn, protrusions [Fig. 6]	OK (ignore)	< 0.1 mm	< 0.15 mm	< 0.2 mm
	≤ 2 pcs / edge ≤ 5 pcs / sheet	width ≤ 0.5 mm **and** length≤ 0.5 mm depth ≤ 50% of thickness	width ≤ 0.7 mm **and** length≤ 0.7 mm depth ≤ 50% of thickness	width ≤ 1.0 mm **and** length≤ 1.0 mm depth ≤ 50% of thickness
	NG (none)	width > 0.5 µm **or** length> 0.5 mm **or** depth > 50% of thickness	width > 0.7 µm **or** length> 0.7 mm **or** depth > 50% of thickness	width > 1.0 µm **or** length> 1.0 mm **or** depth > 50% of thickness
cracks	none	visible	visible	visible

Remark: defect size is defined by the maximum dimension of defect.



(Fig. 6)

3.3.3 Cut to Customer Size - Contaminations

Contaminations e.g. finger prints, conveyor marks, paper marks, haze, cullets, dust, foreign particles are permissible if they are soluble/cleanable by standard washing processes at customer side for thin glass (depending on thickness e.g. brush roller, ultra sonic, DI-water and alkaline detergent, e.g. DECONEX). Cleanable defects will be ignored and are permissible without any size restriction.

3.3.4 Cut to Customer Size - Quality Assurance

Inspection procedure, inspection level and AQL according ISO 2859 (MIL STD-105-D applicable).

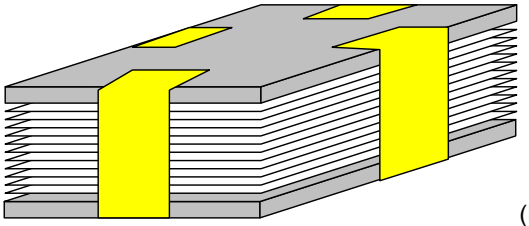
in-process inspections	**100% inspection** of visual properties
	statistical quality control for geometrical properties (SPC)
final inspections	**inspection procedure for visual properties:** Inspection level „II“, single sampling, normal inspection, AQL 1.5
	inspection procedure for geometrical properties: Inspection level „S3“, single sampling, normal inspection, AQL 1.0

3.4 Cut to Customer Size - Packaging

Depending on substrate size (e.g. length, width, thickness), processing status (e.g. cut, wasched) and customer destination and requirements a lot of different packing methods are available:

- stacks with paper interleaves between the glasses
- cardboard or plastic covers on top and bottom to fix the stacks (Fig. 7)
- wrapping of stacks in paper
- cardboard or plastic boxes for the stacks
- cardboard or plastic trays (for small pieces)
- adhesion foil (for small formats)
- clean room packaging possible

Each pack are marked by a waybill which contents data to identify the material.



(Fig. 7)

4. Cut to Customer Size - Additional processing capabilities

Depending on customer requirements additional treatments of glasses are possible. But for these requests a separate feasibility study for each inquiry or order is necessary to check possibilities to meet customer demands.

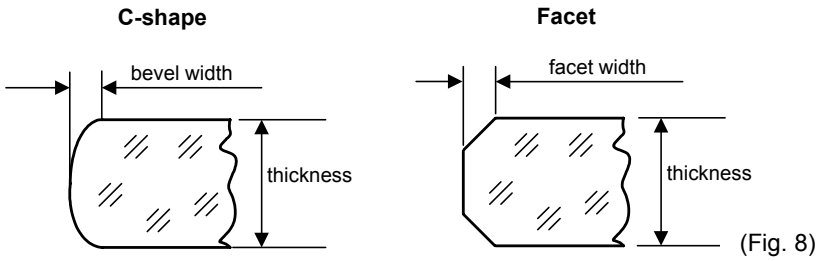
4.1 Cut to Customer Size - Laser cutting

thickness [in mm]	min. size [in mm]	max. size
0.3 to 1.1	5 x 5 depending on glass thickness)	depending on glass size

4.2 Cut to Customer Size - Edge grinding

Edge grinding can be carried out manually or by machines. Polished or grinded edge surface is possible.

Methode	mechanical	manuell
glass shape	rectangular shape only	rectangular shape only
nominal thickness	0.3 – 1.1 mm	0.2 – 1.1 mm
min size [mm]	200 mm	10 mm
max size [mm]	depending on glass size	depending on glass size
edge shape	chamfered, radius or C-shape (Fig. 8)	manually seaming
corner cut	orientation and dubbed corners (e.g. 2x5mm)	orientation and dubbed corners



(Fig. 8)

4.3 Cut to Customer Size - Cleaning

Glasses can be washed to get a clean surface. Depending on glass size (format and thickness) different cleaning machines can be used which are supported by Ultra-Sonic. Washed glasses can be inspected more precisely compared to un-washed substrates. Defect size has to be agreed separately.

4.4 Cut to Customer Size - Chemical Toughening

In order to improve the breakage strength of finished processed glasses a chemical toughening (tempering) process can be performed.

4.5 Cut to Customer Size – Laser Marking

It is possible to perform a permanent marking on substrates by a laser marking process.

4.6 Cut to Customer Size – Sand Blasting

Sand blasting technology can be used to produce:

- matting of surface (complete or structured)
- structuring of surface (cavities)
- making holes

Glass surface which is structured by sand blasting process are matt.