

## QUALIFICATION CONTROL

### 1. Limit Deviation on Thickness of Folio Laminated Products

- The limit deviations on thickness of laminated glass shall not exceed the sum of the limit deviations of the constituent glass panes. The limit deviation of the interlayer shall not be taken into account if the total interlayer thickness is < 2 mm. If the total interlayer thickness is  $\geq 2$  mm a limit deviation of  $\pm 0,2$  mm.

Example:

- A laminated glass made from two sheets of float glass of 3 mm nominal thickness and an interlayer of 0,5 mm. The limit deviation of 3 mm float glass is  $\pm 2$  mm. Therefore, the nominal thickness is 6,5 mm and the limit deviation is  $\pm 4$  mm.

#### a. Measurement of Thickness

- The thickness of the pane shall be calculated as the mean of measurements taken at the centers of the four sides. The measurement shall be taken to an accuracy of 0,01 mm.

#### b. Thickness Tolerances of Glass Types

NOMINAL THICKNESS (mm)	THICKNESS TOLERANCES of GLASS TYPE	
	PATTERNED	FLOAT
3	$\pm 0,5$	$\pm 0,2$
4	$\pm 0,5$	$\pm 0,2$
5	$\pm 0,5$	$\pm 0,2$
6	$\pm 0,5$	$\pm 0,2$
8	$\pm 1,0$	$\pm 0,3$
10	$\pm 1,0$	$\pm 0,3$
12	Not manufactured	$\pm 0,3$
15	Not manufactured	$\pm 0,5$
19	Not manufactured	$\pm 1,0$
25	Not manufactured	$\pm 1,0$

### 2. Displacement Tolerances

Nominal Dimension B or H mm	Maximum Permissible Displacement d, mm
$B, H \leq 1000$	2,0
$1000 < B, H \leq 2000$	3,0
$2000 < B, H \leq 4000$	4,0
$B, H > 4000$	6,0

Note: B is width, H is length.

## QUALIFICATION CONTROL

### 1. Surface Quality

#### a. Scratch

Glass Area ( m <sup>2</sup> )	Scratch Size ( mm )		Scratch Number	
	deep	thin	deep	thin
< 1	-	50	-	2
> 1	10	50	2	5

Note: Test Method; For glasses less equal to 1 m<sup>2</sup> visual sight distance is 1m for 3 seconds, for glasses bigger than 1 m<sup>2</sup> for 10 seconds.

- Deep scratches are permissible if the area is more than 1 m<sup>2</sup> and 150 mm far from the edge.

#### b. Pinprick Sign

- For the glass area is less than 1 m<sup>2</sup> ;There must not be any fault more than 0,5 mm diameter, visual sight distance is 1 m for 5 seconds.
- For the glass area is more than 1 m<sup>2</sup> ;There must not be any fault more than 1 mm diameter, visual sight distance is 1 m for 5 seconds.

### 2. Surface Flatness

- According to EN 12150 standard, test must be made according to (TT.035 ) and the results must be reliable to that instruction.

#### a. Local Bow

- It should be maximum 0,3 mm.

#### b. Overall Bow

- It should be maximum 0,002.

### 3. Optical Surface Pre-stress

- It should be between 90 MPa and 168,83 MPa for tempered glasses.
- It should be between 24 MPa ile 52 Mpa for heat strengthened glasses.

### 4. Fragmentation Quality

- According to EN 12150 standard, test must be made according to (TT.035 ) and the results must be reliable to that instruction.

### 5. Fragmentation Particle Count

Glass Type	Nominal Thickness (mm)	Minimum Particle Count
Float and Drawn Sheet	3	15
	4 - 12	40
	15 - 19	30
Patterned	4 -10	30

Note: The glass which will be tempered should be control all specialities before the process.

- There shouldn't be any fault at veneering in a coated glass.

## QUALIFICATION CONTROLS

### 1. Sandblasting Position

- Sandblasting positions dislocation should be maximum  $\pm 1$  mm.

### 2. Sandblasting Quality

- After sandblasting process; there should not be any pinhole greater than 1mm diameter, visual sight distance is equal to an arm length.
- There should not be any foreign materials on the sandblasting side.
- There should not be any clear area on the sandblasting side of the glass.
- There should not be any sand on the unsandblasted side of the glass.
- Sandblasting should be homogeneous, continuously and should not be any fluctuation.

### 3. Attention

- There should not be corks between the sandblasted glasses, should be only paper.

Note: Before and after sandblasting, glasses should be washed and tempering process should be done before sandblasting process.

## QUALIFICATION CONTROL

### 1. Scraping On Paint

- Defects less than 3 mm area are not considered.
- Maximum 1 defect between 3 - 5 mm area is permitted.
- Defects greater than 5 mm area are not permitted.

### 2. Ragle Sign

- Ragle sign can be maximum 10 cm for the glasses less than 1 m<sup>2</sup>. For the glasses greater than 1 m<sup>2</sup> ; it can be max. 20 cm. Ragle sign width should not be greater than 2 mm for all situations. It can be 1 sign maximum.

### 3. Spots On Paint

#### a. On Unprinted Area

- Defects less than 1 mm area are not considered.
- Maximum 1 defect between 1 - 2 m area is permitted.
- Defects greater than 2 mm area are not permitted.
- There should not be any fingerprints, foreign substances, etc. except printing on the printing area.

### 4. Small Protuberance

#### a. On Printed Area

- Defects less than 0,5 mm area are not considered.
- Maximum 2 defects between 0,5 - 1,5 m area are permitted.
- Defects greater than 1,5 mm area are not permitted.

### 5. Paint Accumulation

#### a. On The Glass Edge

- It can be on all edges of the glass.

### 6. Displacement

- The displacement on the printing position can be  $\pm 1$  mm maximum.

### 7. Paint Effluxion

- There should not be any paint effluxions on the glass edges and hole edges.

### 8. Homogeneity

- Printing should be homogeneous and it should not be seen fluctuating.

### 9. Controlling Method

For the printed glasses which will be check after printing process; The observer should check 70 cm far from the glass for 5 seconds which is less than 1 m<sup>2</sup>. Checking process should be done 70 cm far from the glass for 8 seconds which is greater than 1 m<sup>2</sup>. Invisible faults (pinhole, deleted paint, paint accumulation, displacement, etc.) from that distance are permissible.

## QUALIFICATION CONTROLS

### 1. Washing Quality:

On the glass surface;

- There should not be any water dirth on the glass.
- There should not be any fingerprints, paper dirth, oil dirth, etc.
- There should not be any pollution or dirth on the washed side.

### 2. Other Important Situations:

- After washing, the glass quality should control (surface quality, edge and surface process) according to the determined specialities.

### 3. Water Quality

(For Purified Water)

#### a. Laboratory

Hardness	Conductivity	Temperature
$1 \leq fr \leq 5$	$0 \leq \mu s \leq 5$	Room Temperature

#### b. Glass Processing

Hardness	Conductivity	Temperature
$1 \leq fr \leq 5$	$0 \leq \mu s \leq 40$	$50 \leq ^\circ C \leq 65$

Note: Temperature value is only valid for prewashing water.

#### c. Insulating Glazing

Hardness	Conductivity
$1 \leq fr \leq 5$	$0 \leq \mu s \leq 30$

## QUALIFICATION CONTROL

### a. Hole Diameter

- If the diameter is between 4 mm and 10 mm, the tolerance is  $\pm 0,5$  mm.
- If the diameter is greater than 10 mm the tolerance is  $\pm 1$  mm.

### b. The Distance Between Hole and Edges

- The tolerance of the distance between hole and edges is  $\pm 1$  mm.

### c. The Distance Between Hole Axes

- If the distance between hole axes is less than 1 m, the tolerance is  $\pm 0.5$  mm. If it's greater than 1 m the tolerance is  $\pm 1$  mm.

### d. Fracture Like Flakes Around The Hole

- There can be max. 1,5 mm fracture around the hole if the hole diameter is less than 10 mm.
- There can be max. 1 mm fracture around the hole if the hole diameter is between 10 mm and 50 mm.
- If  $50 \text{ mm} < \text{hole diameter}$ , fracture can be max. 1,5 mm around the hole.
- Step tolerance should be less than  $\pm 0.5$  mm.

### e. Counterbore

- Fracture can be max. 1,5 mm around the counterbore.
- Crookedness tolerance on the counterbore is 1 mm.
- It should not be any rupture at the beginning and end of the counterbore.

### f. Corner

- It should be  $\pm 1$  mm tolerance at the corner.

### g. Radius

- It should be  $\pm 1$  mm tolerance on the radius.

## Issues Must Be Considered For The Glasses Which Will Be Tempered

### a. Hole Distance

- The distance of the edge of a hole to the glass edge should be not less than twice of the nominal thickness of the glass.
- The distance between the edges of two holes should be not less than twice of the nominal thickness of the glass.
- The distance of the edge of a hole to the corner of the glass should be not less than 6 times of the nominal thickness of the glass.

### b. Hole Size

- Hole diameter should not be less than the nominal thickness of the glass.
- Maximum hole diameter should not be more than 1/3 of the short edge (size) of the glass.
- It should not be any burr more than 2 mm depth on the hole.
- If the radius is bright it should be minimum 26 mm, if it's matt it should be minimum 13 mm for the corner cuts, hollows and notches.
- The half amount of the counterbores diameter and hole diameters difference should be more than minimum 2mm from the thickness of the glass.
- The tolerance is  $\pm 1$  mm for all size of hole diameters.

## QUALIFICATION CONTROL

### 1. Size Quality

#### a. Grinded Glass

- For the glass length < 1 m, size tolerance is  $\pm 0,5$  mm.
- For the glass length > 1 m, size tolerance is  $\pm 1$  mm.
- For the glass length > 2 m, size tolerance is  $\pm 1,5$  mm.
- For the glass length > 3 m, size tolerance is  $\pm 2$  mm.

#### b. Chamfered Glass

- For the glass length < 1 m, size tolerance is  $\pm 1$  mm.
- For the glass length > 1 m, size tolerance is  $\pm 1,5$  mm.
- For the glass length > 2 m, size tolerance is  $\pm 2$  mm.

#### c. Squareness

- For the glass length < 1 m, difference between diagonal length tolerance is  $\pm 1$  mm.
- For the glass length > 1 m, difference between diagonal length tolerance is  $\pm 1,5$  mm.

### 2. Surface Quality

#### a. Scratch

Glass Area ( m <sup>2</sup> )	Scratch Length ( mm )		Scratch Quantity	
	Deep	Capillary	Deep	Capillary
< 1	-	50	-	2
> 1	10	50	2	5

- Test Method; For glasses less equal to 1 m<sup>2</sup> visual sight distance is 1m for 3 seconds, for glasses bigger than 1 m<sup>2</sup> for 10 seconds.
- For the glasses greater than 1m<sup>2</sup>; deep scratches are acceptable to the maximum distance is 150 mm from the edge.

### 3. Edge and Surface Process Quality

#### a. Chamfer

- Chamfer should be done a style of not cut hands.
- There should be burrs max. 1 mm length on the edges.

#### b. Grind

- There should not be any area which's not grinded on the grinded side.
- Deviation should be maximum 1 mm at the corners and edges.

#### c. Polishing

- There shouldn't be any unpolished area on the glass edges and closed to the top and bottom parts of the glass.

#### d. Beveled

- Beveled width tolerance is  $\pm 1$  mm.
- It should not be any burr on the beveled glasses.

#### e. Engraved Glass

- Engraved area width tolerance is  $\pm 1$  mm.
- It can be some unpolished areas closed to the edges of the engraved area.

Note: For insulated glasses and the glasses which will install inside a frame evaluated as 2 times bigger than the given tolerances for the failure of burr/deviation.

## QUALIFICATION CONTROL

### 1. Size

#### a. Width and Length Tolerances Of Thickness Of The Glasses For Cutting Processing

Thickness (mm)	Tolerance (mm)	
	Length < 1m	Length > 1 m
3 - 6	± 0,5	± 1
8 - 12	± 1	± 2
15 - 19	± 3	± 4

#### b. Difference Between Diagonal Lengths

- If the glass length is maximum 1m, the tolerance is ± 0,2mm, if the length is greater than 1m the tolerance can be ± 0,5 mm.

### 2. Surface

#### a. Scratch

Glass Area (m <sup>2</sup> )	Scratch Size (mm)		Scratch Quantity	
	Deep	Capillary	Deep	Capillary
< 1	-	50	-	2
> 1	10	50	2	5

- Test Method; For glasses less equal to 1 m<sup>2</sup> visual sight distance is 1m for 3 seconds, for glasses bigger than 1 m<sup>2</sup> for 10 seconds.

#### b. Tiny Faults (Foreign material, bubbles etc.)

- The faults are not considered if the fault lengths are less then 0.5mm
- The closest distance between 2 faults should be minimum 400mm.

Fault Size (mm)	Fault Quantity		
	A<1,8 m <sup>2</sup>	1,8 m <sup>2</sup> <A<8,2 m <sup>2</sup>	A>8,2 m <sup>2</sup>
0.5 - 1	2	3	6
1 - 3	1	2	4
3 - 5	1	2	3
> 5	0	0	0

### c. Colour

- Difference of the colour and fluctuation should be imperceptible.
- It shouldn't be any figure difference on the opal glasses.

### 3. Edge

**Burr** : Ragged edge raised on the surface of glass during drilling or engraving.

**Ear** : A protruding part of the glass.

**Notch** : V-shaped or U-shaped indentation carved or scratched into the glass.

Glass Specialities	Thickness(mm)	Tolerance(mm)
For the glasses which will be grinded	4 - 6	± 1
	8 - 12	± 1,5
	15 - 19	± 1,5
For the beveled glasses	all	± 2
For unprocessed edge	all	± 3

### 4. Thickness

#### a. Thickness Tolerances of Glass Types

Thickness	Patterned Glass	Float Glass
3	± 0,5	± 0,2
4		
5		
6		
8	± 0,8	± 0,3
10	± 1,0	
12	Not manufactured	
15		± 0,5
19		± 1,0
25		



## QUALIFICATION CONTROL

**According to Orders;**

### 1. Against Scratches;

- Paper, cork or glass pollution should be put between each product.

#### a. Paper:

- Paper should be put between 2 glasses, covered the whole surface of the glass and overflow 1,5 cm from all edges.

#### b. Cork:

- The corks should be put on the corners and the middle of the edges, the position must be 3 mm inside of the edges.

### 2. Encasing Process

- Glasses should be stowed in a metal or wooden packing case according to their sizes and thickness. The spaces must fixed by the wood and cardboard. Around the packing case should be covered by metal band.

### 3. Informations

- The packing lists about glass informations should be put on the exportation packing cases.

#### a. Packing lists contain these informations:

- Packing Case Number
- Net Weight
- Gross Weight

### 4. Control

- After packaging or before forwarding the packing cases, etc. are controlled according to the Yıldız Cam Quality Standards.

**Note** : The package details should control to the production cards.

## QUALIFICATION CONTROL

### 1. Venetian Blind Control

- Venetian blind slats should not be struck together.
- Slat sizes should not be different when the venetian blind position is open.
- Venetian blind length shouldn't be shorter or longer than the production length when its position is completely open.

#### a. Rope and Motorized Systems

- Venetian blind slats should move correctly up and down, and axial.
- Control accessories' rope lengths should be suitable to the production dimensions.
- For motorized systems; should be careful for up and down sensors cable lengths.

#### b. Persian Blind Systems

- Persian blind slats should move axial way correctly.

#### c. Curtain + Venetian Blind Systems

- Venetian blind slats should move correctly up and down, and axial.
- When control button which placed underside of the glass moves outer ways, only venetian blind should be active.
- When control button which placed underside of the glass moves inner ways, curtain should be active.

### 2. Visual Control

- Slats should be clean.
- Venetian blind systems window frame which seen from the 4th surface of the glass should be clean.
- Visual sight distance is 1m for 3 seconds, for venetian blind systems window frame which seen from the 4th surface of the glass shouldn't have any constitutional faults.

### 3. Surface and Constitutional Quality

#### a. Bubble, scratch, etc.

- Constitutional faults are not acceptable to the visual sight distance is 700mm (an arm length) for 3 seconds.

- The faults, 700 mm far from the visual sight distance; there should be maximum 4 mm length, 4 constitutional faults and the distance between the faults at least 200 mm are acceptable.
- The sighted scratches 700 mm far from the glass are acceptable if length is 50 mm and the distance between 2 scratches are 200 mm (at least).

#### b. Reflected Glass

- The veneering fault which length is maximum 1,5 mm is not acceptable if the visual sight distance is 2 m. The veneering faults that is less than 1,5 mm should not be heap together at the center of the glass. For the visual sight distance is 3 m; there should not be a scratch which length is maximum 75 mm, and not seen any dirt at the center area of the glass.

### 6. Butyl

- There shouldn't be any discontinuity on the butyl, should be clear-cut and continue on the corners.

### 7. Insulating Chemicals Process

- The distance should be maximum 15 mm between the edge of the profile which's position to the airgap and the edge of the glass.
- For shuco profiles; the distance between glass edge and profile edge which position is in the IG unit should be maximum 25 mm.
- Insulating chemical should not be enter into the product from the edges of the profile. There should not be any air gap.
- Polyurethan space should be 3 mm, and silicone space should be 6 mm at least.

## QUALIFICATION CONTROL

### 5. Surface and Constitutional Quality

#### a. Bubble, scratch, etc.

- Constitutional faults are not acceptable to the visual sight distance is 700mm (an arm length) for 3 seconds.
- The faults, 700mm far from the visual sight distance; there should be maximum 4 mm length, 4 constitutional faults and the distance between the faults at least 200mm are acceptable.
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- For shuco profiles; the distance between glass edge and profile edge which position is in the IG unit shoul be maximum 25 mm.
- Insulating chemical should not be enter into the product from the edges of the profile. There should not be any air gap.
- Polyurethan space should be 3 mm, and silicone space should be 6 mm at least.

### 8. Edge Deletion

- For soft coated glasses; the coated places of the glass edges should be deleted the total distance of the insulating chemical space and profile thickness.

### 9. Pressure Equalization

- %100 PRESSURE EQUALIZATION SHOULD BE DONE if the heighth difference between production place and montage place and the way while transporting is more than 1200 m or less than 500 m.
- CONSIDER THE SITUATIONS BELOW if the heighth difference between production place and montage place and the way while transporting is more then between 700 - 1200 m or les than between 300-500 m.

AN EDGE OF IG UNIT < 700 mm	%100 PRESSURE EQUALIZE
WIDTH / HEIGHT ≥ 2	%100 PRESSURE EQUALIZE
WIDTH / HEIGHT < 2	NO PRESSURE EQUALIZE

### 10. Argon Gas Holes

- Holes should be drilled as possible as closed to the profile corners.

## QUALIFICATION CONTROL

### 1. Size Quality

#### a. Length - Wideness Tolerances

Width and Length (mm)	Tolerance ( mm )	
Less Than 1200 mm	3	-1
1200 mm and more	4	-2

#### b. Nominal Thickness Tolerances

Nominal Thickness (mm)	Tolerance (mm)
12--18	1,4 0
19--22	1,6 0
23--28	1,8 0
28--32	2,2 0

### 2. Visual Quality

- For double glazing products; appreciable undulation faults and etc. are not acceptable.
- The second and the third surfaces of the IG must be very clear, there mustn't be any fingerprints, dirt, insulating chemicals.

- Secondary sealant should not be seen on the spacer, primary and secondary sealant or etc. signs should not be seen on the spacer which is placed up to 3 mm distance on the spacers surface facing the gap.

### 3. Profile Quality

- The aluminum profiles must be maden by a material that's not be affected to the corrosion. (Ex; plumbic, chrome - nickel, rustproof steel, aluminum etc.) Otherwise, the steel profile which is covered by at least 12,5mm zinc must be used.

### 4. Insulating Chemicals

- For the double glazing production; bonding and insulating chemicals should not be affected to the weather condition, temperature difference (especially UV rays) and don't cause cracking, pollination and resolution.

## QUALIFICATION CONTROL

- If the area is less than 1 m<sup>2</sup> it can be maximum 2 amounts of 1 mm diameter air gap.
- If the area is greater than 1 m<sup>2</sup> it can be maximum 5 amounts of 1 mm diameter air gap.
- The gap at the edges of the glass can be maximum 5 mm.
- Foil should be smooth on the surface of the glass.

## QUALIFICATION CONTROL

### 3. Defects In The Vision Area

- Defects less than 0,5 mm area are not considered.
- Defects greater than 3 mm area are not permitted.

#### a. Permissible Spot Defects In The Vision Area

Size of defect d in mm		0,5 < d ≤ 1,0	1,0 < d ≤ 3,0			
Size of pane A in m <sup>2</sup>		For all sizes	A ≤ 1	1 < A ≤ 2	2 < A ≤ 8	A > 8
Number of permissible defects	2 panes	No limitation, however no accumulation of defects	1	2	1 / m <sup>2</sup>	1,2 / m <sup>2</sup>
	3 panes		2	3	1,5 / m <sup>2</sup>	1,8 / m <sup>2</sup>
	4 panes		3	4	2 / m <sup>2</sup>	2,4 / m <sup>2</sup>
	5 panes		4	5	2,5 / m <sup>2</sup>	3 / m <sup>2</sup>

Note: An accumulation of defects occurs if four or more defects are at a distance of < 200 mm from each other. This distance is reduced to 180 mm laminated glass consisting of three panes, to 150 mm laminated glass consisting of 4 panes and 100 mm laminated glass consisting of 5 or more panes.

#### b. Linear Defects In The Vision Area

AREA OF PANES	NUMBER OF PERMISSIBLE DEFECTS ≥ 30 mm IN LENGTH
≤ 5 m <sup>2</sup>	NOT ALLOWED
5 m <sup>2</sup> - 8m <sup>2</sup>	1
>8m <sup>2</sup>	2

- Linear defects less than 30 mm in length are allowed.

### 4. Control Method of Laminated Glass

- The laminated glass which will be checked to be placed in vertical position and parallel to the front of a matt gray screen. And let daylight etc. into it. The observer must be 2m far from the glass. Invisible faults from that distance are permissible.

### 5. Limit Deviations on Width B and Length H

#### a. Limit Deviations For Finished Sizes

Limit Deviations t on Width B or Length H, mm			
Nominal Dimension B or H mm	Nominal Thickness ≤ 8 mm	Nominal Thickness > 8 mm	
		Each Glass Pane < 10 mm Nominal Thickness	At Least One Glass Pane ≥ 10 mm Nominal Thickness
<1100	+2,0 / -2,0	+2,5 / -2,0	+3,5 / -2,5
<1500	+3,0 / -2,0	+3,5 / -2,0	+4,5 / -3,0
<2000	+3,0 / -2,0	+3,5 / -2,0	+5,0 / -3,5
<2500	+4,5 / -2,5	+5,0 / -3,0	+6,0 / -4,0
>2500	+5,0 / -3,0	+5,5 / -3,5	+6,5 / -4,5

t; any possible displacement

#### b. Limit Deviations for Stock Sizes

Limit Deviations t on Width B or Length H, mm			
Nominal Dimension B or H mm	Nominal Thickness ≤ 8 mm	Nominal Thickness > 8 mm	
		Each Glass Pane < 10 mm Nominal Thickness	At Least One Glass Pane ≥ 10 mm Nominal Thickness
up to 6000x3210	+5,0 / -3,0	+6,0 / -4,0	+8,0 / -6,0