EFFECT GLASS	ASSESSMENT OF THE VISIBLE QUALITY OF INSULATED GLASS UNITS	Standard EN 1279-1:2018 No of internal edition: 2 Edition date: 07.01.2020

1. Observation conditions

The panes shall be examined in transmission and not in reflection.

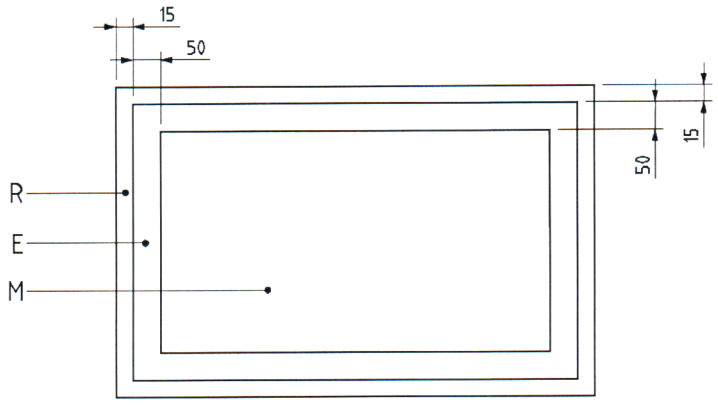
Insulated glass units shall be observed at a distance of not less than 3 m from the inside to the outside and at a viewing angle as perpendicular to the glass surface as possible for up to 1 minute per m^2 .

The assessment is carried out under diffuse light conditions (e.g. overcast sky), without direct sunlight or artificial lighting.

The discrepancies shall not be marked on the pane.

Insulated glass units assessed from outside shall be examined in installed conditions, taking into consideration the usual viewing distance with a minimum of 3 m. The viewing angle shall be as perpendicular to the glass surface as possible.

The following observation zones are defined in Figure 1.



Key:

R - zone of 15mm, usually covered by the frame or corresponding to the edge seal in case of unframed edge

E - zone at the edge of visible area, with a width of 50 mm

M - main zone

Insulated glass units made of two panes of monolithic glass

MAXIMUM ALLOWABLE NUMBER OF SPOT FAULTS (e.g. blisters, pebbles, "grains", coating deficiencies)					
ZONE	**Size of fault (excluding halo) [Ø in mm]**	**Size of the pane S (m^2)**			
		S ≤ 1	**1 < S ≤ 2**	**2 < S ≤ 3**	**3 < S**
R	**All sizes**	No limitation			
E	**Ø ≤ 1**	Accepted, if less than **3** in each area of **Ø ≤ 20cm**			
	1 < Ø ≤ 3	**4**	**1** per metre of perimeter		
	Ø > 3	Not allowed			
M	**Ø ≤ 1**	Accepted, if less than **3** in each area of **Ø ≤ 20cm**			
	1 < Ø ≤ 2	**2**	**3**	**5**	**5** + 2/m^2
	Ø > 2	Not allowed			

MAXIMUM ALLOWABLE NUMBER OF RESIDUE SPOTS AND STAINS (e.g. dirt, stains, etc. after the production process)					
ZONE	**Dimension and type [Ø in mm]**	**Size of the pane S (m^2)**			
		S ≤ 1	**1 < S ≤ 2**	**2 < S ≤ 3**	**3 < S**
R	**All**	No limitation			
E	**Spots Ø ≤ 1**	No limitation			
	Spots 1 < Ø ≤ 3	**4**	**1** per metre of perimeter		
	Stain Ø ≤ 17	**1**			
	Spots Ø > 3 and stain Ø > 17	Maximum **1**			
M	**Spots Ø ≤ 1**	Maximum **3** in each area of **Ø ≤ 20cm**			
	Spots 1 < Ø ≤ 3	Maximum **2** in each area of **Ø ≤ 20cm**			
	Spots Ø > 3 and stain Ø > 17	Not allowed			

MAXIMUM ALLOWABLE NUMBER OF LINEAR/EXTENDED FAULTS (e.g. hairline scratches ≤ 0,15mm; normal scratches)			
ZONE	**Type**	**Individual lengths (mm)**	**Sum of individual lengths (mm)**
All	Hairline scratches ≤ 0,15mm	No limitation	
R	Other linear/extended fault	No limitation	
E		**≤ 30mm**	**≤ 90mm**
M		**≤ 15mm**	**≤ 45mm**

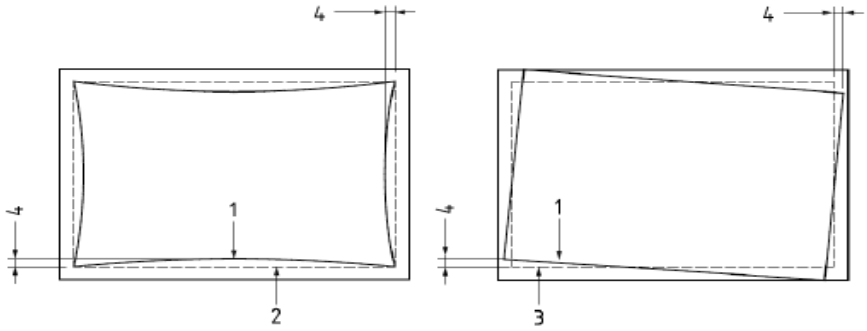
Insulated glass units other than made of two monolithic glass panes

Allowable number of discrepancies is increased by 25% per additional glass component (f.e triple glazing - x 1,25).

Faults smaller than 0,5 mm are not taken into consideration (not visible from a viewing distance of 3 m).

TOLERANCE ON SPACER STRAIGHTNESS

For double glazing the tolerance on the spacer straightness is 4 mm up to a length 3,5 m and 6 mm for longer lengths. The permissible deviation of the spacer(s) in the relation to the parallel straight glass edge or to the other spacers (e.g. in triple glazing) is 3 mm up to an edge length of 2,5 m. For longer edge lengths, the permissible deviation is 6 mm.



Faults definition:

Spot fault: spherical or semi spherical disturbance of the visual transparency looking through the glass.

Halo: area locally distorted, generally around a point fault when the defect is included in the glass pane.

Residue (dirt): a material that remain on the glass surface, that can have a form of spot or stain.

Stain: fault larger than punctual defect, often irregularly shaped, partially or mottled structure.

Linear/extended faults: faults, which can be on or in the glass, in the form of deposits, marks or scratches that occupy an extended length or area.

Visual aspects of insulating glass units: they should not be taken into account when assessing visible quality. They are not considered as faults.

Integral color: the differences in the color impression are possible due to the iron oxide content of the glass, the coating process, the coating itself, the change in glass thickness and the structure of the unit, and cannot be avoided.

The difference in the color of the insulating glass unit: facades made of insulating glass units containing coated glass can have different shades of the same color; a phenomenon that can be magnified when viewed from an angle. Possible reasons for color variations include slight variations in the color of the substrate to which the coating is applied and slight variations in the thickness of the coating itself.

Interference effect: in the case of insulating glass units made of float glass, the phenomenon of interference can cause the appearance of spectral colors. Optical interference is caused by the superposition of two or more light waves at one point. The phenomenon is perceived as the variation in the intensity of the color zones that change when pressure is applied to the glass. This physical phenomenon is enhanced by the parallelism of the glass surface. The interference phenomenon is random and cannot be avoided.

Specific effect due to barometric conditions: the insulating glass unit contains a volume of air or other gas, hermetically sealed by the perimeter sealant. The condition of a gas is generally determined by altitude, barometric pressure and air temperature at the time and place of production. If the insulating glass unit is installed at a different height or when the temperature or barometric pressure changes (higher or lower pressure), the glazing will tilt inwards or outwards, causing optical distortion.

Anisotropy: in the process of thermal toughening, areas with different stresses are created in the cross-section of the glass. The stress areas create a birefringence effect in the glass, visible under polarized light. When viewing a thermally toughened soda-lime-silicate safety glass under polarized light, the stress areas appear as colored zones, sometimes called "leopard spots". Light polarization happens in normal daylight. The degree of light polarization depends on the weather and the angle of the sun's rays. The birefringence effect is more pronounced when viewed at an angle or through polarized glasses. The anisotropy is not an fault, but a visible effect.

External condensation: condensation can occur on outer glass surfaces when the glass surface is colder than adjacent air. The intensity of condensation on the outer surfaces of the glass depends on the U-value, air humidity, air movement as well as internal and external temperature. When the relative humidity of the environment is high and the temperature of the glass surface drops below the ambient temperature, condensation occurs on the glass surface.

Wettability of glass surfaces: the appearance of glass surfaces may vary due to the influence of rollers, fingerprints, labels, suction cups, sealant residue, silicone compounds, smoothing agents, lubricants, environmental influences, etc. This may be visible when the glass surfaces are wet from condensation, rain or cleaning water.

Thermal breakages: breakages caused by thermal stress occur when the glass temperature changes suddenly. The risk of thermal breakage increases in installations with high partial shading (e.g. curtains, blinds, posters, furniture, stickers). Thermal breakage can also occur when insulating glass units stored on racks are exposed to direct sunlight.