

Criteria and rules for assessment of quality of EMPOL doors and windows

1. Visual assessment of materials of the frame and leaf

1.1. PVC profiles

Inspection for visual defects should be performed in a distance of three meters, at an angle in 90° to the surface in question.

Outdoor elements need to be assessed in scattered daylight.

Indoor elements need to be assessed in conditions corresponding to use conditions in a given room.

1.1.1. Surface quality

The surface should be free of discontinuities and irreparable damage. Smooth edges, groves and cloudiness resulting from the extrusion process are acceptable if they meet the conditions specified below.

1.1.2. Gloss

To be assessed visually with bare eye.

Differences in gloss in specific spots are imminent to the technological conditions.

They disappear with time under the influence of weather.

1.1.3. Stains

Stains may occur as a result of production process, transport, assembly or weather conditions after assembly. All stains need to be removable with agents intended for cleaning PVC profiles.

Note: Do not use agents including solvents or abrasives.

Protective foil on the profiles protects them during transport and assembly. It should be removed as soon as possible after assembly, at latest after a month. The foil should also be removed if the structures won't be assembled and will be exposed to sunlight for more than a month.

1.1.4. Surfaces and colours of veneered surfaces

1.1.4.1. In the case of single colour veneers, the colour should be possibly uniform on all the surfaces visible after assembly. The colour gets uniform under the influence of weather conditions.

1.1.4.2. Veneers imitating such materials as wood, stone or concrete are characterized by certain randomness in design layout (e.g. growth rings) in the same design/colour in a finished product. This is intended to imitate the natural material. Therefore, visible differences in colour/texture are a characteristic of these veneers and not a fault.

In assembled, closed window/doors, the foil may not exhibit any folds or air sacs. Edges in places invisible after closing the door may only form such a small gap between them and the profile as not to collect dirt and not to make cleaning difficult. The foil may not delaminate.

In corner joints of profiles covered with foil the base material of the PVC profile is visible and it may have a colour other than the foil. This gap is painted with special markers into a colour similar to the foil applied.

- 1.1.5. Corner joints and position of the profiles with respect to one another.
Corner joints of PVC profiles are pressure welded at an angle of 45° or 90°. Finished joint needs to be continuous and without inclusions, its colour should match the colour of the profiles. Deviation in position of visible profile surfaces may not exceed:

- +/- 0.6 mm for profiles up to 80 mm thick
- +/- 1 mm for profiles thicker than 80 mm

- 1.1.6. Corrections made by a specialist
Small deformations, surface damage, clouding, contaminations etc. may be repaired by a specialist with appropriate tools and cleaning agents. Such repair does not reduce durability of the profiles.
When assessing repair the above-mentioned criteria apply.

1.2. Aluminium profiles

Decorative effects (uniform structure, gloss, colour etc.) need to be assessed under scattered daylight, at 60° angle, in a distance of:

- more than 3 m for outdoor structures
- more than 2 m for indoor structures
- more than 5 m for façades

Powder coating may not exhibit any scratches reaching background material.

- 1.2.1. Features and faults of coated surfaces
Quality and aesthetic values of coated surfaces need to be assessed in line with the guidelines for Aluminium Profiles listed below.
None of the defects specified below may be visible from a distance specified in point 1.2.

Only surfaces visible in assembled, closed structure (window, doors etc.) are subject to assessment.

1.2.1.1. Gloss

Differences in gloss are acceptable if meeting the following criteria:
Assessment of industrial surfaces with reflection measurement in line with ISO 2813:1994 (measurement geometry of 60°) within the following scopes:

- matte surfaces (cat. 1): 0-30 +/- 5 units
- satin surfaces (cat. 2): 31-70 +/- 7 units
- high gloss surfaces (cat. 3): 71-100 +/- 10 units

If measurement with a glossmeter is not possible, visual inspection at the same angle with a reference sample is acceptable.

1.2.1.2. Coating thickness

Assessment in line with ISO 2360:1995. For each element measurements need to be performed in minimum five measurement areas (each with surface area of about 1 cm²). In each area 3 to 5 readings should be made and an arithmetic mean needs to be calculated (none of the means may be lower than 48 µm).

Arithmetic mean (from measurement areas) must be larger than 60 µm.

- 1.2.1.3. Colour
Colour of profile varnish coating should be compared visually with the colour of a reference sample (in a shadow, at the same angle as assessed material). In case of doubt perform colour assessment in line with norm ISO 7724. It does not apply to coatings with metallic effect.
Note:
Do not compare colours with colour samplers as these are demonstrative only.
- 1.2.1.4. Craters, air sacs
- conditionally acceptable: $0 < 0.5$ mm, 10 pcs per m or m²
- 1.2.1.5. Inclusions
- conditionally allowable: $0 < 0.5$ mm, 5 pcs per m or m²
- 1.2.1.6. Chips
- Unacceptable
- 1.2.1.7. Sagging
- Unacceptable
- 1.2.1.8. Orange peel effect
- acceptable, with fine structure
 - acceptable with large structure and layer thickness exceeding 120 μ m
- 1.2.1.9. Colour differences
- acceptable, if they do not attract attentions during test conforming with the guidelines
- With metallic colours larger colour discrepancies may occur. There are technologically conditioned and not a fault.
- 1.2.1.10. Grinding traces, indents, welds
- acceptable, unless smooth finish was ordered
- 1.2.1.11. Mechanical damage occurring during production (e.g. indents, bulges, scratches)
- acceptable, if they do not attract attentions during test conforming with the guidelines
- 1.2.2. Features and faults of anodized surfaces
Quality and aesthetic values of coated surfaces need to be assessed in line with the guidelines for Aluminium Profiles listed below.
None of the defects specified below may be visible from a distance specified in point 1.2.
Only surfaces visible in assembled, closed structure (window, doors etc.) are subject to assessment.
- 1.2.2.1. Rib and bridge reflections, differences in gloss and colour, grinding traces, indents, welds, mechanical damage occurring during production (e.g. indents, bulges, scratches):

- acceptable, if they do not attract attentions during test conforming with the guidelines

1.2.3. Corner joints and position of the profiles with respect to one another.

1.2.3.1. Elements without mechanical joints, butt joints

In the case of aluminium cover plates assembled on PVC elements, corner joints needs to be able to accommodate for temperature expansion of PVC. In such a case variation in gap width is construction-conditioned and thus acceptable.

1.2.3.2. Mechanically joined elements, butt joints

- Width of the gap between adjacent profiles may not exceed 0.2 mm
- Width of the gap at surface shifting may not exceed 0.3 mm

1.2.3.3. Welded joints

- Finished joint needs to be continuous and without inclusions
- For technological reasons small differences in profile geometry in welding spots are acceptable.

1.2.4. Differences in colour due to type of material

Differences between profiles, cover plates, panels, connectors etc. are acceptable because of varying machining technologies, material etc.

Differences may pertain to colour, structure, gloss etc. even though initial assumptions were the same.

1.2.5. Filiform corrosion

In places unprotected because of machining (e.g. drilling, milling, cutting etc.) corrosion occurs which is inevitable. It is recommended to clean and preserve these spots twice to delay the chemical reactions occurring there.

2. Glass quality assessment criteria

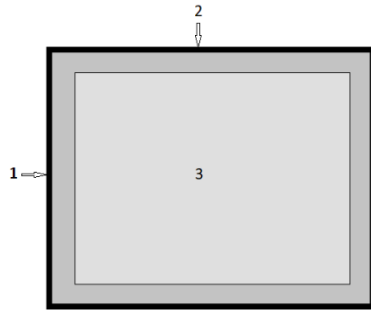
Glass assessment is performed:

- from a distance of minimum 2 meters
- in bright, scattered light
- with panel positioned vertically
- at 90° to panel surface
- against a grey screen
- dividing the panel into two areas: major and edge

Glass defects visible under these conditions of observation are assessed in accordance with the conditions set out below.

2.1. Panel surface

The glass surface has three conventional areas: (1) edge, (2) edge, (3) central



- (1) Edge area (most often covered with a window frame) - 15 mm wide
- (2) Edge area - 50 mm wide
- (3) Central area

Construction glass from which panels are made may exhibit varied characteristics resulting from varied production technologies. These features include e.g. scratches, dots, capillary scratches, inclusions etc.

Depending on their frequency, size, type and location it is assessed whether these are panel quality faults or not.

2.2. Glass fault in in multiple- and single-glazed units:

Fault name	Major area (3)	Edge area (external strip around) (2)
		the panel, with width of 10% of the size of multiple-glazed unit)
Capillary scratches	acceptable, if not clustered	acceptable, if not clustered
Scratches	acceptable - single scratch with length up to 15 mm, sum of all scratch lengths may not exceed 15 mm	acceptable - single scratch with length up to 30 mm, sum of all scratch lengths may not exceed 90 mm
Point defects • <0.5mm • <1.0mm • <2.0mm • >2.0mm	Acceptable Acceptable, if not clustered 2 pcs per m ² , max. 5 pc Unacceptable	Acceptable Allowable, if not clustered 1 pc per m, per single panel side Unacceptable

2.3. Glass staining

No stains and contaminations acceptable inside multiple-glazed units if visible from 2 , greater than indicated in the table of defects.

2.4. Acceptance tolerances for dimensions and thickness of multiple-glazed units

Parameter	Acceptable tolerance
Dimensions	+2.0/-1.0 mm
Thickness	± 1.0 mm (relief annealed glass) ± 1.5 mm (quenched, layered, patterned glass)
diameter difference	< 2 mm/m
panel shifting	< 2.0 mm

2.5. Chips, dents, damage to panel edge

Faults in the form of chips along panel edges are acceptance up to 2 mm or 20% of glass thickness, isolated chips up to 6 mm. Cracks, even small ones are not acceptable and should be reported at the moment of panel acceptance.

2.6. Glass type

It is considered a fault if panels are made from glass with parameters and look other than agreed in the order.

2.7. Decorative elements -muntins

Decorative elements (muntins) may be placed inside the multiple-glazed unit as ordered by the purchaser. Order needs to specify: type, colour, geometrical layout of elements. Assessment method and requirements concerning precision and made quality for muntins are the same as for the whole multiple-glazed unit.

Because of the structure and decorative character some vibrations or muntins hitting against the panel may be observed. This phenomenon occurs especially when external vibrations are transferred to the panel (e.g. passage of a heavy vehicle), when opening/closing windows and doors, under pressure or temperature change. To reduce the occurrence of such cases, transparent silicone straps are used in muntin joining spots. Occurrence of vibrations is not considered a fault.

Changes in temperature may cause increase or reduction in length of muntins and thus small deformations.

2.8. Spacers

- Internal surfaces of spacers should be clean, without stains, stains visible from 2 m.
- Distance between spacers and panel edges (in standard multiple-glazed units) should not exceed 15 mm
- the distance between the frames and their distances from the edge of the panes should not exceed 2 mm on a given side of the panes. The deviation from the straightness of the spacers should not exceed 2 mm.
- spacers can be bent in the corners or cut (if it is not technologically possible to bend or with selected shapes). Visible raw material, joining elements and insignificant discolorations, scratches in the cut area are conditioned on the production process and not considered a fault
- the number of spacer joining point in a multiple-glazed units only depends on the technological process. Spacer is bent in an automatic cycle, thus the number of joints along spacer circumference in a multiple-glazed units depends on panel size

2.9. Unsealing

Unsealing is a fault of multiple-glazed units consisting in losing tightness of the internal chamber of the unit. Vapour visible (constantly or periodically) inside the unit, seepage and water gathering at the bottom of the panel are indicative of this fault.

2.10. Glass own colour

Materials used for manufacturing glass products have their own colour dependant in the raw materials use. The thicker the panel, the more the colour is visible. It also applies to coated panels.

The own colour varies depending on angle of view. Differences in colours are caused by varied iron oxide content in glass, the coating process, coating type, glass thickness and panel structure. This phenomenon is unavoidable and not subject to complaint.

2.11. Vapour condensation

At high humidity indoors and low temperature outdoors humidity included in air may condensate on the panel. It is impossible to eliminate this and thus not considered a fault.