Underwater Window Technical Specifications

Ready-to-Install Underwater Windows (System Hydrosight)

1. System Description

Hydrosight underwater windows are factory-prefabricated, monolithic glazing elements designed for use in swimming pools, aquariums, and specialized water-retaining structures. The system consists of a stainless steel frame, the structurally calculated PMMA glazing, and a certified sealing and casting system.

The component serves as a load-bearing interface that safely transfers the resulting forces from water pressure and self-weight into the building structure. Manufacturing takes place under controlled conditions (Factory Production Control FPC). Delivery is carried out as a ready-to-install complete component, including leak testing.

---

2. Components and Materials

2.1 Frame Construction

The frame functions as a mechanical adapter to the building structure and decouples the glazing from structural movements and constraints.

- **Material:** Stainless steel V4A (Grade 1.4571 / AISI 316Ti).
- **Execution:** TIG-welded, fully pickled, and passivated.
- **Variants & Connection Types:**
  - *Adhesive flange:* For tiled and concrete pools.
  - *Loose/Fixed flange construction:* For liner pools and plastic pools (PVC/PP).
  - *Welding flange:* For stainless steel pools.
  - *Water stop plate:* For exposed concrete pools (cast-in/grouting installation).
  - *Special constructions:* On request.

2.2 Glazing

Monolithic cast blocks made of Polymethyl methacrylate (Acrylic glass).

- **Material:** PMMA cast (GS).
- **Standards Compliance:** Corresponds to DIN EN ISO 7823-1.
- **Quality Assurance:** ISO 9001 certified production of raw blocks; annealed to relieve stress.

2.3 Sealing and Chemical Bonding

- **Standards:** The sealing system meets EOTA ETAG 002 (Structural Glazing), EN 13022, and ASTM C1184.
- **Material Properties:** Hardness Shore A approx. 45, Elongation at break approx. 300 %.
- **Quality Proof:** 100 % factory pressure and leak testing before delivery (documented by inspection seal on the component).

---

3. Mechanical Properties and Dimensioning

The dimensioning of the panel thickness (30 mm to 200 mm) is carried out on a project-specific basis based on water depth (hydrostatic pressure) and the clear opening dimensions.

3.1 Load Limits

- **Maximum Water Column:** Standard design up to 20 m (higher pressures on request).
- **Fracture Behavior:** PMMA behaves in a ductile manner (viscoelastic). There is no risk of spontaneous brittle fracture (cf. tempered/laminated safety glass).

- **Serviceability:** Dimensioning ensures that deflection remains within the optically and structurally permissible range.

3.2 Material Properties PMMA (Guideline values at 23 °C)

Property	Value	Standard
Density	1.19 g/cm³	ISO 1183
Modulus of Elasticity (Tensile)	3300 MPa	ISO 527-2/1B/1
Tensile Strength	≥ 70 MPa	ISO 527-2/1B/5
Coeff. of Linear Thermal Expansion	70 x 10^-6 /K	ISO 11359

---

4. Optical Properties

Hydrosight glazings offer a light transmission of approx. 92 % with complete UV absorption.

Optical Quality (Distortion-Free)

- **Test Criterion:** Legibility of standard text through the material block.
- **Test Setup:** Distance 50 cm behind the panel.
- **Reference:** Font Courier New 12pt (approx. 16 characters/inch).
- **Permissible Tolerances:** Free from waviness, burrs, and perceptible depressions.
- **Exclusion Criteria:** No visible voids, scratches, or foreign body inclusions.

---

5. Thermal Properties and Fire Behavior

- **Thermal Conductivity:** 0.19 W/(m·K). The material offers high thermal insulation and minimizes condensation.
- **Operating Temperature Range:**
  - *Standard:* +5 °C to +30 °C.
  - *Extended (optional):* -40 °C to +45 °C.
- **Temperature Differences:** A Delta T > 15 K between the water and air side (e.g., due to direct sunlight on an empty pool) must be taken into account in the structural design of the joint.
- **Fire Behavior:**
  - *Glazing:* Building material class B2 (normally flammable) according to DIN 4102 / Class E according to EN 13501. Burns almost smoke-free, no flaming droplets.
  - *Frame:* Non-combustible (Class A1).

---

6. Chemical Resistance

The overall system (Frame 1.4571, PMMA, and sealants) is resistant to the following media:

6.1 Swimming Pool Water

- **Free Chlorine:** Continuous load up to 0.6 mg/l (Standard according to DIN 19643).
- **Shock Chlorination:** Short-term exposure (high chlorination / chlorine shock) permissible in case of microbiological indication.
  - *Limit Value:* Concentrations up to 100 mg/l.
  - *Exposure Duration:* Max. 2.5 hours (150 min).
- **pH Value:** 7.0 to 7.4 (neutral range).

6.2 Other Media

- **Ozone:** Resistant to ozone-enriched water up to 200 pphm and use in skimmers at approx. 0.5 - 1.0 mg Ozone/h.
- **Saltwater / Brine:**
  - Standard execution: Seawater resistant (Salinity approx. 3.5 %).
  - Special execution: Brine resistant > 3.5 % (High brine) on request.
- **Potable Water:** Execution compliant with the KTW guideline of the German Federal Environment Agency (UBA) optionally available.

6.3 Cleaning Warning

- **Prohibited Substances:** Contact with organic solvents (acetone, alcohol > 5 %), thinners, strong acids, or abrasive cleaners must be strictly avoided.
- **Reference:** Further information and detailed care instructions can be found in the *Hydrosight Operation and Maintenance Manual for Underwater Windows*.

---

7. Installation and Assembly

The window is delivered as a ready-to-assemble unit. The on-site connection to the primary sealing layer (water-impermeable concrete, sealing slurry, liner, etc.) is made via the integrated stainless steel frame. Detailed installation instructions can be found in the project-specific installation manual.

Status: February 2026 | Subject to technical changes. | Manufacturer: Hydrosight GmbH, Emmerich am Rhein, Germany