Morgan Advanced Materials

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HALDENWANGER

Contents

All products listed in this catalogue are in accordance with DIN 40680 – subject to inadvertent modifications, errors and omissions.
Special sizes and custom designs available on request.

What is Laboratory Porcelain?

Laboratory Porcelain results from thousands of years of systematic development of porcelain itself – an impervious silicate material that is made by firing a mixture of natural minerals such as china clay, quartz and feldspar.

The properties of Haldenwanger Laboratory Porcelain correspond to the DIN EN 60672 standard, group 100, type 110. Temperature stability and resistance to physical and chemical attack are important characteristics. Consistant quality is ensured through strict control of raw materials and production. Laboratory Porcelain is a potassium aluminium silicate. Under the microscope, a transparent cut shows that Haldenwanger Laboratory Porcelain is a material in which scorched and prismatic mullite crystals ($3Al_2O_3 \cdot 2SiO_2$) are embedded in a glass matrix. As a silicate, Haldenwanger Laboratory Porcelain is very resistant to all types of acids, even at boiling temperatures, with the exception of hydrofluoric acid.

Although less resistant to warm and highly concentrated alkalis than to acids, it still performs better than glass. Molten alkali salts attack Laboratory Porcelain. Its resistance to high temperatures comes from the mullite structure of the material. Although its glass phase softens at very high temperatures, the mullite structure has a stabilising effect and prevents deformations. Therefore, unglazed Laboratory Porcelain can be used at temperatures of up to 1350°C according to the application. Glazed Laboratory Porcelain can be used at temperatures of up to 1000°C. After that, the glaze begins to soften.

Haldenwanger has been manufacturing Laboratory Porcelain for more than 150 years and development is still ongoing. New market demands in terms of form and quality mean continual custom. Many standard products must comply with a range of different national norms. Laboratory Porcelain is mainly used in industrial laboratories and research institutes worldwide as an aid in chemical analyses and preparation work.

Why should I use Haldenwanger Laboratory Porcelain?

Quality and resistance for more than 150 years

Despite our long history, we have taken care to maintain the original size and shape of our products. New challenges in an ever-growing market have led us to new developments. Ensuring the best refractoriness and resistance to physical and chemical attack has always been of the utmost importance to us.

We guarantee consistently high standards by performing quality checks at all levels, e.g. on raw materials, in the forming process and during final product inspection. To this end, we have established our own state-of-the-art testing and development centre as well as a pilot plant.

Our products are continuously tested to comply with DIN 12851 regulations. This comprehensive and strict DIN standard specifies the requirements and test procedures for laboratory equipment made of hard porcelain (C110).

→ Imperviousness of the ceramic body

No single area of any sample may show:

- any kind of discoloration in glaze-free areas
- penetration of dye between the ceramic body and glazing

→ Dense glazing (no pores, no cracks)

No single sample may show trajectories of excess glazing slurry or any discoloration along the edges.

→ Thermal shock resistance

No single sample may fail by fracture and no crazing may appear after quenching.

→ Refractoriness of the glazing up to 900°C

Glazed pieces may not stick together at 900°C.

→ No weight change during annealing

No single sample may show a weight change exceeding 0.1 mg per 10 g material.

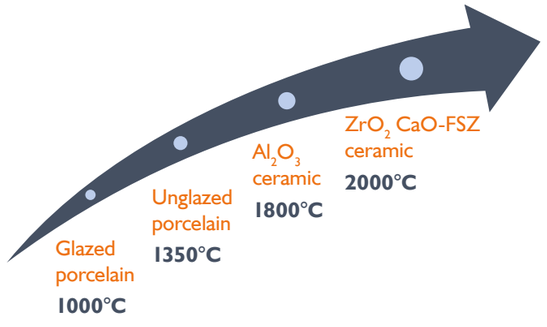
→ Chemical resistance to hydrochloric acid, soda and caustic soda

No single sample may show a weight loss of more than:

- 1 mg per dm^2 of the wetted inner surface area (hydrochloric acid)
- 10 mg per dm^2 of the wetted inner surface area (diluted soda)
- 60 mg per dm^2 of the wetted inner surface area (caustic soda)

Technical support

As a producer of high-performance ceramics, Haldenwanger offers not only the best materials but also technical support with materials selection and application. Our laboratory ceramics portfolio includes products that deliver temperature stability up to 2000°C (as for instance ZrO_2 – materials on request).



Material	Application temperature	WAK* $10^{-6}K^{-1}$
Glazed porcelain	1000°C	5.3
Unglazed porcelain	1350°C	5.3
Al_2O_3	1800°C	8–9
ZrO_2 CaO-FSZ	2000°C	10

Please note that all values quoted (page 4–5) are based on test specimens and may vary according to component design. These values cannot be guaranteed and can only be transferred to other forms and dimensions to a limited extent. They should be used for guidance only. In the field, for example, Alsint 99.7 moulded pieces demonstrate mechanical strength values between 160 and 300 MPa, depending on wall thickness, actual shape, surface finish, the shaping process and post-processing.

Being a member of the VGKL (Verband des Groß- und Außenhandels für Krankenpflege- und Laborbedarf), a trade association for leading wholesalers of laboratory equipment, we have always been at the cutting edge of technology.

In addition, Haldenwanger offers training courses in the theory and usage of Laboratory Porcelain.

Aggressive reagents

Laboratory Porcelain	Chemical resistance
All acids (20°C):	excellent*
All acids (boiling):	excellent*
Warm, highly-concentrated alkaline solutions:	good
Molten alkaline salts:	unsuitable

* Exception: hydrofluoric acid

Alsint 99.7-Oxide Ceramics	
All acids (20°C):	excellent*
All acids (boiling):	excellent*
Warm, highly-concentrated alkaline solutions:	good
Molten alkaline salts:	unsuitable

* Exception: highly concentrated hydrofluoric acid, boiling phosphoric acid, boiling potassium hydroxide and sodium hydroxide solutions

High temperatures	Heat resistant
Glazed Laboratory Porcelain:	up to max. 1000°C
Unglazed Laboratory Porcelain:	up to max. 1350°C
Alsint 99.7 Oxide Ceramics:	up to max. 1800°C

High-wear conditions

For example:

- mortar and pestle
- ball mill
- mouthpieces
- shaft-protection sleeves, etc.

New developments

We are constantly optimising our Laboratory Porcelain to meet your needs.

Highest standards

- Our Laboratory Porcelain complies with DIN EN 60672-3, Group C 100, Type C 110.
- Laboratory articles made of Alsint 99.7 Oxide Ceramics comply with DIN EN 60672, Group C 700, Type C 799.

Stringent product controls, from the raw materials to the finished product, ensure the consistently high quality of our products.

Laboratory Porcelain	Unit	Hard porcelain	Pythagoras
Type according to DIN EN 60672-3	–	C 110	C 610
Range of application	–	Laboratory Porcelain	Chemical-technical products
Water absorption capacity	%	≤ 0.2	≤ 0.2
Bulk density	g/cm^3	2.4	2.6
Flexural strength 20°C (3-Punkt)	Vol.-%	70–90	120
Thermal expansion 20–1000°C	µm	5.3	6
Thermal conductivity 200°C	MPa	1.4	2
Maximum temperature exposure	GPa	1350 unglazed/1000 glazed	1400 unglazed

Oxide Ceramics	Unit	Alsint 99.7*	Alsint porous
Al_2O_3 content	%	99.7	99.5
Alkali content	%	0.05	0.05
CaO stabiliser content	%	–	–
Type according to DIN VDE 0335	–	C 799	–
Water absorption capacity	%	≤ 0,2	2–3.5
Bulk density	g/cm^3	3.75–3.94	3.5–3.6
Flexural strength 20°C (3-Punkt)	MPa	300	70–110
Young's modulus	GPa	300–380	–
Hardness (Mohs' scale)	–	9	–
Thermal expansion 20–1000°C	$1/10^6$ K	8–9	8–9
Thermal conductivity 20–100°C	W/m K	25	–
Thermal shock resistance	–	good	good
Average pore diameter	µm	–	1–3
Specific thermal capacity 20–100°C	J/kg K	900	–
Maximum temperature exposure**	°C	1800	1700

*We recommend that products be heated at a rate not exceeding 30–50°C per hour, **dependent on load

Oxide Ceramics

Alsint 99.7-combustion boats

Length mm	Width mm	Height mm
19	5	4
45	11	7
52	7.5	6
75	11	7
87	17	9
115	16	9
120	30	15
160	40	21
200	15	15

Alsint porous incinerating dishes

Length mm	Width mm	Height mm
420	200	50
350	240	40
350	230	58
280	210	100
220	170	100
210	170	300
100	100	110

Alsint 99.7-incinerating dishes

Length mm	Width mm	Height mm
40	10.5	8.5
50	20	20
50	25	20
50	38	36
75	50	25
100	32	28
100	45	19
105	15	15
150	65	19
150	65	35
160	80	30
160	135	90
190	138	75
250	65	30

Alsint 99.7-tubular crucibles

Outer Ø mm	Inner Ø mm	Height mm
14	10	100
16	12	100
20	15	100
22	17	100
24	19	100
30	25	100
34	28	100
38	32	100
44	38	100
48	40	100
55	45	100
60	50	100
38	32	200
44	38	200

Custom design

We can custom made Alsint 99.7 components to your requirements. Simply send us your detailed specifications and we will provide you with an obligation-free quote. Alsint 99.7 is the material of choice for use under high-wear conditions, in chemical-technical and electrical engineering applications and in high-temperature technology.

Important information concerning the use of Alsint 99.7 laboratory equipment

Due to their high refractoriness (melting point above 2000°C) and chemical resistance to a wide range of substances, crucibles and other devices made of Alsint 99.7 are used in multiple applications. However, these outstanding properties are only fully maintained with proper handling.

Applications

Chemical-technical applications:

- Crucibles for crystal growing
- Crucibles for fusion processes
- Crucibles for annealing

High-wear conditions:

- Ball mill pots
- Milling balls
- Mouthpieces
- Shaft-protection sleeves

Alsint 99.7-crucibles

cylindrical, flat base, minimum filling level 75%

Size no.	Outer Ø mm	Inner Ø mm	Height mm	Capacity approx. ml	Lid
1 A	20	16	30	5	79 D/9
2 A	30	26	40	15	79 D/8
3 A	35	30	50	30	79 D/7
4 A	40	36	60	60	79 D/7a
5 A	50	44	75	110	79 D/5
6 A	65	55	100	270	79 D/3
7 A	85	75	150	700	79 D/1
8 A	125	110	220	2,200	–

conical, low wide shape, minimum filling level 75%

Size no.	Upper outer Ø mm	Lower outer Ø mm	Height mm	Capacity approx. ml	Lid
00 B	30	14	24	10	79 D/8
0 B	41	18	37	25	79 D/7a
1 B	48	20	41	40	79 D/5
2 B	54	24	50	60	79 D/4
3 B	60	26	50	80	79 D/4
4 B	66	30	56	100	79 D/3

conical, tall shape, minimum filling level 75%

Size no.	Upper outer Ø mm	Lower outer Ø mm	Height mm	Capacity approx. ml	Lid
00 C	25	15	30	10	–
0 C	30	18	38	15	79 D/8
1 C	33	18	40	20	79 D/7
2 C	38	21	47	30	79 D/7a
3 C	42	25	54	45	79 D/6
4 C	50	27	65	80	79 D/5
5 C	62	32	75	150	79 D/3
6 C	73	35	90	250	79 D/2
7 C	85	35	100	350	79 D/1
8 C	90	47	115	500	79 D/1a
9 C	105	54	130	750	–
10 C	120	62	150	1,200	–

Morgan
Advanced Materials

HALDENWANGER

Morgan Advanced Materials Haldenwanger has developed from its foundation in 1865 to become one of the world's leading manufacturers of high-tech ceramics. We offer you an extensive range of products made of oxide and non-oxide materials, which are primarily used in demanding thermal, chemical or even mechanical applications. Thanks to our wealth of expertise in ceramics, we serve you not only as a supplier, but also as a reliable partner in developing **solutions for your challenges.**

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