

The quality of a sight (gauge) glass depends mainly on the chemical composition and mechanical strength of the glass material.

Constant glass quality is provided through glass analyses and acid/alkali tests. The mechanical strength is attained through thermal prestressing.

Liquid level gauges

The gauge glass is the most important component of the liquid level gauge.

LUMIGLAS gauge glasses are suitable for installation in liquid level gauges of almost any make.

We manufacture our gauge glasses ourselves and use exclusively "extra-hard" borosilicate glass which is subsequently heat-treated.

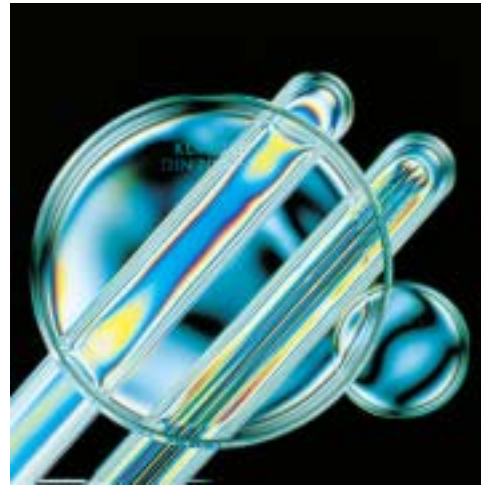
LUMIGLAS gauge glasses have high mechanical strength and are exceptionally resistant to alkalis, acids and boiler water (within the service limitation). Our glass testing laboratory carries out continuously quality control tests: purity of glass, flaws in glass, dimensional accuracy, etc. This ensures the high quality standard of LUMIGLAS gauge glasses. We manufacture reflex and transparent glasses according to the most varied international standards.

Fields of application:

- Oil refineries
- Petro-chemical plants
- Pharmaceutical manufacture
- Chemical processing
- Mechanical engineering, especially

manufacture of boilers and storage vessels

- Foodstuffs and beverages industry
- Water engineering
- Paper and cellulose industry
- Textile industry
- Marine engineering
- Nuclear engineering



Stress-optical view of thermally prestressed circular and long gauge glasses in polarized light



LUMIGLAS transparent glass (above) and reflex glass (underneath)



Circular gauge glasses made from borosilicate glass "extra-hard"

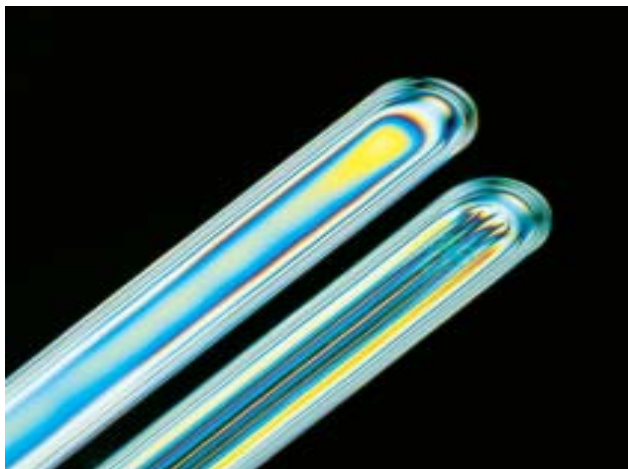
Reflex and transparent gauge glasses made of borosilicate glass "extra-hard", long types

Reflex glasses

The side facing the medium chamber is provided with moulded grooves set at 90° angles. The moulding process increases the resistance of the glass grooves to wear; the "skin" which the glass attains during moulding gives it maximum smoothness and hardness. This makes it extremely resistant to the attack of boiler water.

Applications:

Up to 35 bar saturated steam, reflex glasses provide the optimum solution: they are corrosion resistant and provide an absolutely clear indication. Reflex glasses can be used with all media except steam at service conditions up to 400 bar or temperatures up to 400 °C.



Transparent glasses

LUMIGLAS transparent glasses are also manufactured from "extra-hard" borosilicate glass. The surfaces on both sides are finely ground and polished to ensure optimal transparency.

LUMIGLAS transparent glass (left side)
and reflex glass (right) in polarized light

Applications:

In steam service above 35 bar and with media with a high pH-value. LUMIGLAS transparent glasses must be protected by a mica shield on the side facing the medium chamber. Transparent glasses should always be chosen for contaminated, viscous or corrosive media. Within the given service limitations they may be used for all media ex-LUMIGLAS package units for gauge glasses, sealing gaskets and cushion gaskets except steam at pressures up to 340 bar or temperatures up to 400°C.



Packing

LUMIGLAS gauge glasses are packed in individual cardboard boxes. In addition to the glass, each package contains a LUMIGLAS sealing gasket and cushion gasket and forms a complete unit ready for installation.

Note

Only LUMIGLAS original parts guarantee a trouble-free operation of the gauge glasses. Therefore it is recommended to use only original spare parts for gauge glasses, mica shields, sealing gaskets and cushion gaskets.

Standards

We manufacture reflex and transparent glasses in series to the following standards:

OeNORM M 7354 (long gauge glasses)
DIN 7081 (long gauge plate glasses)
JIS B 8211 (Japanese Industrial Standard)
OMV-Spez. H 2009 (OMV-AG, Vienna)
MIL-G-16356 D (US-Navy-Ships)

Esso Eng. Spec. 123 (Esso Research & Engineering Co. – New Jersey)

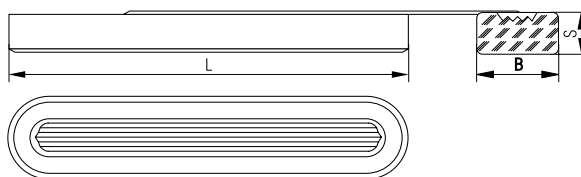
S.O.D. Spec. 123 (Standard Oil Development Company – New Jersey)
BS 3463 (British Standard Institution).

Quality control

LUMIGLAS reflex and transparent glasses are subject to continuous control during manufacture in order to guarantee exact dimensions, stress conditions, material composition and resistance to bending strain.

Reflex and transparent gauge glasses technical datas

Reflex glasses A, B, H



Overall dimension (mm)

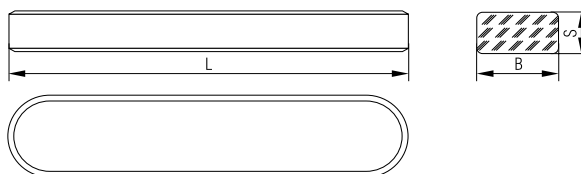
Size	Type A			Weight g/piece	Type B			Weight g/piece	Type H			Weight g/piece
	L	B	S		L	B	D		L	B	S	
0	—	—	—	—	95	34	17	110	—	—	—	—
I	115	30	17	118	115	34	17	132	115	34	22	176
II	140	30	17	146	140	34	17	162	140	34	22	214
III	165	30	17	176	165	34	17	195	165	34	22	254
IV	190	30	17	200	190	34	17	228	190	34	22	294
V	220	30	17	237	220	34	17	264	220	34	22	344
VI	250	30	17	265	250	34	17	301	250	34	22	392
VII	280	30	17	303	280	34	17	338	280	34	22	445
VIII	320	30	17	334	320	34	17	387	320	34	22	503
IX	340	30	17	359	340	34	17	410	340	34	22	536
X	—	—	—	—	370	34	17	461	—	—	—	—

KLINGER gauge glasses Applicational range reflex glasses	Type A 1)		Type B 1)		Type H	
	bar	°C	bar	°C	bar	°C
For media with no significant glass attack, e.g.oils, hydrocarbons	400	120	265	120	300	120
	150	400	180	400	200	400
	0–10	430	0–10	430	0–10	430
For media with significant glass attack, e.g.saturated steam, HPHW, alkalis	35	243	35	243	2)	253

1)Glass types to OeNORM M 7354 or DIN 7081.

2)For steam pressures above 35 bar we recommend the use of transparent glasses with mica shields.

Transparent glasses A, B, H, TA, 28



Overall dimension (mm)

Size	Type A			Weight g/piece	Type B			Weight g/piece	Type H			Weight g/piece	Type TA 28			Weight g/piece
	L	B	S		L	B	D		L	B	S		L	B	S	
I	115	30	17	122	115	34	17	137	—	—	—	—	113	27,6	16,8	114
II	140	30	17	152	140	34	17	172	140	34	22	218	—	—	—	—
III	165	30	17	176	165	34	17	204	165	34	22	260	163	27,6	16,8	168
IV	190	30	17	211	190	34	17	238	190	34	22	302	188	27,6	16,8	194
V	220	30	17	250	220	34	17	280	220	34	22	357	218	27,6	16,8	226
VI	250	30	17	280	250	34	17	317	250	34	22	400	248	27,6	16,8	258
VII	280	30	17	314	280	34	17	356	280	34	22	460	278	27,6	16,8	290
VIII	320	30	17	360	320	34	17	407	320	34	22	530	318	27,6	16,8	334
IX	340	30	17	387	340	34	17	430	340	34	22	562	338	27,6	16,8	356
X	—	—	—	—	370	34	17	480	—	—	—	—	—	—	—	—

LUMIGLAS gauge glasses Applicational range transparent glasses	Type A 1)		Type B 1)		Type H		Type TA 28 4)	
	bar	°C	bar	°C	bar	°C	bar	°C
For media with no significant glass attack, e..g.oils, hydrocarbons	240	120	290	120	340	120	—	—
	160	400	200	400	230	400	—	—
	0-10	430	0-10	430	0-10	430	—	—
For media with significant glass attack, e..g.saturated steam, HPHW, alkalis	2)	—	2)	—	2)	—	3)	—
	35	243	35	243	42	253	120	324
	70	300	85	300	85	300	180	356

1)Glass types to OeNORM M 7354 or DIN 7081.

2)For steam pressures above 35 bar we recommend the use of transparent glasses with mica shields.

3)For steam pressures above 120 bar only TA 28 glasses. size I. may be used.

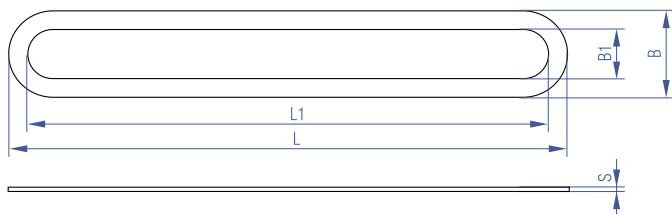
4)TA glasses may only be used with mica shields.

4All measurements in mm

In the interest of technical progress, designs and dimensions are subject to modification

Sealing and cushion gaskets & mica shields for reflex and transparent gauge glasses

Sealing gasket, cushion gasket made from asbestos-free material



Overall dimension (mm)

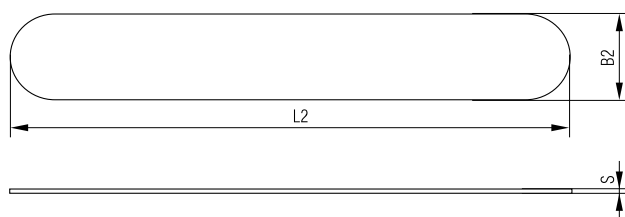
Size	Type A				Type B/H				Sealing gasket and protective gasket 1) TA 28				Cushion gasket 2) TA 28			
	L	L1	B	B1	L	L1	B	B1	L	L1	B	B1	L	L1	B	B1
0	95	70	30	15	95	70	34	15	—	—	—	—	—	—	—	—
I	115	90	30	15	115	90	34	15	133	97	47	19	112	97	27	17
II	140	115	30	15	140	115	34	15	—	—	—	—	—	—	—	—
III	165	140	30	15	165	140	34	15	183	147	47	19	162	147	27	17
IV	190	165	30	15	190	165	34	15	208	172	47	19	187	172	27	17
V	220	195	30	15	220	195	34	15	238	202	47	19	217	202	27	17
VI	250	225	30	15	250	225	34	15	268	232	47	19	247	232	27	17
VII	280	255	30	15	280	255	34	15	298	262	47	19	277	262	27	17
VIII	320	295	30	15	320	295	34	15	338	302	47	19	317	302	27	17
IX	340	315	30	15	340	315	34	15	358	322	47	19	337	322	27	17

Sealing and cushion gaskets s = 1,5 mm

1) Protective gasket s = 0,5 mm

2) Cushion gasket s = 0,5 mm

Mica shields



Overall dimension (mm)

Size	Type A		Type B/H		Type TA 28	
	L2	B2	L2	B2	L2	B2
0	95	30	95	34	—	—
I	115	30	115	34	133	47 ¹⁾
II	140	30	140	34	—	—
III	165	30	165	34	183	47 ²⁾
IV	190	30	190	34	208	47 ²⁾
V	220	30	220	34	238	47 ²⁾
VI	250	30	250	34	268	47 ²⁾
VII	280	30	280	34	298	47 ²⁾
VIII	320	30	320	34	338	47 ²⁾
IX	340	30	340	34	358	47 ²⁾

0s=0,15 – 0,20

¹⁾ s=0,60 ²⁾ s=0,30 – 0,40

Material

A and B micas: stained first quality TA

28 micas: stained A quality

KEL-F shield

Size like mica shields

Type B/H standard thickness = 1 mm

Circular sight glasses made from borosilicate glass “extra-hard”

From our standard range

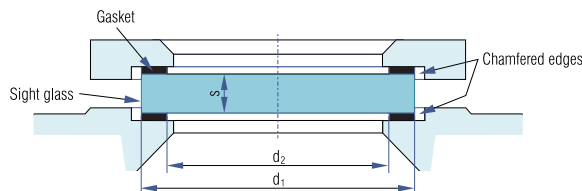
Glass		Permiss. PB**) bar	Gasket		
Diameter mm	Thickness mm		O.D. mm	I.D. mm	Thickness mm
31,75	12,7	175	*)	*)	*)
40	12	50	42	30	1,5
45	10	40	47	32	1,5
45	12	50	47	32	1,5
50	10	25	52	35	1,5
50	12	40	52	35	1,5
60	10	16	62	45	1,5
60	12	25	62	45	1,5
60	15	40	62	45	1,5
63	10	16	65	48	2
63	12	25	65	48	2
63	15	40	65	48	2
70	12	25	72	55	2
80	12	16	82	65	2
80	15	25	82	65	2
80	20	40	82	65	2
90	10	10	92	75	2
100	10	8	102	80	2
100	15	16	102	80	2
100	20	25	102	80	2
100	25	40	102	80	2
110	20	25	112	90	2
120	10	8	122	100	2
125	15	10	127	100	2
125	20	16	127	100	2
125	25	25	127	100	2
150	15	8	152	125	2
150	20	10	152	125	2
150	25	16	152	125	2
150	30	25	152	125	2
170	15	8	172	140	2
175	20	10	177	150	2
175	25	16	177	150	2
175	30	25	177	150	2
200	20	8	202	175	2

■ Dimensions not in DIN 7080 or OeNORMM7353

) Gasket set and micas for high-pressure steam gauges

*) PB=working pressure (gauge)

Calculation of the correct glass thickness



$$s = 0,55 \cdot d_m \sqrt{\frac{p \cdot S}{10 \cdot \sigma_{bB}}}$$

S: Theoretical minimum thickness in mm

d_m : $\frac{d_1 + d_2}{2}$ Mean diameter of gasket

d_1 : O.D. of glasses and gasket

d_2 : I.D. of gasket

p: Max. permissible working pressure (gauge) in bar

σ_{bB} : Minimum bending strength in N/mm²

S: Safety factor



Technical datas

Material:

Borosilicate glass, thermally prestressed, optically tested, properties as laid down in DIN and OeNORM.

Extract from the OeNORM: “ Chemical prestressing of glasses is not permissible. For safety reasons soda-lime glasses may not be used. ”

Resistance to bending strain:

≥ 160 N/mm²

Mean coefficient of linear expansion:

$\alpha_{20/300} \leq 4.5 \cdot 10^{-6} \cdot K^{-1}$, tested to DIN 52328.

Transition temperature:

$t_g = 550^\circ C$, tested to DIN 52324.

Chemical resistance

Alkali resistance:

alkali class 2, tested to ISO 675.

Water resistance:

hydrolytic class 1, tested ISO 719.

Acid resistance:

acid class 1, tested to DIN 12116.

moulded – ground – polished – thermally prestressed

Temperatur resistance:

suitable for temperatures from $-273^\circ C$ to $+300^\circ C$, size 31.75/12.7 up to $356^\circ C$

Circular sight glasses made from borosilicate glass “ extra-hard ”

LUMIGLAS Package unit:

Sight glasses are packed in individual cardboard boxes. In addition to the glass, each package contains a LUMIGLAS sealing gasket and cushion gasket and forms a complete unit ready for installation. Handy, shock proof package.

Standards

We manufacture reflex and transparent glasses in series acc. to the following standards:

OeNOR M M7353 (Austrian Standard) DIN 7080 (German Standard) BS 3463 (British Standard Institution) JIS 8211 (Japanese Industrial Standard)

At request we supply circular sight glasses in any desired dimension.



Dimensional tolerances:

Glass Ø	DIN 7080 OeNORM M 7353	LUMIGLAS house standard
31,75 mm to 125 mm 150 to 200 mm	– ±0,5 mm ±0,8 mm	± 0,13 mm ± 0,5 mm ± 0,5 mm
Glass thickness		
12,7 mm 10 to 20 mm above 20 mm	– ±0,5 mm ±0,8 mm	± 0,05 mm ± 0,5 mm ± 0,5 mm

Ultra-high pressure aluminosilicate glass

Aluminum silicate glass is a kind of alkali-free pressure-resistant glass. The glass mirror cast by alkali-free aluminum silicate glass excellent high-pressure resistance performance, which is a special glass for various boilers, high-pressure reactors, petrochemical and submarines. It has good chemical stability, electrical insulation flexural strength, and high-pressure resistance. Its flexural strength is 2-3 times that of borosilicate glass. Our company is a highly specialized of aluminum silicate glass in China! Aluminum silicate glass is composed of RO-Al₂O₃-SiO₂, where RO represents divalent metal ox such as magnesium oxide, calcium oxide, barium oxide, and zinc oxide. Since the components do not contain alkali metal ions, it is named alkali-free silicate glass.

Product performance index:

Bending strength: 260~300 Mpa
Coefficient of thermal expansion: $42\sim46 \times 10^{-7}/^{\circ}\text{C}$
Product density: 2.62 g/cm^3
Softening temperature: >920
Service temperature: ≤ 375
Thermal shock temperature: ≤ 300
Minimum service temperature: -196
Maximum service temperature: 500
Glass temperature T_g (): 715
Sagging temperature TS (): 791
Young's modulus $E(10^7\text{Pa})$: 8450
Poisson's ratio μ : 0.24
Transparency: $400\sim2500\text{nm} \geq 90\%(5\text{mm})$
Refractive index: 1.5472
Explosion-proof performance:
 $10\text{mm} \geq 10\text{J}$, $15\text{mm} \geq 20\text{J}$, $20\text{mm} \geq 40\text{J}$.
Pressure resistance performance: $1.0\sim70.0 \text{ Mpa}$
Executive standard: JC/T891-2016



Common thickness:

12.7mm, 16mm, 17mm, 19mm, 21mm

(various non-standard thicknesses can be customized)

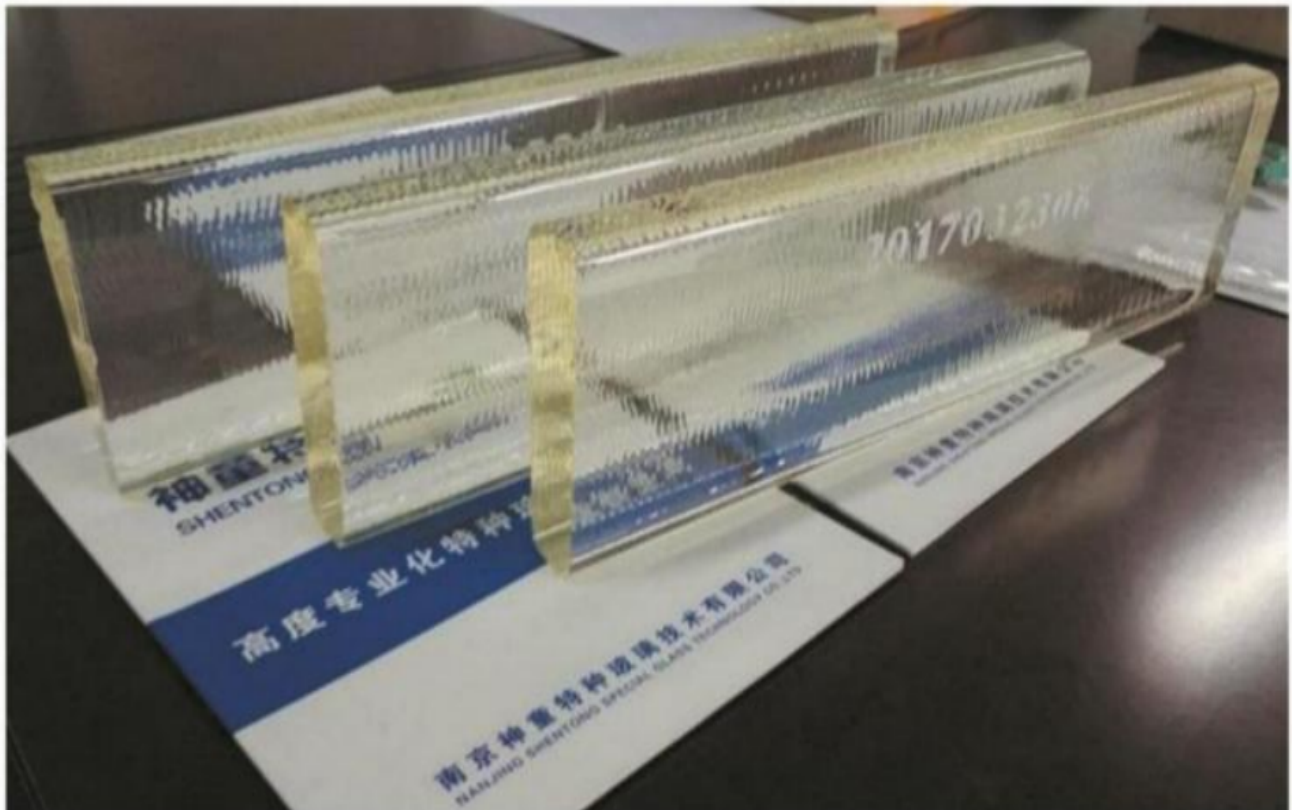
Common size:

80*24*17 80*4*21 108*24*17 108*24*21 118*24*21 130*24*21 130*26*19
115*34*17 130*4*17 140*34*17 160*34*17 165*34*17 190*34*17 218*34*17
220*34*17 250*34*17 280*34*17 320*34*17 340*34*7 370*34*17 400*34*17
Other non-standard sizes are produced according to customer requirements

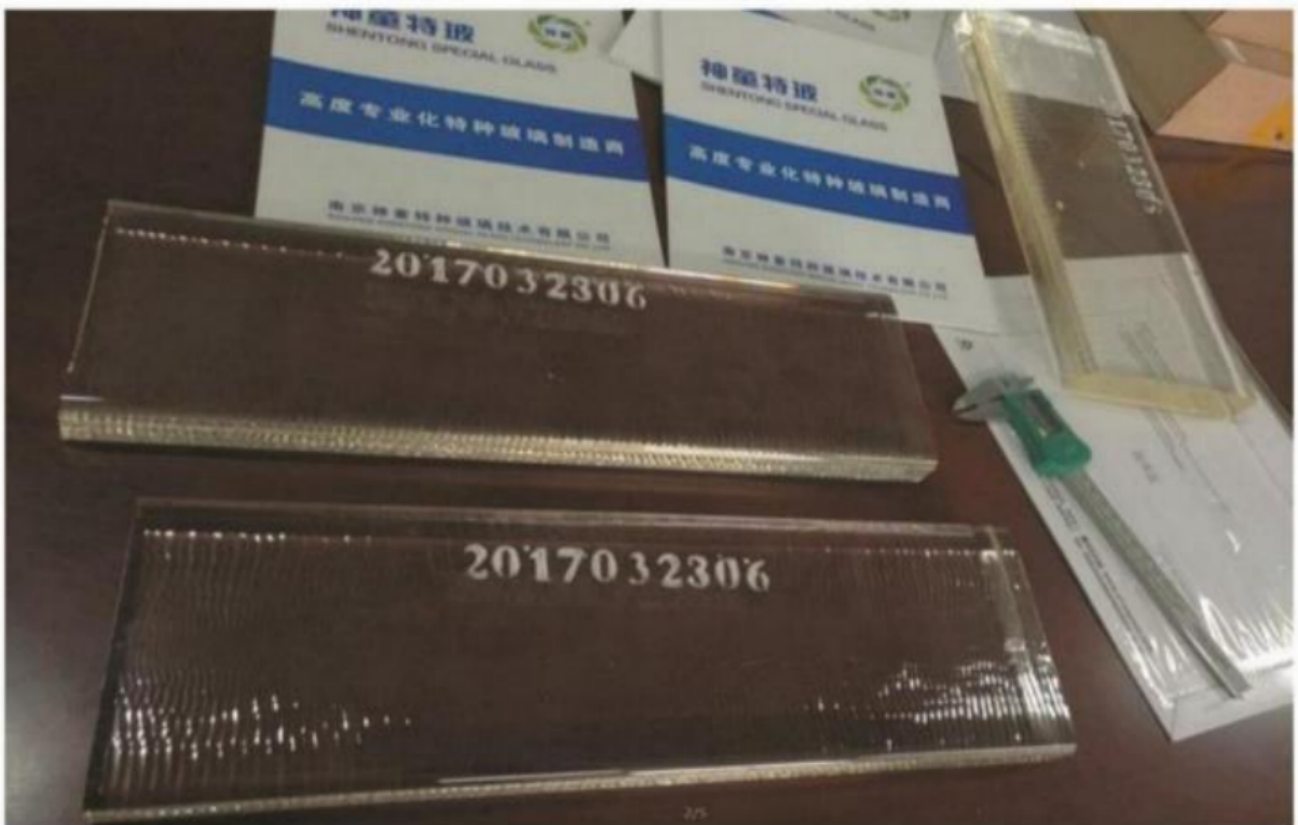
Super high pressure alkali-resistant mica glass (garnet-yttrium-lanthanum-aluminum-silicate glass)

For a long time, the glass sight window of pressure vessels and boiler steam drums has been a safety hazard and technical problem for users manufacturers of high-pressure level gauges due to its lack of resistance to alkaline corrosion. The using unit can only protect the glass from alkaline ion corrosion by adding mica pad in front of the glass sight window. The clarity of the glass with mica pads is seriously reduced, and both scientific researchers and users are eager to a technical glass that can withstand high temperature and pressure and resist alkaline ion corrosion without the need for mica protection.

The price of natural mica sheets, which mainly produced in India, has shown an upward trend year by year. Mica mines are non-renewable, and long-term disorderly mining has led to a decline in mica quality. Affected by international politics and economy, it has brought considerable economic pressure and technical difficulties to the using units such as petrochemical and plants. At present, international companies such as Japan's BBK and NBK have successively developed alkali-resistant glass that can replace mica protection and can be for a long time under PH values of 10-14, and it does not accumulate dirt. Since it belongs to a high-tech product, the selling of Japanese companies is quite high, and they implement a ban on sales to Chinese companies. The development of high-end pressure vessel sight windows and high-pressure water level ga in China is seriously restricted.



Lumistar Special Glass Technology Co., Ltd. has invested a huge amount of funds, hired famous experts and scholars in the domestic glass industry, and cooperated with scientific research institutions to overcome technical problems. From the design of product for mutations, the selection of raw materials, melting processes, anne processes, cutting processes, grinding and polishing processes, and tempering processes, it has taken more than two years of scientific and technological research and development. From sample trial, pilot production, and mass production, it has lasted for two and a half years. Without any melting experience to refer to, it has overcome many difficulties and successfully out mass production in March 2017. After testing by the National Glass Fiber Quality Supervision and Inspection Center (Nanjing Glass Fiber Institute), the fully reaches the technical level of foreign similar products! In terms of ultra-high temperature tempering technology, Lumistar Company is even better than foreign similar products. At the products have been mass-produced and supplied to large domestic instrument manufacturers such as Tieling Iron Light, Changchun Boiler Instrument Co., Ltd., Shanghai Xhen, Dandong Tongbo Group, Hubei Huaxing, Wuhan Hyde Long, National Nuclear Power Research Institute, Sen Song Pharmaceutical, Dongyang, Siemens, and Valmet Paper Machinery, and the users' feedback is very good.

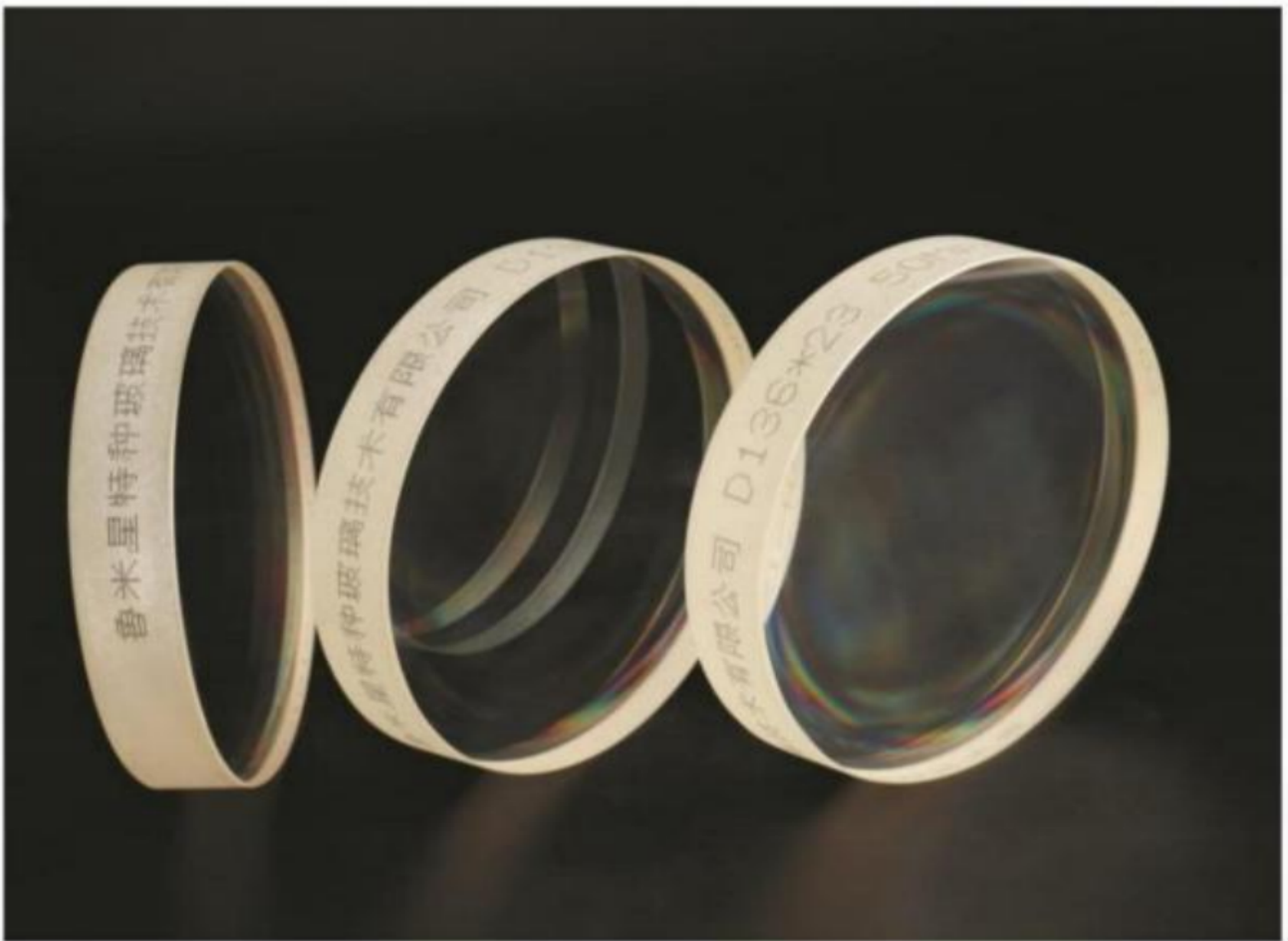


Lumiglas®

The mystery of alkali-resistant glass is that the basic raw material for making glass, silica, is an acidic substance, which will undergo acid-base reaction when it encounters an alkaline solution.

Lumistar scientific researchers have significantly reduced the content of silica and added a large amount of rare earth alkaline oxides, including lanthanum oxide, yttrium oxide, aluminum oxide, zirconia and other refractory alkaline earth metal oxides. Through scientific, the technical indicators such as the material structure density, flexural strength, and hardness of the glass have been greatly improved. The Young's modulus has reached $1780 \times 10^7 \text{Pa}$, the alkali corrosion rate $\leq 0.004 \text{mg/cm}^2$, the flexural strength has reached $40 \sim 450 \text{Mpa}$, and the pressure resistance performance has also been improved by 2~3 times compared with high-pressure aluminum silicate glass, which meets various pressure vessel windows below 600 °C high temperature and high pressure alkali corrosion.

The alkali resistance performance and mechanical performance index of alkali-resistant m glass are compared with aluminum silicate glass and PYR EX7740 glass, which shows excellent technical advantages.

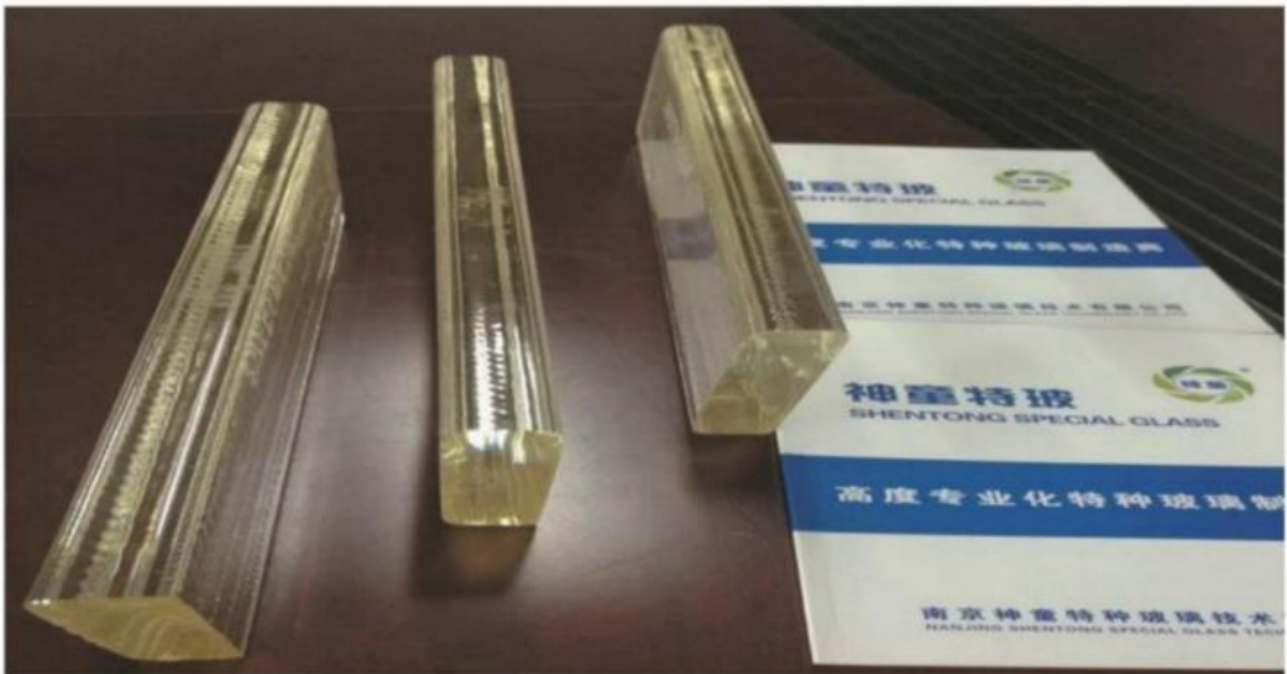


Comparison of corrosion performance data of mica and aluminum-silicate glass, borosilicate glass

	NO	1.Alkali resistant glass		2.Aiuminosilicate	3. PYERX7740 Borosilicate glass
		2nd generation	First generation		
Composition ratio	SiO ₂	22.8	35	57	72
	Al ₂ O ₃	19.0	19	16	5.0
	Y ₂ O ₃	25.2	22.5	0	0
	La ₂ O ₃	20.0	12.5	0	0
	TiO ₂	6.4	1.94	0	0
	ZrO ₂	6.6	3.5	0	0
	MgO	0	0	0	0
	BaO	0	0.93	0	0
	ZnO	0	1.23	0	0
	B ₂ O ₃	0	0.93	5.0	14
	Sb ₂ O ₃	0	0.95	0	0
	Other	0	0	23	9
Physical and chemical properties	specific gravity	3.92g/cm ³	3.42g/cm ³	2.62g/cm ³	2.23g/cm ³
	Alkaline corrosion amount	3.6mg/dm ²	6.7mg/dm ²	142mg/dm ²	174mg/dm ²
		0.20mm/Year	3.5mm/Year	21.7mm/Year	53.1mm/Year
	Mechanical strength	374-450 N/mm ²	370-450 N/mm ²	240-300N/mm ²	100-170N/mm ²
	Expansion coefficient	58*10 ⁻⁷ /	63*10 ⁻⁷ /	48*10 ⁻⁷ /	33*10 ⁻⁷ /

It can be seen from the above figure that the alkali resistance of the alkali-resistant mica glass is 800 times that of aluminum-silica glass and 1750 times that of the borosilicate glass, which has excellent performance.

The successful development of Lumixingali-resistant glass will save tens of millions of dollars in mica sheet purchase costs for domestic enterprises, especially for petrochemical and power plant users, and provide strong support and guarantee for the manufacturers of various high-pressure vessels and high-pressure water level gauges, which will alleviate the import economic pressure of various manufacturers and greatly enhance comprehensive competitive advantage of China's high-pressure power station equipment export !



Lumistar Special Glass Technology Co., Ltd., Nanjing Shentong Special Glass Technology Co., Ltd. through:

ISO9001: 2015 quality management system,
ISO14001-2004 environmental management system,
GJB9001C-017 military equipment quality management system,
EJ/T9001-2014 nuclear industry quality management system and other multi-system certifications.