

## Product Data Sheet

First created on: 2016-08-01

Updated on: 2016-08-01

Next inspection on: 2017-06-30

Printed on: 2016-08-01

<b>Product</b>	<b>SiLibeads Glass beads Type P</b>
<b>Material</b>	Glass beads made of soda lime glass with polished or (fine-)matt surface Specific weight: 2.58 kg/l Hydrolytic resistance on Glass beads: HGB 2 (based on DIN ISO 720) Acidic resistance on Glass beads: S1 (according to DIN 12116) Alcaline resistance on Glass beads: A1 (according to DIN ISO 695)
<b>Application</b>	Glass beads are used as high precision beads for ball bearings, Valves of dosage pumps and dispensers in the cosmetic- and food industry, Closures of ink cartridges and many other special applications in the optical, space and medical technique.
<b>Technical Data</b>	
Roundness	≥ 0.99 (ratio width/length ( $x_{min}/x_{max}$ ))
Bulk density	mean value 1.53 kg/l (belonging to diameter)
Refractive index	1.53
Size (Diameter)	from 0.7 mm up to 55.0 mm (see table Standard Sizes)
Transformation temperature	525 °C
Softening point (Littleton point)	718 °C
Melting point	1445 °C
Specific thermal Conductivity	1.102 W/km
Thermal expansion	$9.81 \cdot 10^{-6} \text{ K}^{-1}$ [20 °C] (Coefficient of linear expansion $\alpha$ )
Specific thermal capacity	1.175 kJ/kg K [>600 °C]
Youngs-Module	65 GPa
Hardness according to Mohs	≥ 6
Linear thermal expansion, $\alpha$ (20-300 °C)	$8.60 \cdot 10^{-6} \text{ K}^{-1}$

**Assessment acc. to Food Legislation**

The Glass beads are a consumer good in the sense of §2 clause 6 no. 1 German Code for Food Stuff (LFGB), Commodities and Feeding Stuff. Therefore they have to comply with the legal requirements.

The Glass beads comply with the requirements § 31 of the German Food and Feed Code (LFGB) and of the European Food Regulation 1935/2004/EC, Article 3.

**Chemical Analysis;** Glass beads made of soda lime glass; CAS-Nr. 65997-17-3 / EINECS 266-046-0

Name	Method	Weight (Reference values)	CAS-No.	EINECS
Silicon dioxide SiO <sub>2</sub>	DIN 51001	69.30 %	7631-86-9	231-545-4
Sodium oxide Na <sub>2</sub> O	DIN 51001	10.30 %	1313-59-3	215-208-9
Calcium oxide CaO	DIN 51001	4.90 %	1305-78-8	215-138-9
Potassium oxide K <sub>2</sub> O	DIN 51001	6.10 %	12136-45-7	235-227-6
Barium oxide BaO	DIN 51001	4.80 %	1304-28-5	215-127-9
further		4.60 %		

The heavy metal content of the Glass beads keeps the permitted limits of EU directive 2011/65/EC (RoHS).

Lead < 1000 ppm      Cadmium < 100 ppm      Chrome VI < 1000 ppm      Mercury < 1000 ppm

## Product Data Sheet

 First created on: 2016-08-01  
 Next inspection on: 2017-06-30

 Updated on: 2016-08-01  
 Printed on: 2016-08-01

## Standard Sizes (special diameters by request)

Diameter *)	Tolerance **)	Roundness**)	Surface	Weight per 1000 pieces	Amount (pieces per kg)
0.700 mm	+/- 0.02 mm	≤ 0.02 mm	polished	0.45 gr.	2.227.236
0.800 mm	+/- 0.02 mm	≤ 0.02 mm	polished	0.67 gr.	1.492.074
1.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	1.31 gr.	763.942
1.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	4.42 gr.	226.353
1.588 mm 1/16"	+/- 0.02 mm	≤ 0.02 mm	polished	5.24 gr.	190.769
2.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	10.47 gr.	95.493
2.381 mm 3/32"	+/- 0.02 mm	≤ 0.02 mm	polished	17.67 gr.	56.596
2.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	20.45 gr.	48.892
2.700 mm	+/- 0.02 mm	≤ 0.02 mm	polished	25.76 gr.	38.812
2.780 mm	+/- 0.02 mm	≤ 0.02 mm	polished	28.12 gr.	35.557
3.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	35.34 gr.	28.294
3.175 mm 1/8"	+/- 0.02 mm	≤ 0.02 mm	polished	41.90 gr.	23.869
3.400 mm	+/- 0.02 mm	≤ 0.02 mm	polished	51.45 gr.	19.437
3.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	56.12 gr.	17.818
3.969 mm 5/32"	+/- 0.02 mm	≤ 0.02 mm	polished	81.84 gr.	12.218
4.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	83.78 gr.	11.937
4.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	119.28 gr.	8.383
4.762 mm 3/16"	+/- 0.02 mm	≤ 0.02 mm	polished	141.35 gr.	7.074
5.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	163.63 gr.	6.112
5.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	217.79 gr.	4.592
5.556 mm 7/32"	+/- 0.02 mm	≤ 0.02 mm	polished	224.51 gr.	4.454
5.800 mm	+/- 0.02 mm	≤ 0.02 mm	polished	255.40 gr.	3.915
6.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	282.74 gr.	3.537
6.350 mm 1/4"	+/- 0.02 mm	≤ 0.02 mm	polished	335.17 gr.	2.984
6.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	359.48 gr.	2.782
6.747 mm 17/64"	+/- 0.02 mm	≤ 0.02 mm	polished	402.04 gr.	2.487
7.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	448.99 gr.	2.227
7.144 mm 9/32"	+/- 0.02 mm	≤ 0.02 mm	polished	477.27 gr.	2.095
7.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	552.23 gr.	1.811
7.938 mm 5/16"	+/- 0.02 mm	≤ 0.02 mm	polished	654.75 gr.	1.527
8.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	670.21 gr.	1.492
8.500 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	803.89 gr.	1.244
8.731 mm 11/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	871.23 gr.	1.148
9.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	954.26 gr.	1.048
9.525 mm 3/8"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1131.19 gr.	884
10.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1309.00 gr.	764
10.319 mm 13/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1438.31 gr.	695
10.500 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1515.33 gr.	660
11.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1742.28 gr.	574
11.112 mm 14/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1796.04 gr.	557
11.906 mm 15/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2209.21 gr.	453
12.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2261.95 gr.	442
12.303 mm 31/64"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2437.66 gr.	410
12.500 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2556.64 gr.	391
12.700 mm 1/2"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2681.33 gr.	373
13.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2875.87 gr.	348
13.494 mm 17/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	3216.34 gr.	311

## Product Data Sheet

First created on: 2016-08-01

Updated on: 2016-08-01

Next inspection on: 2017-06-30

Printed on: 2016-08-01

Diameter *)	Tolerance**)	Roundness**)	Surface	Weight per 1000 pieces	Amount (pieces per kg)
14.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	3591.90 gr.	278
15.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	4417.88 gr.	226
15.081 mm 19/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	4489.83 gr.	223
15.875 mm 5/8"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	5236.98 gr.	191
16.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	5361.66 gr.	187
17.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	6431.12 gr.	155
18.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	7634.09 gr.	131
19.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	8978.43 gr.	111
19.050 mm 3/4"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	9049.50 gr.	111
20.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	10472.00 gr.	95
22.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	13938.23 gr.	72
24.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	18095.62 gr.	55
25.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	20453.12 gr.	49
25.400 mm 1"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	21450.67 gr.	47
31.750 mm 1 1/4"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	41895.83 gr.	24
38.100 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	72396.00 gr.	14
55.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	217784.88 gr.	5

\*) special diameters by request, between 0.7 – 55.0 mm Ø

\*\*) on special request tolerance +/- 0.01 mm and roundness ≤ 0.01 mm possible

## Grades and Tolerances acc. to DIN 5401 - 11.1993 (ANSI/AFBMA - 10.1989)

Grade	Deviation from spheric form in micron	Maximum surface roughness in micron
200	5.0	0.200
100	2.5	0.125

## Chemical resistance of Glass beads Type P (soda lime glass) 2,5 mm Ø, in further media:

Medium	Concentration	Temperature	Time	Corrosion rate
Hydrochlorid Acid (HCl)	20.4 %	102 °C	6 h	0.002 gr. / m <sup>2</sup> / h
Nitric Acid (HNO <sub>3</sub> )	30.0 %	102 °C	6 h	0.012 gr. / m <sup>2</sup> / h
Oxalic Acid (H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> )	30.0 %	102 °C	6 h	0.006 gr. / m <sup>2</sup> / h
Formic Acid (H <sub>2</sub> CO <sub>2</sub> )	30.0 %	102 °C	6 h	0.000 gr. / m <sup>2</sup> / h
Sodium Hydroxide (NaOH)	30.0 %	102 °C	6 h	1.200 gr. / m <sup>2</sup> / h
Deionized Water (H <sub>2</sub> O)	100.0 %	102 °C	6 h	0.005 gr. / m <sup>2</sup> / h

## Additional Information

Storage indication	Store in a dry manner in closed (original) container by room temperature.
Disposal	Please consult national laws and local regulations in force for disposal or landfill.
Safety advice	High risk of slipping due to spillage of product
Product information	Sample card ... glass beads for technical applications, Safety Data Sheet SiLibeads Type P; Test Reports
Manufacturer/Supplier	Sigmund Lindner GmbH; Oberwarmensteinacher Strasse 38; 95485 Warmensteinach / GERMANY Phone: +49-9277-9940 Fax: +49-9277-99499 Web: <a href="http://www.sili.eu">www.sili.eu</a> E-Mail: <a href="mailto:sili@sigmund-lindner.com">sili@sigmund-lindner.com</a>

All data are reference values – subject to change without prior notice