

Product Data Sheet

First created on: 2016-10-12

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Next inspection on: 2017-12-31

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Product	SiLibeads Glass beads Type P Borosilicate
Material	Precision Glass beads made of Borosilicate glass with polished or (fine-)matt surface Specific weight: 2.23 kg/l Hydrolytic resistance: HGB 1 (based on DIN ISO 720) Acidic resistance: S1 (according to DIN 12116) Alcaline resistance: A2 (according to DIN ISO 695)
Application	Glass beads are used as high precision beads for ball bearings in aggressive and corrosive media (solutions). Mixing bead in insulin cartridges, Valves of dosage pumps and dispensers in the cosmetic- and food industry and many other special applications in the optical and medical technique.
Technical Data	
Roundness	≥ 0.99 (ratio width/length (x_{min}/x_{max}))
Compressive strength	mean value 1.30 kg/l (belonging to diameter)
Refractive index	1.46
Size (Diameter)	see table Standard Sizes
Transformation temperature	586 °C
Softening point (Littleton point)	787 °C
Melting point	1663 °C
Specific thermal Conductivity	1.268 W/Km
Specific thermal capacity	1.447 kJ/kg K [>600 °C]
Youngs-Module	64 GPa
Hardness according to Mohs	7
Linear thermal expansion	$3.3 \times 10^{-6} K^{-1}$

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.

Conformity to Pharmacopoeia

The Glass beads are in accordance with the current versions of Pharmacopoeia Ph.Eur., USP and JP.

Chemical Analysis; Glass beads made of Borosilicate glass; CAS-No. 65997-17-3 / EINECS 266-046-0

Name	Method	Weight (Reference values)	CAS-No.	EINECS
Silicon dioxide SiO ₂	DIN 51001	81 %	7631-86-9	231-545-4
Boric oxide B ₂ O ₃	DIN 51086-1	13 %	1303-86-2	215-125-8
Sodium oxide Na ₂ O +	DIN 51001	} 4 %	1313-59-3	215-208-9
Potassium oxide K ₂ O	DIN 51001		12136-45-7	235-227-6
Aluminium oxide Al ₂ O ₃	DIN 51001	2 %	1344-28-1	215-691-6

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
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Standard Sizes (special diameters by request)

Diameter *)	Tolerance **)	Roundness**)	Surface	Weight per 1000 pieces	Amount (pieces per kg)
2.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	9.34 gr.	107.055
2.381 mm 3/32"	+/- 0.02 mm	≤ 0.02 mm	polished	15.76 gr.	63.448
2.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	18.24 gr.	54.812
2.700 mm	+/- 0.02 mm	≤ 0.02 mm	polished	22.98 gr.	43.512
2.780 mm	+/- 0.02 mm	≤ 0.02 mm	polished	25.09 gr.	39.862
3.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	31.53 gr.	31.720
3.175 mm 1/8"	+/- 0.02 mm	≤ 0.02 mm	polished	37.37 gr.	26.759
3.400 mm	+/- 0.02 mm	≤ 0.02 mm	polished	45.89 gr.	21.790
3.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	50.06 gr.	19.975
3.969 mm 5/32"	+/- 0.02 mm	≤ 0.02 mm	polished	73.00 gr.	13.698
4.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	74.73 gr.	13.382
4.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	106.40 gr.	9.398
4.762 mm 3/16"	+/- 0.02 mm	≤ 0.02 mm	polished	126.09 gr.	7.931
5.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	145.95 gr.	6.851
5.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	194.26 gr.	5.148
5.556 mm 7/32"	+/- 0.02 mm	≤ 0.02 mm	polished	200.26 gr.	4.994
5.800 mm	+/- 0.02 mm	≤ 0.02 mm	polished	227.82 gr.	4.389
6.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	252.21 gr.	3.965
6.350 mm 1/4"	+/- 0.02 mm	≤ 0.02 mm	polished	298.97 gr.	3.345
6.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	320.66 gr.	3.119
6.747 mm 17/64"	+/- 0.02 mm	≤ 0.02 mm	polished	358.62 gr.	2.788
7.000 mm	+/- 0.02 mm	≤ 0.02 mm	polished	400.50 gr.	2.497
7.144 mm 9/32"	+/- 0.02 mm	≤ 0.02 mm	polished	425.72 gr.	2.349
7.500 mm	+/- 0.02 mm	≤ 0.02 mm	polished	492.59 gr.	2.030
7.938 mm 5/16"	+/- 0.02 mm	≤ 0.02 mm	polished	584.03 gr.	1.712
8.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	597.83 gr.	1.673
8.500 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	717.07 gr.	1.395
8.731 mm 11/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	777.14 gr.	1.287
9.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	851.20 gr.	1.175
9.525 mm 3/8"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1009.02 gr.	991
10.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1167.63 gr.	856
10.319 mm 13/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1282.97 gr.	779
10.500 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1351.68 gr.	740
11.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1554.11 gr.	643
11.112 mm 14/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1602.07 gr.	624
11.906 mm 15/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	1970.62 gr.	507
12.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2017.66 gr.	496
12.303 mm 31/64"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2174.39 gr.	460
12.500 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2280.52 gr.	438
12.700 mm 1/2"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2391.75 gr.	418
13.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2565.28 gr.	390
13.494 mm 17/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	2868.97 gr.	349
14.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	3203.97 gr.	312
15.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	3940.74 gr.	254
15.081 mm 19/32"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	4004.93 gr.	250
15.875 mm 5/8"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	4671.39 gr.	214

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Diameter ^{*)}	Tolerance ^{**)}	Roundness ^{**)}	Surface	Weight per 1000 pieces	Amount (pieces per kg)
16.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	4782.60 gr.	209
17.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	5736.56 gr.	174
18.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	6809.61 gr.	147
19.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	8008.76 gr.	125
19.050 mm 3/4"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	8072.15 gr.	124
20.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	9341.02 gr.	107
22.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	12432.90 gr.	80
24.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	16141.29 gr.	62
25.000 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	18244.19 gr.	55
25.400 mm 1"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	19133.99 gr.	52
31.750 mm 1 1/4"	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	37371.08 gr.	27
38.100 mm	+/- 0.02 mm	≤ 0.02 mm	(fine-)matt	64577.23 gr.	15

*) special diameters by request

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

Chemical resistance of Glass beads Type P (Borosilicate) 2,5 mm Ø, in further media:

Medium	Concentration	Temperature	Time	Corrosion rate
Hydrochlorid Acid (HCl)	20.4 %	102 °C	6 h	0.001 gr. / m ² / h
Nitric Acid (HNO ₃)	30.0 %	102 °C	6 h	0.010 gr. / m ² / h
Sulphuric Acid (H ₂ SO ₄)	30.0 %	102 °C	6 h	0.040 gr. / m ² / h
Oxalic Acid (H ₂ C ₂ O ₄)	30.0 %	102 °C	6 h	0.005 gr. / m ² / h
Formic Acid (H ₂ CO ₂)	30.0 %	102 °C	6 h	0.000 gr. / m ² / h
Sodium Hydroxide (NaOH)	30.0 %	102 °C	6 h	1.200 gr. / m ² / h
Distilled Water (H ₂ O)	100.0 %	102 °C	6 h	0.002 gr. / m ² / h

Test Report No. 43383/6/AU-04560 (19.01.2001), Dorfner Analysezentrum, D-92242 Hirschau

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+M (Borosilicate); Test Reports
Manufacturer/Supplier	Sigmund Lindner GmbH; Oberwarmensteinacher Strasse 38; 95485 Warmensteinach / GERMANY Phone: +49-9277-9940 Fax: +49-9277-99499 Web: www.sili.eu E-Mail: sili@sigmund-lindner.com

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