

ROBU[®]
GLASFILTER-GERÄTE

SINTERFILTER HIGHGLASS



BETTER SYNDICATE CO., LTD.

WWW.BETTERSINDICATE.CO.TH

Der Name

VitraPOR® ist der Handelsname für eine eingeführte Serie von Glasfilter-Geräten, ausgerüstet mit Filterelementen. ROBU-Produkte entsprechen dem international festgelegten Typ des Borosilicatglases 3.3 der DIN-ISO-Norm 3585, sowie den englischen, amerikanischen und französischen Normen. Glasfilter-Geräte der Firma ROBU zeichnen sich durch höchstmögliche chemische Resistenz, minimale Wärmedehnung sowie hohe Temperaturwechselbeständigkeit aus. Diese optimalen physikalischen und chemischen Eigenschaften ermöglichen den Einsatz in präparativen und analytischen Verfahren bei chemischen, biotechnischen, pharmazeutischen und labortechnischen Anwendern.

VitraPOR®-Glasfilter in Standard-Ausführung:

- Runde Platten von 5 mm bis 380 mm Durchmesser
- Runde Platten biplan geschliffen
- Runde Platten biplan geschliffen, Rand verschmolzen
- Kerzen in zylindrischer oder konischer Form von 9 mm bis 40 mm Durchmesser
- Alle gängigen Filter-Apparaturen und Absorber

VitraPOR®-Glasfilter Sonderausführungen:

- Jede gewünschte Plattenform bis 400 mm in nahezu allen Stärken
- Alle Sonderanfertigungen von Platten sind wahlweise ungeschliffen oder biplan geschliffen und mit verschmolzenem Rand nach Ihren Anforderungen herstellbar
- Filterkerzen und Filterzylinder bis zu 500 mm Länge nach Ihren Wünschen

Für weitere Sonderanfertigungen empfehlen wir Ihnen ein persönliches Gespräch mit unseren qualifizierten Mitarbeitern.

**Unverbindliche Preise in EURO/Stck. ab Werk gemäß unseren Liefer- und Zahlungsbedingungen.
MwSt. berechnen wir gemäß den gesetzlichen Bestimmungen.
Alle bisherigen Preise verlieren ihre Gültigkeit.**

Alle Informationen auch zum Download unter:
www.robuglas.com

VitraPOR®

The Name

VitraPOR® is the trade-name for a complete series of glass filter-products, equipped with filter elements. ROBU-products represent the internationally established type of borosilicate glass 3.3 according to DIN-ISO 3585 and english, american and french standards. Highest possible chemical resistance, minimum thermal expansion as well as the high thermal shock resistance are the characteristic points of ROBU glass filter products. Due to these features the ROBU filters are specially designed for use in the chemical, biotechnical, pharmaceutical and laboratory field.

Standard fritted discs are available:

- in round shape from 5 mm to 380 mm diameter
- in round shape bi-plane ground
- in round shape bi-plane ground and with fused edge
- filter candles in cylindrical or conical shapes from 9 mm to 40 mm diameter
- all filterapparatus and absorbers

Custom made **VitraPOR®**-filters:

- any shape up to 400 mm in almost any thickness
- all custom made discs are available unground, bi-plane ground and with fused edge
- any cylindrical or conical filter candle according to your design up to 500 mm length

Please contact us for any custom made item. We are the experts for any special design and are able to solve your problems fast and at reasonable costs.

Prices in EURO/piece ex works according to our terms of delivery and payment.

**VAT will be invoiced according to European regulations.
All previous prices are no longer valid.**

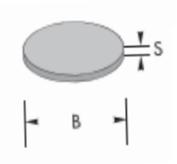
All information also available for download:
www.robuglas.com



ROBU®

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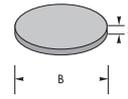
FILTERPLATTEN FILTER DISCS



Filter discs

edge not fused, centred

*The faces of our filterdiscs from the 15 and 51 – 53 series are press moulded and may show thickness deviations. Please refer to the discs of our 16 and 61 – 63 series on the following pages for more specific requirements.



Best. -Nr. Cat. -No.	€/Stück €/piece	Por.	B mm	*S ca. mm	VE
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15 05 0	2,90	0	5	2,8	10
15 05 1	2,90	1			10
15 05 2	2,90	2			10
15 05 3	2,90	3			10
15 05 4	3,30	4			10
15 05 5	9,65	5			10

15 10 9	2,90	00	10	2,8	10
15 10 0	2,90	0			10
15 10 1	2,90	1			10
15 10 2	2,90	2			10
15 10 3	2,90	3			10
15 10 4	3,30	4			10
15 10 5	9,65	5			10

15 20 9	3,00	00	20	3,0	10
15 20 0	3,00	0			10
15 20 1	3,00	1			10
15 20 2	3,00	2			10
15 20 3	3,00	3			10
15 20 4	3,35	4			10
15 20 5	9,80	5			10

15 25 9	3,05	00	25	3,0	10
15 25 0	3,05	0			10
15 25 1	3,05	1			10
15 25 2	3,05	2			10
15 25 3	3,05	3			10
15 25 4	3,50	4			10
15 25 5	13,30	5			10

Best. -Nr. Cat. -No.	€/Stück €/piece	Por.	B mm	*S ca. mm	VE
-------------------------	--------------------	------	---------	--------------	----

15 30 9	3,35	00	30	3,8	10
15 30 0	3,35	0			10
15 30 1	3,35	1			10
15 30 2	3,35	2			10
15 30 3	3,35	3			10
15 30 4	4,05	4			10
15 30 5	14,40	5			10

15 40 9	4,45	00	40	4,5	10
15 40 0	4,45	0			10
15 40 1	4,45	1			10
15 40 2	4,45	2			10
15 40 3	4,45	3			10
15 40 4	5,30	4			10
15 40 5	18,65	5			10

15 50 9	5,75	00	50	4,5	10
15 50 0	5,75	0			10
15 50 1	5,75	1			10
15 50 2	5,75	2			10
15 50 3	5,75	3			10
15 50 4	6,75	4			10
15 50 5	20,95	5			10

15 60 9	9,35	00	60	5,0	5
15 60 0	9,35	0			5
15 60 1	9,35	1			5
15 60 2	9,35	2			5
15 60 3	9,35	3			5
15 60 4	11,75	4			5
15 60 5	37,45	5			5

15 65 9	13,60	00	65	5,5	5
15 65 0	13,60	0			5
15 65 1	13,60	1			5
15 65 2	13,60	2			5
15 65 3	13,60	3			5
15 65 4	16,45	4			5
15 65 5	39,50	5			5

15 70 9	16,25	00	70	5,5	5
15 70 0	16,25	0			5
15 70 1	16,25	1			5
15 70 2	16,25	2			5
15 70 3	16,25	3			5
15 70 4	21,10	4			5
15 70 5	47,20	5			5

15 80 9	17,65	00	80	6,2	5
15 80 0	17,65	0			5
15 80 1	17,65	1			5
15 80 2	17,65	2			5
15 80 3	17,65	3			5
15 80 4	22,90	4			5
15 80 5	57,70	5			5

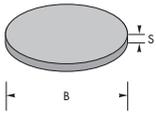
15 90 9	20,95	00	90	7,0	5
15 90 0	20,95	0			5
15 90 1	20,95	1			5
15 90 2	20,95	2			5
15 90 3	20,95	3			5
15 90 4	27,50	4			5
15 90 5	64,15	5			5



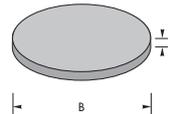
Please contact us for your special designs
and intermediate sizes

Prices in Euro currency net/piece

VE = Verpackungseinheit
VE = Packing unit



Best.-Nr. Cat. -No.	€/Stück €/piece	Por.	B mm	*S ca. mm	VE
15 11 9	43,20	00	100	8,5	1
15 11 0	43,20	0			1
15 11 1	43,20	1			1
15 11 2	43,20	2			1
15 11 3	43,20	3			1
15 11 4	56,05	4			1
15 11 5	114,05	5			1
<hr/>					
15 12 9	50,50	00	120	8,5	1
15 12 0	50,50	0			1
15 12 1	50,50	1			1
15 12 2	50,50	2			1
15 12 3	50,50	3			1
15 12 4	65,65	4			1
15 12 5	127,00	5			1
<hr/>					
51 30 0	88,45	0	130	10,0	1
51 30 1	88,45	1			1
51 30 2	88,45	2			1
51 30 3	88,45	3			1
51 30 4	106,25	4			1
<hr/>					
51 40 0	101,90	0	140	10,0	1
51 40 1	101,90	1			1
51 40 2	101,90	2			1
51 40 3	101,90	3			1
51 40 4	122,20	4			1
<hr/>					
51 50 0	117,95	0	150	10,0	1
51 50 1	117,95	1			1
51 50 2	117,95	2			1
51 50 3	117,95	3			1
51 50 4	141,90	4			1
<hr/>					
51 60 0	133,85	0	160	13,0	1
51 60 1	133,85	1			1
51 60 2	133,85	2			1
51 60 3	133,85	3			1
51 60 4	160,85	4			1
<hr/>					
51 70 0	150,40	0	170	13,0	1
51 70 1	150,40	1			1
51 70 2	150,40	2			1
51 70 3	150,40	3			1
51 70 4	180,55	4			1
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51 80 0	168,85	0	180	13,0	1
51 80 1	168,85	1			1
51 80 2	168,85	2			1
51 80 3	168,85	3			1
51 80 4	202,65	4			1
<hr/>					
51 90 0	187,25	0	190	15,0	1
51 90 1	187,25	1			1
51 90 2	187,25	2			1
51 90 3	187,25	3			1
51 90 4	224,75	4			1
<hr/>					
52 00 0	289,85	0	200	15,0	1
52 00 1	289,85	1			1
52 00 2	289,85	2			1
52 00 3	289,85	3			1
52 00 4	348,35	4			1
<hr/>					
52 10 0	352,90	0	210	19,0	1
52 10 1	352,90	1			1
52 10 2	352,90	2			1
52 10 3	352,90	3			1
52 10 4	423,45	4			1



Best.-Nr. Cat. -No.	€/Stück €/piece	Por.	B mm	*S ca. mm	VE
52 20 0	388,00	0	220	19,0	1
52 20 1	388,00	1			1
52 20 2	388,00	2			1
52 20 3	388,00	3			1
52 20 4	465,30	4			1
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52 30 0	423,45	0	230	19,0	1
52 30 1	423,45	1			1
52 30 2	423,45	2			1
52 30 3	423,45	3			1
52 30 4	508,25	4			1
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52 40 0	460,95	0	240	19,0	1
52 40 1	460,95	1			1
52 40 2	460,95	2			1
52 40 3	460,95	3			1
52 40 4	553,00	4			1
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52 50 0	500,25	0	250	19,0	1
52 50 1	500,25	1			1
52 50 2	500,25	2			1
52 50 3	500,25	3			1
52 50 4	600,30	4			1
<hr/>					
52 60 0	540,15	0	260	26,0	1
52 60 1	540,15	1			1
52 60 2	540,15	2			1
52 60 3	540,15	3			1
52 60 4	648,15	4			1
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52 70 0	580,55	0	270	26,0	1
52 70 1	580,55	1			1
52 70 2	580,55	2			1
52 70 3	580,55	3			1
52 70 4	696,70	4			1
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52 80 0	626,10	0	280	26,0	1
52 80 1	626,10	1			1
52 80 2	626,10	2			1
52 80 3	626,10	3			1
52 80 4	751,30	4			1
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52 90 0	672,05	0	290	26,0	1
52 90 1	672,05	1			1
52 90 2	672,05	2			1
52 90 3	672,05	3			1
52 90 4	806,50	4			1
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53 00 0	721,10	0	300	26,0	1
53 00 1	721,10	1			1
53 00 2	721,10	2			1
53 00 3	721,10	3			1
53 00 4	865,40	4			1
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53 50 0	986,85	0	350	28,0	1
53 50 1	986,85	1			1
53 50 2	986,85	2			1
53 50 3	986,85	3			1
53 50 4	1181,45	4			1
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53 80 0	1178,30	0	380	38,0	1
53 80 1	1178,30	1			1
53 80 2	1178,30	2			1
53 80 3	1178,30	3			1
53 80 4	1411,50	4			1

Please contact us for your special designs and intermediate sizes

VE = Verpackungseinheit
VE = Packing unit

TIEGEL, NUTSCHEN, TRICHTER CRUCIBLES, FUNNELS

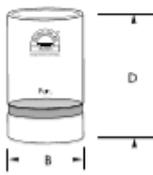


Best.-Nr. Cat. -No.	€/Stück €/piece	Por. ml	B mm	VE
20 30 0	8,95	0	30	10
20 30 1	8,95	1	30	10
20 30 2	8,95	2	30	10
20 30 3	8,95	3	30	10
20 30 4	10,10	4	30	10
20 30 5	19,55	5	30	10
20 50 0	13,00	0	50	10
20 50 1	13,00	1	50	10
20 50 2	13,00	2	50	10
20 50 3	13,00	3	50	10
20 50 4	15,00	4	50	10
20 50 5	30,45	5	50	10



Filternutschen Filter funnels

Best.-Nr. Cat. -No.	€/Stück €/piece	Por. ml	A mm	B mm	VE
21 50 0	20,15	0	50	35	10
21 50 1	20,15	1	50	35	10
21 50 2	20,15	2	50	35	10
21 50 3	20,15	3	50	35	10
21 50 4	21,55	4	50	35	10
21 50 5	36,85	5	50	35	10
21 75 0	22,65	0	75	45	10
21 75 1	22,65	1	75	45	10
21 75 2	22,65	2	75	45	10
21 75 3	22,65	3	75	45	10
21 75 4	25,00	4	75	45	10
21 75 5	40,70	5	75	45	10
21 12 0	31,85	0	125	60	10
21 12 1	31,85	1	125	60	10
21 12 2	31,85	2	125	60	10
21 12 3	31,85	3	125	60	10
21 12 4	35,35	4	125	60	10
21 12 5	63,30	5	125	60	10
21 25 0	42,20	0	250	80	18
21 25 1	42,20	1	250	80	18
21 25 2	42,20	2	250	80	18
21 25 3	42,20	3	250	80	18
21 25 4	46,75	4	250	80	18
21 25 5	77,10	5	250	80	18
21 55 0	50,50	0	500	90	22
21 55 1	50,50	1	500	90	22
21 55 2	50,50	2	500	90	22
21 55 3	50,50	3	500	90	22
21 55 4	60,25	4	500	90	22
21 55 5	127,30	5	500	90	22



Rohfaser-Tiegel
System Tecator® und andere
Filter crucibles
for dietary fibre extraction
System Tecator® and others

Best.-Nr. Cat. -No.	Por. ml	B mm	D mm	VE		
20 60 0	15,45	0	30	34	60	10
20 60 1	15,45	1	30	34	60	10
20 60 2	15,45	2	30	34	60	10
20 60 3	15,45	3	30	34	60	10
20 60 4	16,65	4	30	34	60	10
20 65 0*	17,25	0	30	34	60	10
20 65 1*	17,25	1	30	34	60	10
20 65 2*	17,25	2	30	34	60	10
20 65 3*	17,25	3	30	34	60	10
20 65 4*	18,25	4	30	34	60	10



Best.-Nr. Cat. -No.	€/Stück €/piece	Por. ml	A mm	B mm	VE	
21 11 0	82,85	0	1000	120	22	1
21 11 1	82,85	1	1000	120	22	1
21 11 2	82,85	2	1000	120	22	1
21 11 3	82,85	3	1000	120	22	1
21 11 4	106,90	4	1000	120	22	1
21 11 5	218,55	5	1000	120	22	1
21 40 0	276,65	0	4000	175	30	1
21 40 1	276,65	1	4000	175	30	1
21 40 2	276,65	2	4000	175	30	1
21 40 3	276,65	3	4000	175	30	1
21 40 4	321,40	4	4000	175	30	1
21 80 0	609,90	0	8000	210	40	1
21 80 1	609,90	1	8000	210	40	1
21 80 2	609,90	2	8000	210	40	1
21 80 3	609,90	3	8000	210	40	1
21 80 4	705,10	4	8000	210	40	1

Introduction

Borosilicate glass 3.3 is specified as a standard glass - it contains mainly sand, calcium carbonate and sodium carbonate.

High quality sand, dehydrated borate boric acid, alumina and salt are used in its manufacture and strict control is applied to ensure the specifications for purity and consistency of these materials are maintained. Because of its resistance to heat, corrosion and thermal shock borosilicate glass 3.3 is used extensively in science and in industry.

Fusion of Sintered Glass

All VitroPOR® sintered filters in our glass apparatus are solely joint to the massive glass by fusing, i.e. welding without additives. No foreign substances like adhesives impair the inert properties of the pure borosilicate glass 3.3.

Standard Thicknesses Filterdiscs (Art. 15 - ...)

Please note,
that the values are only of approximate value and given without tolerances

Outer Diameter	Approximate Thickness
Ø 5 – 10 mm	2,8 mm
Ø 20 – 25 mm	3,0 mm
Ø 30 mm	3,8 mm
Ø 40 – 50 mm	4,5 mm
Ø 60 mm	5,0 mm
Ø 65 – 70 mm	5,5 mm
Ø 80 mm	6,2 mm
Ø 90 mm	7,0 mm
Ø 100 – 120 mm	8,5 mm
Ø 130 – 150 mm	10,0 mm
Ø 160 – 180 mm	13,0 mm
Ø 190 – 200 mm	15,0 mm
Ø 210 – 250 mm	19,0 mm
Ø 260 – 300 mm	26,0 mm
Ø 350 mm	28,0 mm
Ø 380 mm	38,0 mm

The material-specific shrinkage of finer pore sizes results in correspondingly smaller thicknesses of the filters.



Specific Heat

bei 20°C 750 J/kg·K
150°C 960 J/kg·K
300°C 1090 J/kg·K

Thermal Conductivity

at 20°C 1.13 W/m·K
150°C 1.25 W/m·K
300°C 1.42 W/m·K

Chemical Composition

The following is a typical analysis of borosilicate glass 3.3:

Element	% by weight
Silica (SiO ₂)	80.60
Boric oxide (B ₂ O ₃)	12.60
Sodium oxide (Na ₂ O)	4.20
Alumina (Al ₂ O ₃)	2.20
Iron oxide (Fe ₂ O ₃)	0.04
Calcium oxide (CaO)	0.10
Magnesium oxide (MgO)	0.05
Chlorine (Cl)	0.10

There may be heavy metals in a concentration of less than 5 ppm.

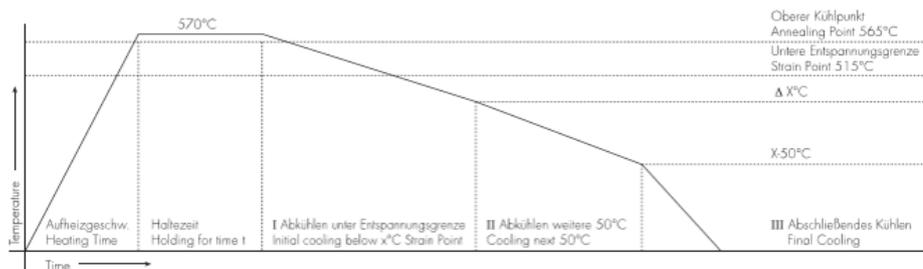
Physical Properties

Coefficient of Expansion	33 x 10 ⁻⁷ /K between 20°C - 300°C
Specific Heat	0,8x10 ³ J/kg K ¹ at 20°C
Thermal Conductivity	1.13 W/m K ¹ at 20°C
Densit	2.23 x 10 ³ kg/m ³
Poisson's Ratio	0.22 between 25°C - 400°C
Young's Modulus	6.500 kg/mm ² at 25°C
Rigidity Modulus E	64 x 10 ³ MPa
DPH (Vickers) Hardness	580 Kg/mm ² with 50 gram load
Relative Hardness	1.52 (comparative Soda-Lime = 1.0)
Refractive Index	1.474 Sodium D - Line
Dielectric Constant	4.6 at 1 MHz and 20°C
Loss Factor	2.6 % at 1 MHz and 20°C
Log ₁₀ Volume Resistivity	15 Ohm · cm/s at 20°C
Surface Resistivity	10 ¹³ Ohm s·cm ² at 50% humidity
Transformation Point (T _g)	525 °C

Annealing

The annealing of glass is the process by which it is heated to and held at a controlled temperature for a defined period to relieve internal stresses. Careful cooling under controlled conditions is essential to ensure, that no stresses are reintroduced by chilling.

Temperverlauf / Annealing Schedule



Stärke Thickness	Aufheizgeschw. Heating Rate °C/min.	Zeit Time t min.	Temp. Δ X °C	Rate I °C/min.	Rate II °C/min.	Rate III °C/min.
3,0	130	5	5	12,0	24,0	130
6,0	30	15	10	3,0	6,0	30
12,0	8	30	20	0,8	1,6	8

Thermal Expansion

The coefficient of linear thermal expansion is one of the characteristic properties by which glass is measured and is defined as the change in unit length per degree rise in temperature. The thermal expansion is 33 x 10⁻⁷ per °C between 20°C and 300°C and is controlled to a tolerance of ± 0.5 x 10⁻⁷ per °C. Due to its porous structure, sintered glass has a slightly different thermal expansion. Care should be taken when fusing it to massive borosilicate glass 3.3.

Thermal Resistance

Since borosilicate glass has a high softening point, it can be used at temperatures of the order of 515°C. Care must be exercised, however, in cooling down apparatus which has been held at high temperatures. The cooling process must be slow and uniform, particularly in the case of thick sections (see annealing). If a temperature gradient is applied to the glass, stresses are set up - the hotter glass being under compression and the cooler under tension. The magnitude of the tensile stress depends on the temperature difference which in turn depends on the glass thickness. ATTENTION: Abrasions greatly reduce the temperature shock resistance.

Maximum Temperatures

In general it is recommended, that the strain point (515°C) be regarded as the maximum safe operating temperature of borosilicate glassware 3.3. For some shapes and for a relatively short time this limit can be exceeded, but at 580°C there is danger of deformation and in case of sintered glassware the porous structure may be changed. At high temperatures the glass may acquire permanent stress on cooling and this may result in subsequent breakage.

If it is suspected that permanent stress has occurred, the article should be annealed making references to the annealing process explained below. Permanent stress can greatly reduce the mechanical and thermal resistance.

Viscosity

Although glass has no defined softening point, there are four points in the viscosity-/temperature relation which have accepted definitions (ISO 7884-2/-3/-4):

1. Strain Point	515°C	
Viscosity of the glass is		10 ^{14.5} dPa·s
2. Annealing Point	565°C	
Viscosity of the glass is		10 ^{13.0} dPa·s
3. Softening Point	820°C	
Viscosity of the glass is		10 ^{7.6} dPa·s
4. Working Point	1250°C	
Viscosity of the glass is		10 ^{4.0} dPa·s

Chemical Resistance

The chemical resistance of glass is better than that of all other known materials. It shows resistance to water, acids and alkalis, salt, organic substances as well as chlorine and bromine. Hydrofluoric acid, concentrated phosphoric acid and strong alkalis attack the glass surface at higher concentrations and temperatures.

The following are typical results of tests undertaken to international standards:

1. Hydrolytic resistance

Glass grains (300 - 500 microns)

acc. ISO 719 (98°C) Water attack: < 0,01 mg Na₂O/g grains

Class ISO 719 - HGB 1

acc. ISO 720 (121°C)

Class ISO 720 - HGA 1

2. Acid Resistance

Resistance acc. DIN 12116 Acid Class 1

Resistance acc. DIN/ISO 1766 = Loss in weight < 100 µg Na₂O/dm²

3. Alkali Resistance

Resistance acc. DIN 52322 / ISO 695 Class A2

Optical Properties

Massive borosilicate glass 3.3 has a high ability to transmit light throughout the visible range of the spectrum. Ranging from approx. 310 to 2300 nm there is virtually no absorption through the thickness of glass generally encountered in laboratory ware (up to approx. 6 mm). The following table shows additional data:

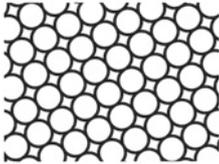
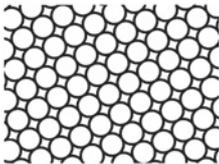
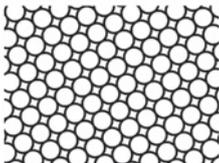
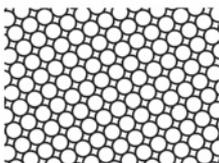
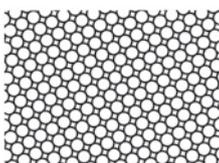
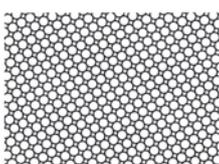
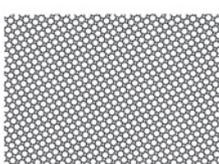
Tabelle / Table

Refractive index (sodium D line)	1.474
Dispersion (NF-NC)	0.00738
Visible light transmission	92% in 2 mm thick glass 91% in 6 mm thick glass
Stress optical coefficient	3.5 nm/kg cm ² per cm length



Porosity

The **VitraPOR** glass filters are divided into seven porosity classes from 1,0 µm to 500 µm. Therefore they are suitable for all applications in the chemical and pharmaceutical industry, in laboratories as well as in large technical plants.

	Porosity	ISO 4793	Nominal pore size	Fields of application
	00	P 500	250 - 500 µm	Liquid and gas distribution
	0	P 250	160 - 250 µm	Gas distribution in liquids at low pressure, coarse filtration
	1	P 160	100 - 160 µm	Coarse filtration, gas distribution, liquid distribution, gas cleaning
	2	P 100	40 - 100 µm	Preparative fine filtration, mercury filtration, preparative work with coarse crystalline products
	3	P 40	16 - 40 µm	Analytical work with medium fine precipitates analytical filtration, fine gas filtration, special filtration
	4	P 16	10 - 16 µm	Analytical fine filtration, analytical and preparative works with the finest precipitates return and stop valves
	5	P 1,6	1,0 - 1,6 µm	General bacteria filtration, sterile filtration

Additionally, the following porosities are also available:

Porosity	Abbreviation	Nominal pore size	Porosity	Abbreviation	Nominal pore size
Extra Coarse	EC	170 - 220 µm	Fine	F	4 - 5.5 µm
Coarse	C	40 - 60 µm	Very Fine	VF	2 - 2.5 µm
Medium	M	10 - 16 µm	Ultra-Fine	UF	0.9 - 1.4 µm

Flow rate and Pressure Drop

Flow rates of liquids and drop in pressure of gases are functions of:

- diameter of the filter
- porosity of the filter
- relation of pressure/vacuum in the apparatus
- physical properties of the medium to be filtered.

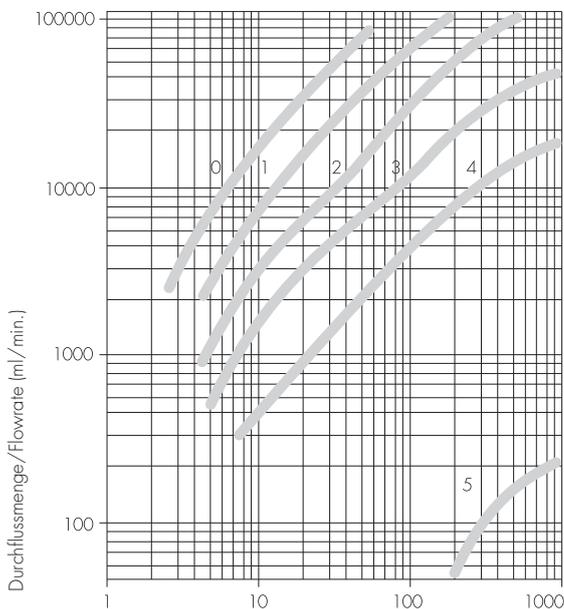
To determine the possible application of glass filter-products and to choose the best apparatus for the work intended, it is necessary to know the flow rates of liquids and gases. Please use our diagrams 1 and 2 which are shown for water and air. The data apply to filter discs of 30 mm diameter with average properties and usually effective filter area and - thicknesses, as well as poresizes.

The flow rates for other diameters can easily be taken by multiplying this factor by the conversion factor. Minor deviations with very limited tolerances are possible. Strict control is recommended, especially when filtering bacteria using porosity 5.

Durchflussmengen / Flow rates

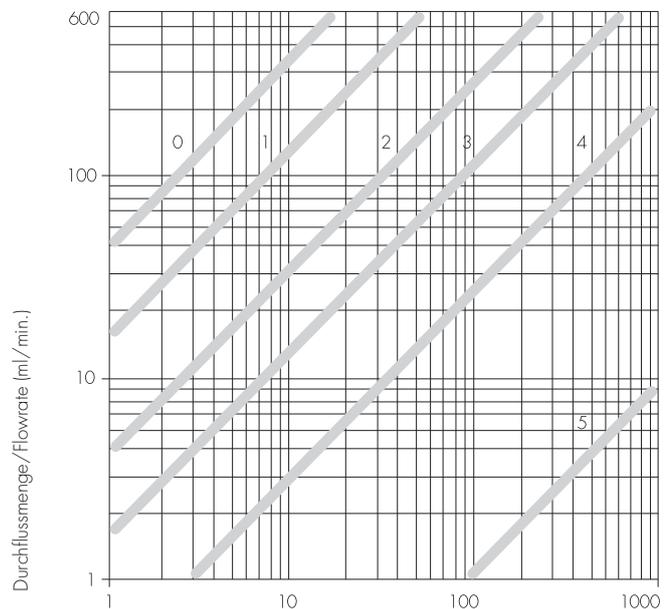
Filter disc ø mm	10	20	30	40	50	60	90	120	175
Conversion factor	0,13	0,55	1,00	1,50	2,50	4,30	6,80	9,70	15,00

Dry-air flowrate for a disc of ø 30 mm.



Druckunterschied/Pressure differential Δp (mbar)

Waterflow for a disc of ø 30 mm.



Druckunterschied/Pressure differential Δp (mbar)

Cleaning

Successful experimental results can only be achieved by using clean apparatus. The following advice may be used for the massive and porous borosilicate glass 3.3:

Wash glassware as quickly as possible after use. During washing with water all parts of the article should be scrubbed with a soft brush. Avoid any abrasion of the glassware! After cleaning thoroughly rinse with distilled water. Drying can be undertaken either in air or at a temperature not exceeding 100°C.

If after mechanical cleaning for example filter-pores should still remain clogged, the thorough chemical cleaning is required. A few suggestions found generally useful follow:

Contamination	Solvent
Barium sulphate	Hot concentrated sulphuric acid (100°C), Silver-chloride Ammonian or Sodium hyposulfite
Copper or Iron Oxides	Hot Hydrochloric acid plus potassium chlorate
Mercury residue	Hot Nitric acid
Mercury sulphide	Hot aqua regia
Albumen	Hot hydrochloric acid or hot ammonia
Grease, oil, fatty materials	Carbon tetrachloride
Organic matters	Hot concentrated cleaning solution, or hot concentrated sulfuric acid plus a few drops of sodium or potassium nitrite
Glucose	Carefully heat to approx. 200°C with mixed acid (5% H ₂ SO ₄ and 1% HNO ₃)

Extensive rinsing with water must be obviously follow.

Warning!

Hot concentrated phosphoric acid and hot alkaline solutions attack the glass surface, they are unsuitable as cleaning agents. If they have to be filtered, an increase in pore size and reduced life of the fritted disc is unavoidable.

Safety Instructions

Cleaning

Before the first use of glass-filters, they must be cleaned with diluted, hot hydrochloric acid, followed by several rinses with distilled water. Glass-filters should be cleaned immediately after their use. The surfaces can be wiped with a squeegee or a brush. Surface rinsing with a wash bottle or back-flushing under the water tap is often sufficient.

Pressure and Vacuum

Due to the mechanical properties, a vacuum- or pressure resistance of glass cannot be guaranteed. Scratches or internal abrasions of the glass surface can greatly reduce the mechanical and thermal strength. Filter pores may clog during filtration and cause a pressure drop - in any case 0,1 MPa may not be exceeded. Never subject glassware to sudden pressure changes.

Temperature Resistance

The maximum allowable service temperature is approx. 500°C. To avoid permanent stress, careful heating and cooling according to the schedule for borosilicate glass 3.3 should be ensured. Permanent stress can reduce the mechanical and thermal resistance. Never subject glassware to sudden temperature changes.

Chemical resistance

High concentrations of hydrofluoric acid or hot alkali solutions attack the glass and can cause deterioration in the filter and an increase of the pore size.

Safety advice

When working with glassware always wear protective glasses and protective gloves to avoid injuries. Use a safety screen, -hood or similar protection when working with glassware subject to pressure or vacuum. Be prepared, that reagents may leak from a broken vessel.

Please heed these guidelines in combination with the respective state-specific regulations for the use of glassware in the laboratory.

All information also available for download:
www.robuglas.com





Das neu entwickelte und vielfältig einsetzbare Quarz-Sintermaterial von **ROBU®** wird in einem innovativen Verfahren hergestellt und bearbeitet. Es bietet entscheidende Vorteile, zum Beispiel in elektrochemischen und elektrokinetischen Anwendungen, als Support-Struktur, aber auch für optoelektronische oder Filtrationsaufgaben in Medizin- und Verfahrenstechnik:

- Rohmaterial aus reinem, amorphem SiO₂
- Temperaturbeständig bis über 1.000 °C
- Hervorragende Temperatur-Wechselbeständigkeit
- Extrem widerstandsfähig gegen aggressive Medien
- Hohe Oberflächenladung, Offenporigkeit und innere Oberfläche
- Mono- und mehrmodale Porendurchmesser von 0.5 bis über 5 µm
- Folienstärken von unter 1.0 bis über 10 mm realisierbar



With the background of a long term experience **ROBU®** has developed a new and flexible porous quartz membrane. It is produced in a special casting process using a specialized technology. It not only offers various advantages in electrochemical, opto-electronic and electrokinetic applications, but also in the medical field or as a filter and support structure:

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- Superior temperature change resistance
- Very good chemical resistance
- High electric potential, porosity and large surface area
- Mono- or multimodal pore sizes from 0.5 to over 5 µm dia.
- Tape thicknesses from below 1.0 to over 10 mm





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