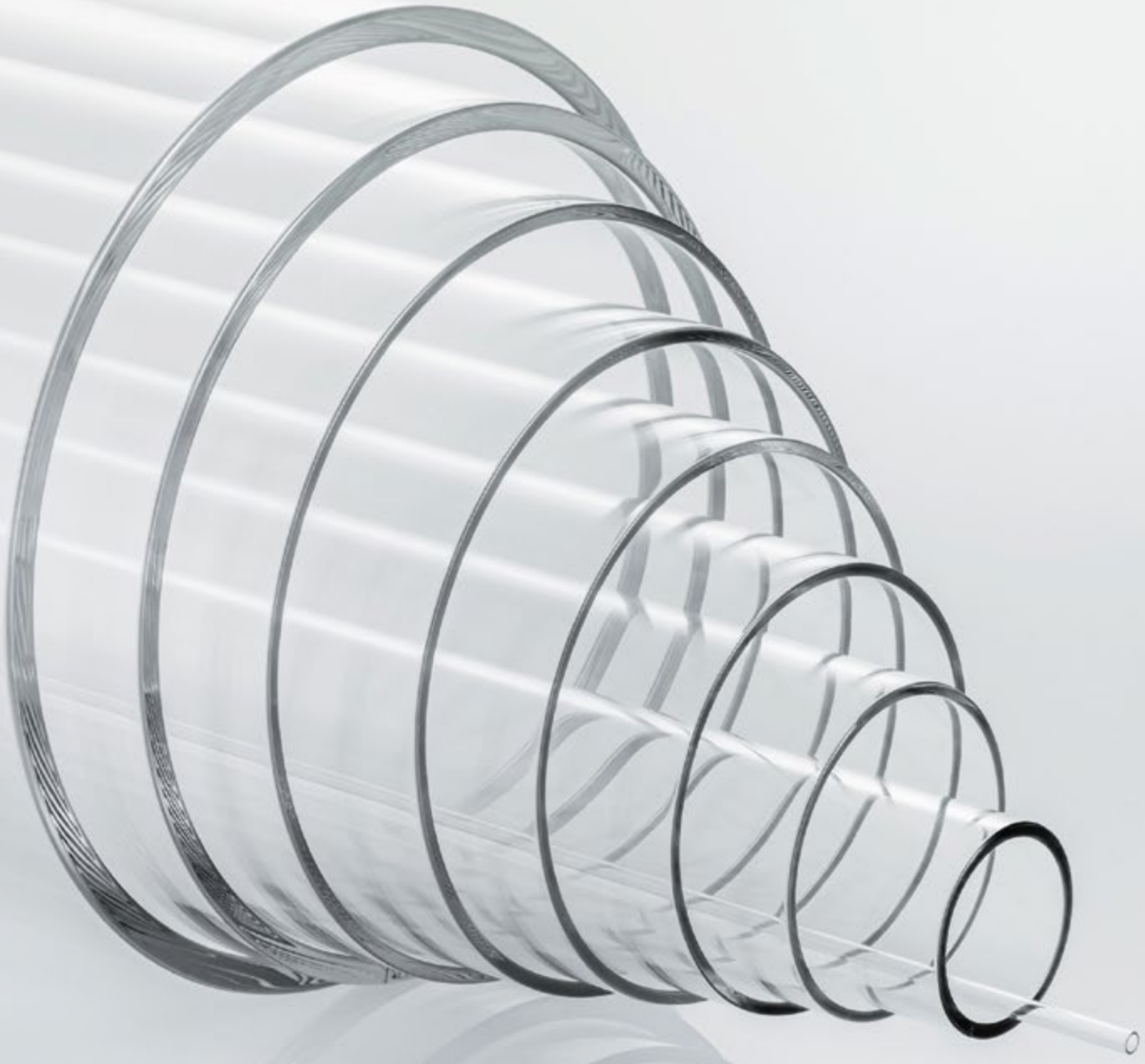
SCHOTT
glass made of ideas

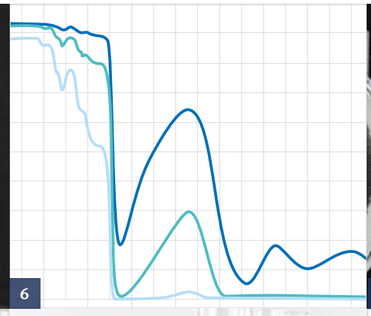


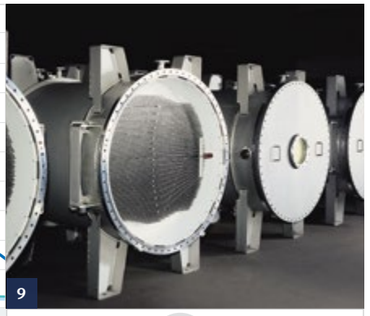
DURAN®

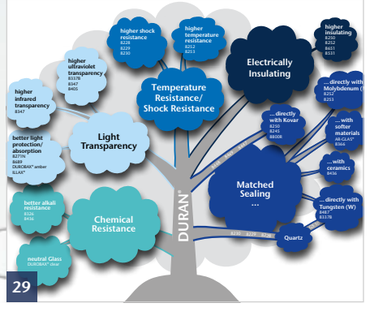
Tubing, Rods and Capillaries made of Borosilicate Glass 3.3

Pioneering – responsibly – together. These attributes characterize SCHOTT as a manufacturer of high-tech materials based on specialty glass. Always opening up new markets and applications with a pioneering spirit and passion – this is what has driven the #glasslovers at SCHOTT for more than 130 years. Represented in 34 countries, the company is a highly skilled partner for high-tech industries: Healthcare, Home Appliances & Living, Consumer Electronics, Semiconductors & Datacom, Optics, Industry & Energy, Automotive, Astronomy & Aerospace. As a foundation company, SCHOTT has anchored responsibility for employees, society and the environment deeply in its DNA. The goal is to become a climate-neutral company by 2030.

With a production capacity of more than 190,000 tons and production sites in Europe, South America and Asia, SCHOTT Tubing is one of the world's leading manufacturers of glass tubes, rods and profiles. More than 60 different glass types are produced in a large variety of dimensional and cosmetic specifications based on a standardized production process and a global quality assurance system. SCHOTT Tubing provides customized products and services for international growth markets such as pharmaceuticals and electronics as well as industrial and environmental engineering.







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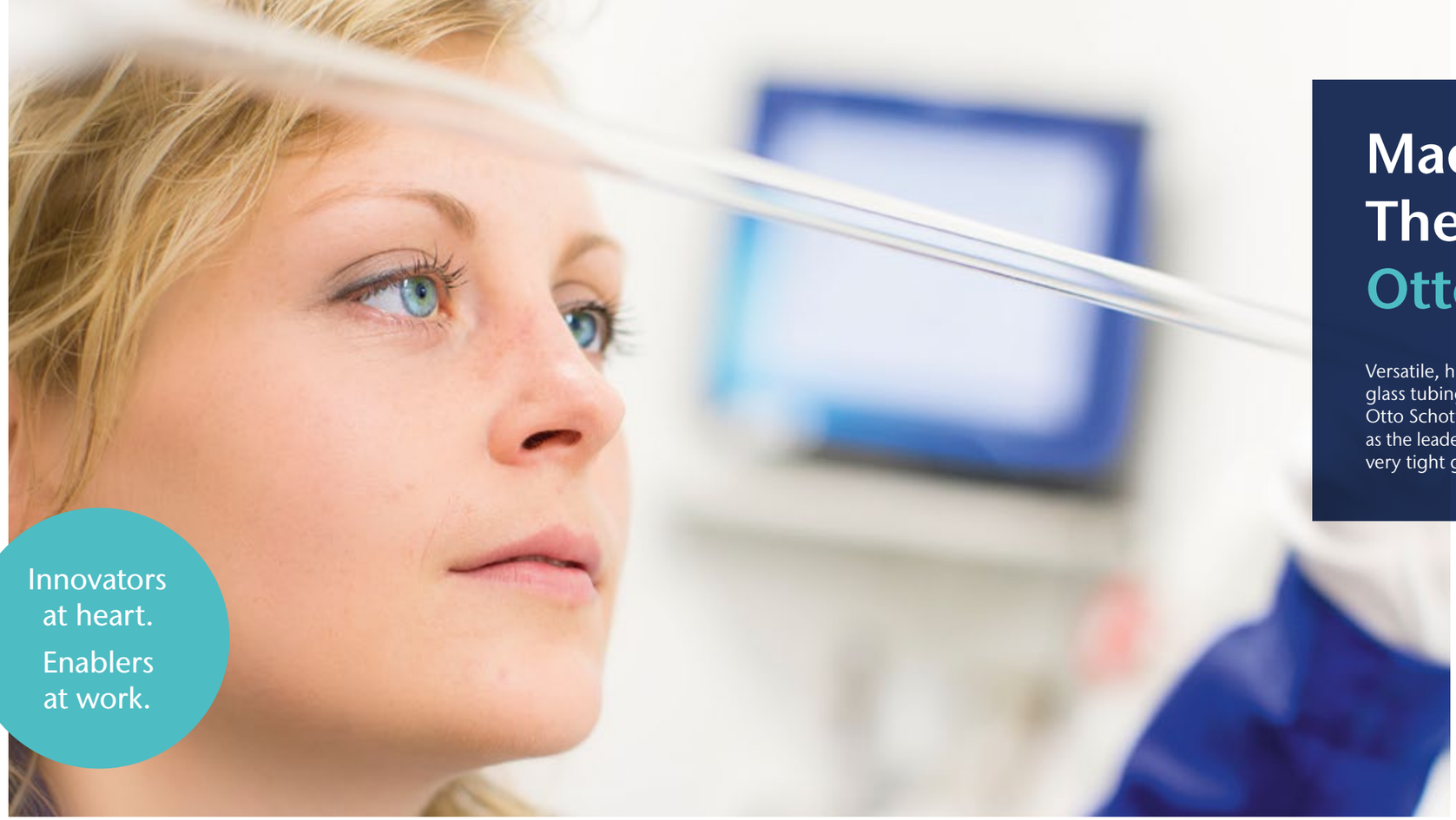


Innovators at heart.

Enablers at work.

Made by SCHOTT – The Invention from Otto Schott

Versatile, highly resistant, easily processed – its many features make DURAN® glass tubing the all-round talent among all technical glasses. Invented in 1887 by Otto Schott, this 3.3 expansion glass to this day in many ways positions SCHOTT as the leader in the borosilicate glass industry, boasting uniquely varied dimensions, very tight geometric tolerances and high optical quality.

The inventor: Otto Schott, scientist and company founder

1887

The invention
Borosilicate glass 3.3, resistant to chemicals, heat and thermal shock, was invented in 1887 by Otto Schott.

1938

Register trade name
Brand registered in 1938 under the trade name DURAN®

1950

Industry standard
DURAN® borosilicate glass tubing has been the standard material in the production of laboratory glass items since the 1950s.

2011

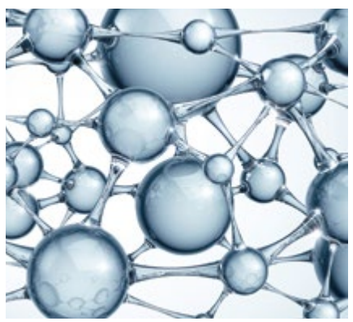
A first: glass tubing with a length of 10 meters!
SCHOTT in Mitterteich, Germany, was the first to produce DURAN® tubing in a length of 10 meters, making it the longest industrially produced glass tube.

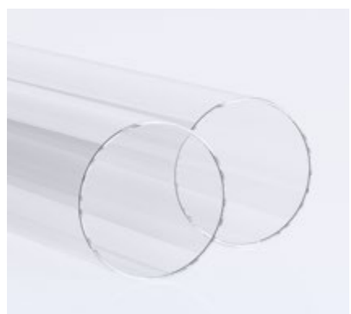
2015

A first: glass tubing with 465 mm outside diameter!
SCHOTT in Mitterteich has set a world record: It manufactured DURAN® tubing with an outside diameter of 465 mm, the largest-ever industrially produced glass tubing.

2021

A new solution for architectural design: DURAN® Tough
Understanding the concern in case of breakage, SCHOTT in Mitterteich developed DURAN® Tough. A polymer coating on the inside ensures the glass tubing maintains its form and integrity in the case of breakage.



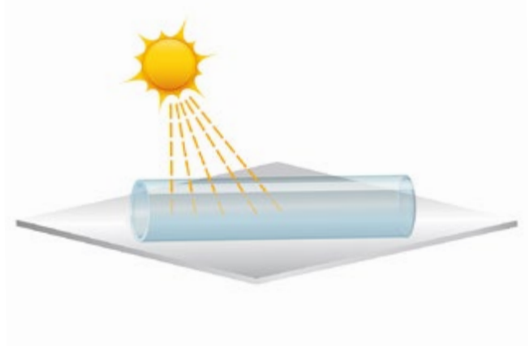


Properties

High chemical resistance

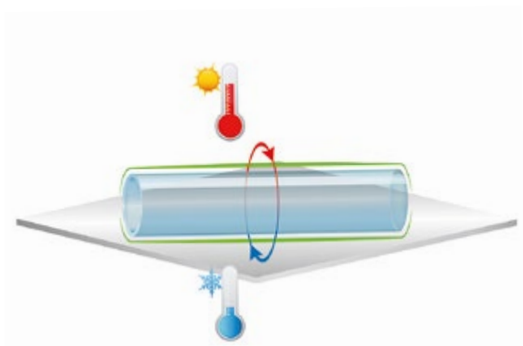
Durability in corrosive environments thanks to high chemical resistance of the material

Outstanding transmission properties



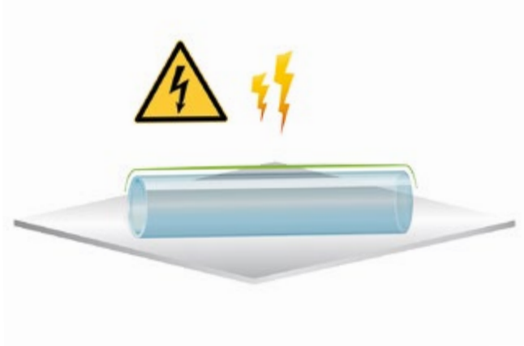
Ideal base material for transparent encapsulationa, thanks to consistently high transmission from UV-A into IR range

High thermal capacity and resistance to thermal shock



Ideal for applications in contact with fire or high temperatures due to high working temperatures and thermal shock

Good electrical properties

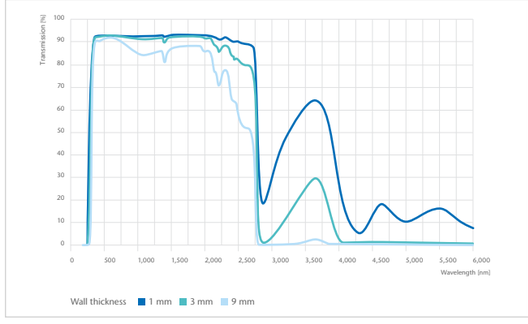


Excellent for high-voltage applications, thanks to its good electrical insulating characteristics with high dielectric strength

Hydrolytic resistance	
Hydrolytic resistance (DIN ISO 719)	Class HGB 1
Acid resistance (DIN 12116)	Class S 1
Alkali resistance (DIN ISO 695)	Class A 2

DURAN® borosilicate glass 3.3 is very resistant to water, neutral and acid solutions, strong acids and their compounds, as well as against chlorine, bromine, iodine and organic substances. Hydroflouric acid, hot phosphoric acid, and alkaline solutions attack the glass surface depending on concentration and temperature, thus applications must be individually tested.

Transmission	
Index of refraction (λ = 587.6 nm) n_d	1.473

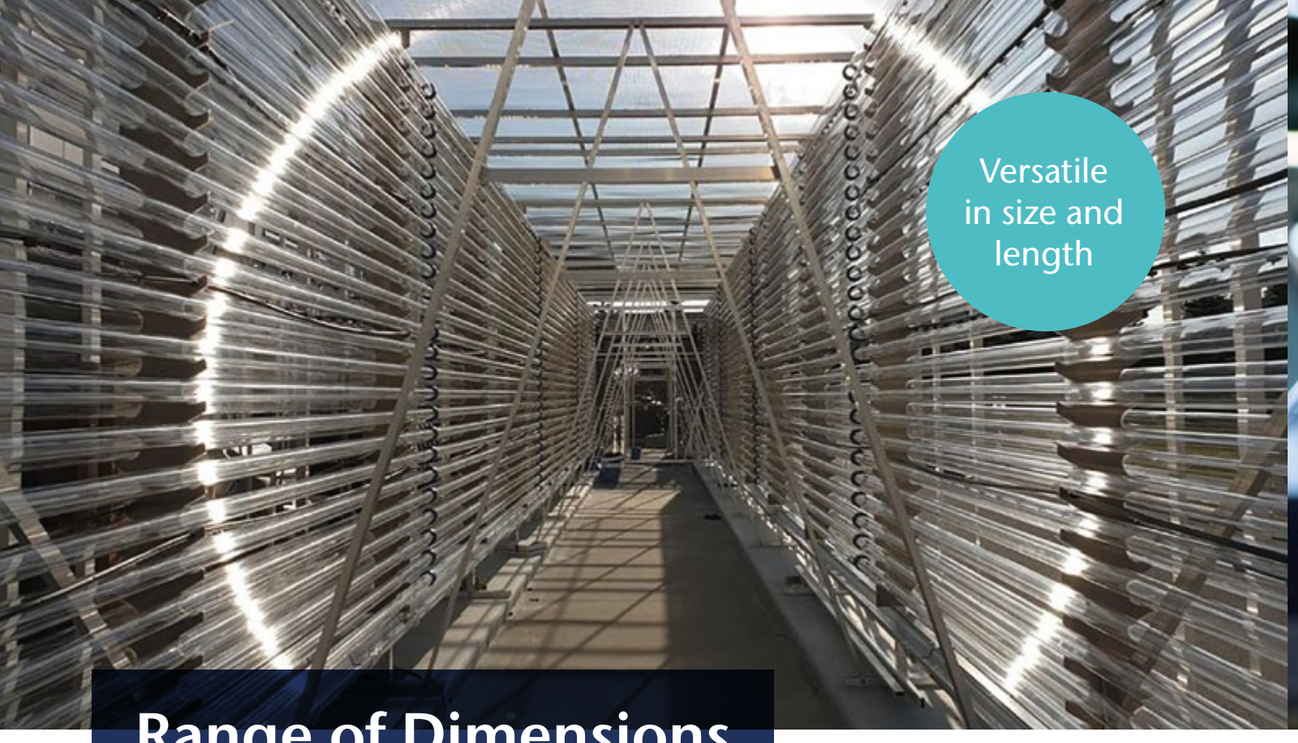


Transmission curves for WT of 1 mm, 3 mm, 9 mm

Other characteristics			
Density ρ at 25 °C	2.23 g · cm^{-3}	Poisson number μ	0.20
Elasticity modulus E (Young's modulus)	63 · 10^3 N · mm^{-2}	Stress-optical constant (DIN 52 314) K	4.0 · 10^{-6} mm^2 · N^{-1}

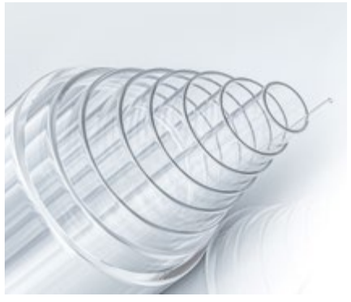
Temperature resistance and thermal expansion		
Coefficient of mean linear thermal expansion α (20 °C; 300 °C) as per DIN ISO 7991		3.3 · 10^{-6} K^{-1}
Transformation temperature T_g		525 °C
Glass temperature at viscosity η in dPa · s		
10^{13}	(annealing point)	560 °C
10^{7,6}	(softening point)	825 °C
10^4	(working point)	1260 °C
Thermal conductivity λ_w at 90 °C		1.2 W · m^{-1} · K^{-1}

Electrical properties		
Temperature for specific electrical resistance of 10^8 Ω · cm (DIN 52 326) $t_{k\,100}$		250 °C
Log of the electric volume resistivity (Ω · cm) (logarithm)	at 250 °C	8
	at 350 °C	6.5
Dielectric properties (1 MHz, 25 °C)	dielectric constant ε	4.6
	dielectric loss factor tan δ	37 · 10^{-4}



Range of Dimensions

DURAN® tubing



Dimension range [mm]	
Outside diameter (OD)	3.00 to 465.00
Wall thickness (WT)	0.45 to 14.00
Length (L)	600* to 10,000

DURAN® rods

Dimension range [mm]	
Diameter (D)	> 2.00 to 42.00
Length (L)	1,200* to 3,000

DURAN® capillaries

Dimension range [mm]	
Outside diameter (OD)	4.00 to 9.00
Inside diameter (ID)	0.40 to 3.00
Length (L)	1,000* to 2,000

These dimensions cannot be selected in any combination of OD, WT, ID and L. Further dimensions available upon request. Requirement: successful technical feasibility test

*Shorter lengths are available with post-processing upon request.

Quality Management

Ultra-modern manufacturing methods forge SCHOTT quality, 100 % measured, controlled, documented, and traceable all the way back to its origin.

Certified quality

DURAN® meets all significant standards for technical glass such as ISO 3585:1998 and ASTM E438 Type I. Good Manufacturing Practice (GMP) is a guideline for production processes and production environment (ISO 15378) and is an extension of the familiar standard ISO 9001. SCHOTT in Mitterteich, Germany, is the world's first glass tubing manufacturer to be certified under the applicable European standard ISO 15378.

TÜVRheinland® CERTIFIED
Management System
ISO 9001:2015
ISO 15378:2017
www.tuv.com
ID 9108654402

Germany: site Mitterteich and Mainz

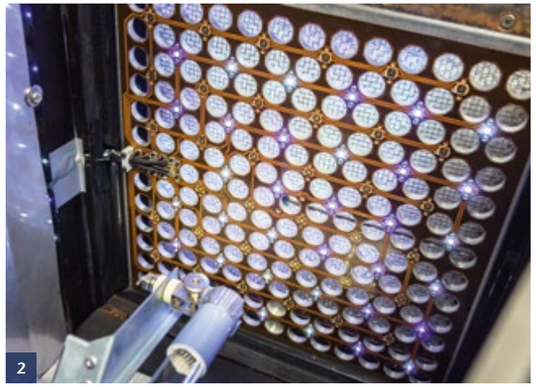
Proven quality from SCHOTT

In addition to measuring done within the production lines, random samples are regularly taken during the production process. The in-house laboratory tests these samples chemically, physically and visually in order to verify and expand upon the automatic testing. Once the finished tubing is packaged and ready for shipment, all measuring results and packaging information is archived for any later access that may be required.

Wide Range of Applications

Do you know some of the many ways where DURAN® tubing is used? Here are a few examples.


1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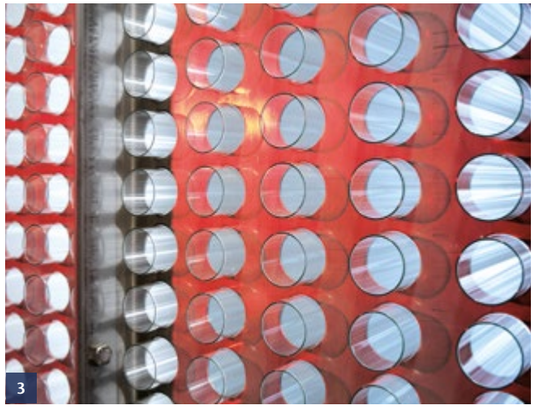
1 Food dispensers DURAN® tubing for storage of food, powders or liquids
2 Ventilation systems DURAN® tubing for optimum effect and long life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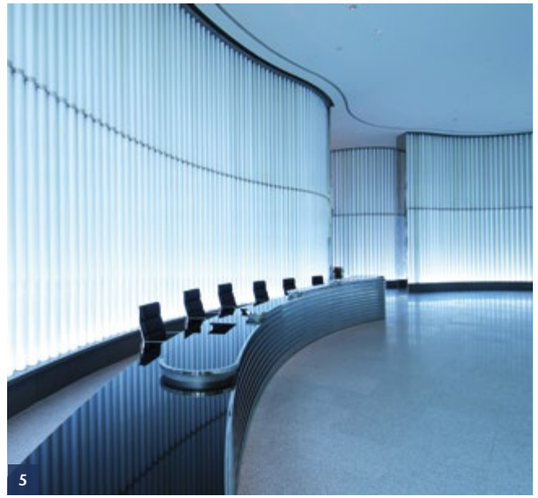
3 Heat exchangers DURAN® tubing for high corrosion resistance
4 Photobioreactors DURAN® tubing with high transmission for ideal algae growth


4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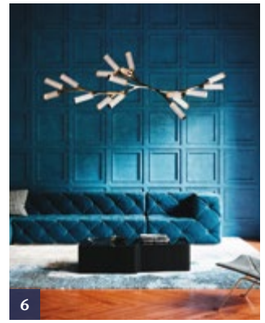

6

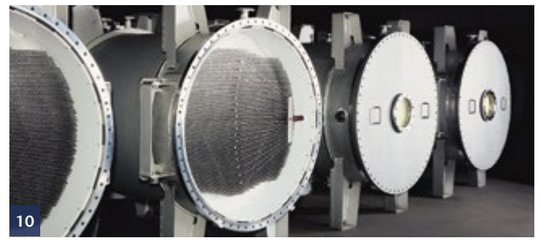

7

5 Interior design DURAN® tubing for modern and innovative design solutions
6 Design lighting DURAN® tubing for timeless and elegant lighting concepts
7 Product presentation DURAN® tubing with high transparency and resistance to scratches


8

8 Chemical equipment geometrically precise DURAN® tubing for commercial plants
9 Sight glasses DURAN® tubing for consistently stable clarity
10 Ozone generators DURAN® tubing as insulator

9


10


11

12

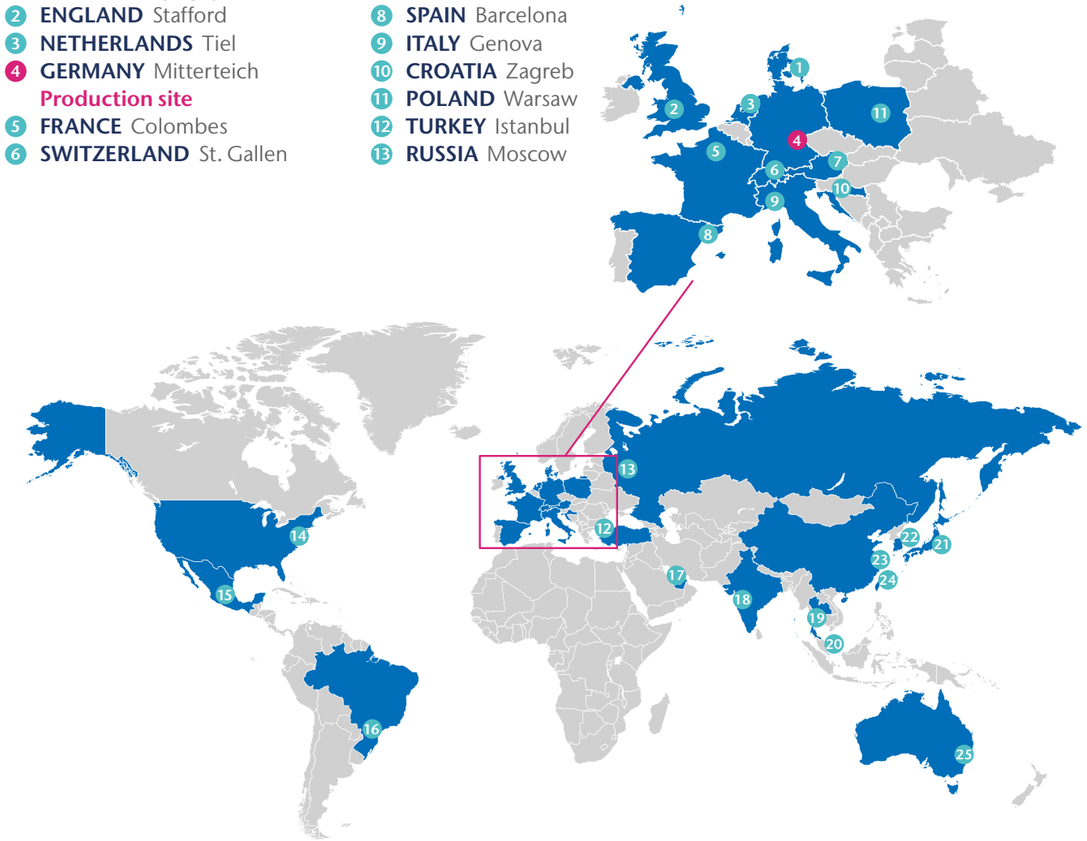
11, 12 Laboratory devices DURAN® tubing for high thermal-shock and corrosion resistance

International and Close to Customers

The Worldwide Sales Office of SCHOTT Technical Tubing

Europe

1. **DENMARK** Lyngby
2. **ENGLAND** Stafford
3. **NETHERLANDS** Tiel
4. **GERMANY** Mitterteich
   Production site
5. **FRANCE** Colombes
6. **SWITZERLAND** St. Gallen
7. **AUSTRIA** Vienna
8. **SPAIN** Barcelona
9. **ITALY** Genova
10. **CROATIA** Zagreb
11. **POLAND** Warsaw
12. **TURKEY** Istanbul
13. **RUSSIA** Moscow



North America

14. **USA** Rye Brook, NY
15. **MEXICO** Mexico City
    also responsible for South America (except Brasil)

South America

16. **BRASIL** São Paulo

Near East

17. **UNITED ARAB. EMIRATES** Dubai

Asia

18. **INDIA** Mumbai
19. **THAILAND** Bangkok
20. **SINGAPORE** Singapore
21. **JAPAN** Tokyo
22. **KOREA** Seoul
23. **CHINA** Shanghai
24. **TAIWAN** Taipei
25. **AUSTRALIA** Frenchs Forest

Technical Glass Tubing Consulting

Glass specialists from SCHOTT Technical Tubing provide support for all issues of production, processing and application of glass tubing, rods, and capillaries. Our qualified experts have in-depth knowledge of glass and its properties and processes. We provide custom-tailored advice and services, from material selection to support for technical feasibility studies, up to product development.

Your benefits

Guidance

Help with choosing the ideal glass for your innovative product idea from a portfolio of over 60 different glass types.

Joint development

We would love to develop the ideal glass components for your project using our experience of processed glass sample analytics.

Technical consulting

Our customers benefit from our competency in materials, product properties and processing.

Know-how

We share our unique expertise with our customers using sample analysis and lectures.

Logistics Services

Standard packaging solutions

Carton

Individual packaging solutions

More custom packaging is available as per individual needs and customer request.

DENSOPACK®

Tight packaging plus shrunk-on foil = effective transport protection

- Up to exterior diameter of 50 mm
- Standard length 1,500 mm
- Can be custom made

Large carton box

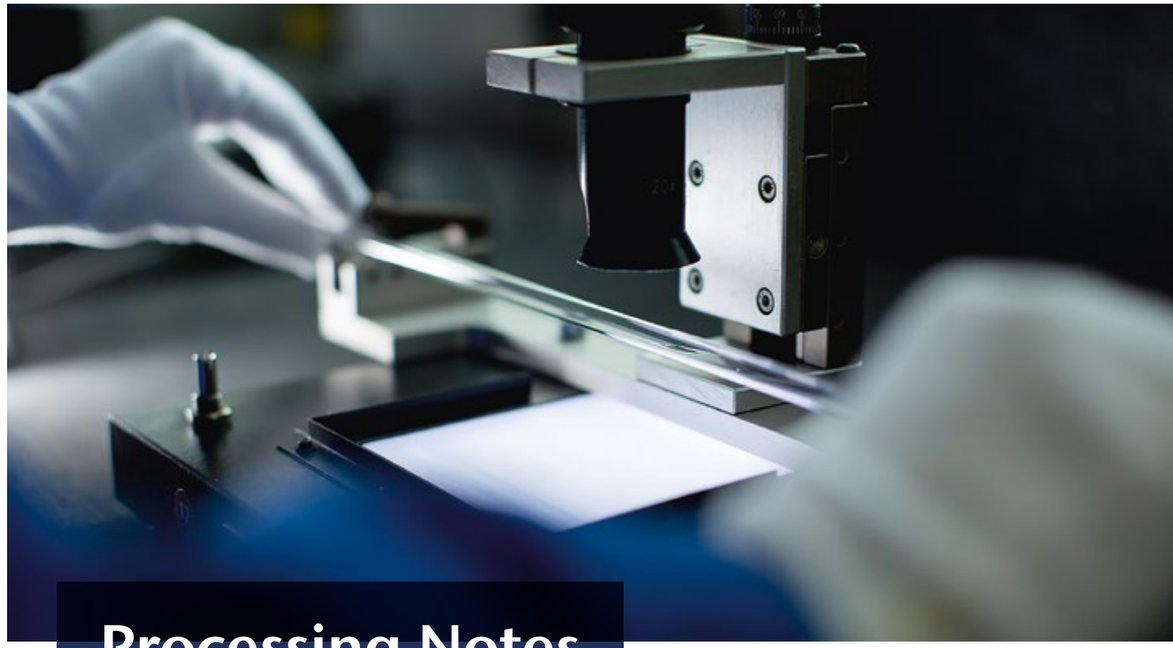
Wooden box

Bulk pallet

Round-the-clock ordering

DURAN® is easily ordered 24/7 and online. Stock lists, price transparency, and anticipated delivery date are only a few of the practical functions. Comprehensive, log-in-protected functions facilitate ordering:
shop.schott.com/tubing

Questions on handling, functions or registration process?
Call +49 (0) 9633/80-100 or contact shop.tubing@schott.com.



Processing Notes

Strength

Glass is a brittle material. Theoretically calculated strength is meaningless in the practical application of glass. The strength of glass is not determined by material property but rather by surface property. The surface of glass always contains microscopic defects. Packaging, transport and especially processing determine strength, because this is when microscopic to macroscopic damage occurs to the surface. The strength of glass components is thus researched experimentally and not theoretically.

Experimental tests of the strength of glass indicate the distribution of failure frequency under certain loads. Statistical assessment of this distribution allows for calculating the probability of fracture. The probability of fracture, in turn, allows for dimensioning of the glass component or assessment of its use for a specific application, if required.

The following theoretical considerations can help in laying out applications or defining operating conditions, yet do not replace practical strength tests when necessary. These must be performed on the final product and are thus the responsibility of the end-product manufacturer.

Processing Notes

Compressive strength of DURAN® borosilicate glass 3.3 tubing

The following formula applies to stress-free tubing and hollow cylindrical bodies with rounded profile, consistent wall thickness and open ends, free of thermal loads under positive interior and negative exterior pressure.

Calculating resistance to pressure (p)

$$p = \frac{WT \cdot 140\ bar}{OD - WT}$$

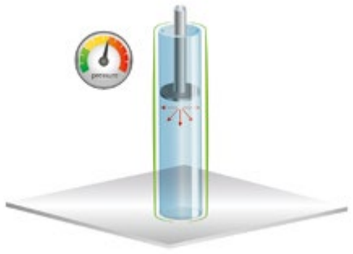
Calculating wall thickness (WT)

$$WT = \frac{OD \cdot p}{140\ bar + p}$$

OD = outside diameter in mm
WT = wall thickness in mm
p = pressure in bar

The formula stems from the AD 2000 specifications N4, Issue 2000-10: pressure vessels of glass with Annex 1, Issue 2000-10: assessment of errors in pressure vessel walls of glass and B1, Issue 2000-10: cylinder and spherical shells under excess interior pressure, whereby approved strain under DIN EN 1595: pressure equipment made from borosilicate glass 3.3 – General rules for design, manufacture and testing of 7N/mm² were established.

Under DIN EN 1595: pressure equipment of borosilicate glass 3.3 – General rules for design, manufacture and testing, DURAN® is an approved material and can be used in the manufacture of pressure equipment.



Thermal-shock resistance

The thermal-shock resistance of glass tubing can be estimated with, for example, a GIT publication (data and process sheets, Process sheet GIT 6 [1962] booklet 12 [Dec.]). Thermal-shock resistance refers to the mechanical resistance of glass tubing against cracking or breaking under extreme thermal shock. The values in this publication are based on theoretical research and practical experience and should show temperature differences which the glass bodies can withstand in practice. Breakage is thereby not expected until temperature differences are 1.2 to 2 times higher.

Processing Notes

The table below gives two maximum temperature differences each for some dimensions. The publication for glass tubing distinguishes between two types of temperature change.
1. Temperature change to the tubing occurs only from the outside, without direct influence on the interior atmosphere.
2. Temperature change occurs simultaneously from the outside and on the inside of the tubing. This case is less critical and represents the higher value of the table.

Tubing	Rod
OD 50.5 / WT 5.00 mm: 100 / 140 °C	OD 24.0 mm: 75 °C
OD 133.0 / WT 7.00 mm: 90 / 120 °C	
OD 120.0 / WT 8.00 mm: 85 / 110 °C	

The thermal-shock resistance of tubing, capillaries and rods depends on wall thickness, shape and size of the quenched surface, surface condition, existing stresses and end finish. It is recommended not to exceed a temperature difference of 120 °C.

Stress-free cooling

To remove temporary stresses arising from processing, glass is heated to a maximum of 550 °C and kept at this temperature for no more than 30 minutes; for lower thickness a fraction of this time is normally needed. For subsequent cooling the following table contains standard values for recommended cooling rate:

Wall thickness	Temperature range		
in mm	550 to 480 °C	480 to 400 °C	400 to 20 °C
3	~ 12 °C / min	~ 24 °C / min	to ~ 480 °C / min
6	~ 3 °C / min	~ 6 °C / min	to ~ 120 °C / min
12	~ 0.8 °C / min	~ 1.6 °C / min	to ~ 32 °C / min

If an item needs to be cooled several times, the sum of all relaxation times at 550 °C should not exceed two hours.

Standard Product Range

Tubing

Outside diameter		Wall thickness		Tube weight Length approx. 1,500 mm	Carton contents		Pallet load	
mm		mm		g	Number of tubes	Weight approx. kg	Number of cartons	Weight approx. kg
3	± 0.13	**0.7**	± 0.03	17	941	16.0	27	432.0
4	± 0.13	**0.8**	± 0.03	27	555	15.0	36	540.0
5	± 0.13	**0.8**	± 0.03	35	343	12.0	45	540.0
6	± 0.13	**1.0** **1.5**	± 0.04 ± 0.07	53 71	245 211	13.0 15.0	36 36	468.0 540.0
7	± 0.13	**1.0** **1.5**	± 0.04 ± 0.07	63 87	190 172	12.0 15.0	45 36	540.0 540.0
8	± 0.13	**1.0** **1.5**	± 0.04 ± 0.07	74 102	149 147	11.0 15.0	45 36	495.0 540.0
9	± 0.13	**1.0** **1.5**	± 0.04 ± 0.07	84 118	119 119	10.0 14.0	45 36	450.0 504.0
10	± 0.13	**1.0** **1.5** **2.2**	± 0.04 ± 0.07 ± 0.11	95 134 180	95 90 56	9.0 12.0 10.0	45 45 45	405.0 540.0 450.0
11	± 0.16	**1.0** **1.5** **2.2**	± 0.04 ± 0.07 ± 0.11	105 150 203	86 73 42	9.0 11.0 8.5	45 45 45	405.0 495.0 382.5
12	± 0.16	**1.0** **1.5** **2.2**	± 0.04 ± 0.07 ± 0.11	116 165 226	130 67 42	15.0 11.0 9.5	35 45 45	525.0 495.0 427.5
13	± 0.16	**1.0** **1.5** **2.2**	± 0.04 ± 0.07 ± 0.11	126 181 250	119 55 36	15.0 10.0 9.0	35 45 45	525.0 450.0 405.0
14	± 0.16	**1.0** **1.5** **2.2**	± 0.04 ± 0.07 ± 0.11	137 197 273	110 46 30	15.0 9.0 8.2	35 45 45	525.0 405.0 369.0
15	± 0.16	**1.2** **1.8** **2.5**	± 0.05 ± 0.08 ± 0.12	174 250 328	86 56 25	15.0 14.0 8.2	35 35 45	525.0 490.0 369.0
16	± 0.16	**1.2** **1.8** **2.5**	± 0.05 ± 0.08 ± 0.12	187 268 354	81 49 25	15.0 13.1 8.8	35 35 45	525.0 458.5 396.0

Tubing

Outside diameter		Wall thickness		Tube weight Length approx. 1,500 mm	Carton contents		Pallet load	
mm		mm		g	Number of tubes	Weight approx. kg	Number of cartons	Weight approx. kg
17	± 0.16	**1.2**	± 0.05	199	75	15.0	35	525.0
		1.8	± 0.08	287	49	14.0	35	490.0
		2.5	± 0.12	381	25	9.5	45	427.5
18	± 0.16	**1.2**	± 0.05	212	66	14.0	35	490.0
		1.8	± 0.08	306	49	15.0	35	525.0
		2.5	± 0.12	407	20	8.1	45	364.5
19	± 0.16	**1.2**	± 0.05	224	63	14.0	35	490.0
		1.8	± 0.08	325	42	13.7	35	479.5
		2.5	± 0.12	433	36	15.6	35	546.0
20	± 0.23	**1.2**	± 0.05	237	55	13.0	35	455.0
		1.8	± 0.08	344	36	12.4	35	434.0
		2.5	± 0.12	460	20	9.2	45	414.0
22	± 0.23	**1.2**	± 0.05	262	42	11.0	35	385.0
		1.8	± 0.08	382	30	11.5	35	402.5
		2.5	± 0.12	512	30	15.4	35	539.0
24	± 0.23	**1.2**	± 0.05	287	36	10.3	35	360.5
		1.8	± 0.08	420	25	10.5	35	367.5
		2.5	± 0.12	565	25	14.0	45	490.0
26	± 0.24	**1.4**	± 0.05	362	30	10.9	35	381.5
		2.0	± 0.09	504	25	12.6	35	441.0
		2.8	± 0.14	682	20	13.6	35	476.0
28	± 0.24	**1.4**	± 0.05	391	25	9.8	35	343.0
		2.0	± 0.09	546	20	11.0	35	385.0
		2.8	± 0.14	741	20	14.8	35	518.0
30	± 0.30	**1.4**	± 0.07	421	36	15.2	20	304.0
		2.0	± 0.09	588	16	9.4	35	329.0
		2.8	± 0.14	800	16	12.8	35	448.0
32	± 0.30	**1.4**	± 0.07	450	25	11.3	20	226.0
		2.0	± 0.09	630	16	10.1	35	353.5
		2.8	± 0.14	859	16	13.8	35	483.0
33	± 0.30	**2.0**	± 0.09	651	25	16.2	20	324.0
34	± 0.30	**1.4**	± 0.07	479	25	12.1	20	242.0
		2.0	± 0.09	672	16	10.8	35	378.0
		2.8	± 0.14	918	16	14.8	35	518.0

Standard Product Range

Tubing

Outside diameter		Wall thickness		Tube weight Length approx. 1,500 mm	Carton contents		Pallet load	
mm		mm		g	Number of tubes	Weight approx. kg	Number of cartons	Weight approx. kg
36	± 0.35	**1.4**	± 0.07	509	25	12.6	20	252.0
		2.0	± 0.09	714	25	18.0	20	360.0
		2.8	± 0.14	976	12	11.7	35	409.5
38	± 0.35	**1.4**	± 0.07	538	20	10.8	20	216.0
		2.0	± 0.09	756	20	15.0	20	300.0
		2.8	± 0.14	1 035	9	9.4	35	329.0
40	± 0.50	**1.6**	± 0.08	645	16	10.2	20	204.0
		2.3	± 0.11	911	16	14.6	20	292.0
		3.2	± 0.18	1 237	9	11.2	35	392.0
		5.0	± 0.30	1 838	9	16.5	28	462.0
42	± 0.50	**1.6**	± 0.08	679	16	10.9	20	218.0
		2.3	± 0.11	959	16	15.3	20	306.0
		3.2	± 0.18	1 304	9	11.7	35	409.5
44	± 0.50	**1.6**	± 0.08	713	16	11.4	20	228.0
		2.3	± 0.11	1 007	16	16.0	20	320.0
		3.2	± 0.18	1 371	9	12.4	35	434.0
45	± 0.60	**5.0**	± 0.30	2 101	9	18.9	28	529.2
46	± 0.60	**1.6**	± 0.08	746	16	11.9	20	238.0
		2.3	± 0.11	1 056	9	9.5	35	332.5
		3.2	± 0.18	1 439	9	13.0	35	455.0
48	± 0.60	**1.6**	± 0.08	780	16	12.4	20	248.0
		2.3	± 0.11	1 104	16	17.6	20	352.0
		3.2	± 0.18	1 506	6	9.0	35	315.0
50	± 0.65	**1.8**	± 0.11	911	12	10.9	20	218.0
		2.5	± 0.14	1 247	12	15.0	20	300.0
		3.5	± 0.22	1 709	12	20.5	20	410.0
		5.0	± 0.30	2 363	6	14.1	35	493.5
		7.0	± 0.45	3 161	6	19.0	28	532.0
		9.0	± 0.60	3 876	6	23.2	21	487.2
52	± 0.65	**1.8**	± 0.11	949	9	8.5	20	170.0
		2.5	± 0.14	1 300	9	11.7	20	234.0
		3.5	± 0.22	1 783	9	16.0	20	320.0
54	± 0.65	**1.8**	± 0.11	987	9	8.9	20	178.0
		2.5	± 0.14	1 352	9	12.2	20	244.0
		3.5	± 0.22	1 856	9	16.7	20	334.0
55	± 0.65	**5.0**	± 0.30	2 626	4	10.5	35	367.5

Tubing

Outside diameter	Wall thickness	Tube weight Length approx. 1,500 mm	Carton contents		Pallet load	
mm	mm	g	Number of tubes	Weight approx. kg	Number of cartons	Weight approx. kg
56 ± 0.65	**1.8** ± 0.11	1 025	9	9.2	20	184.0
	2.5 ± 0.14	1 405	9	12.6	20	252.0
	3.5 ± 0.22	1 930	9	17.5	20	350.0
58 ± 0.65	**1.8** ± 0.11	1 063	9	9.6	20	192.0
	2.5 ± 0.14	1 457	9	13.1	20	262.0
	3.5 ± 0.22	2 004	9	18.0	20	360.0
60 ± 0.75	**2.2** ± 0.16	1 336	9	12.0	20	240.0
	3.2 ± 0.18	1 910	9	17.2	20	344.0
	4.2 ± 0.25	2 462	4	9.8	35	343.0
	5.0 ± 0.30	2 888	4	11.5	35	402.5
	7.0 ± 0.45	3 897	4	15.6	35	546.0
	9.0 ± 0.60	4 821	4	19.3	28	540.4
65 ± 0.75	**2.2** ± 0.16	1 451	8	11.7	20	234.0
	3.2 ± 0.18	2 077	4	8.3	35	290.5
	4.2 ± 0.25	2 682	4	10.7	35	374.5
	5.0 ± 0.30	3 151	4	12.6	35	441.0
70 ± 0.85	**2.2** ± 0.16	1 567	8	12.5	15	187.5
	3.2 ± 0.18	2 245	4	9.0	35	315.0
	4.2 ± 0.25	2 903	4	11.6	35	406.0
	5.0 ± 0.30	3 414	4	13.6	35	476.0
	7.0 ± 0.45	4 632	4	18.5	35	647.5
	9.0 ± 0.60	5 766	4	23.1	21	485.1
75 ± 0.85	**2.2** ± 0.16	1 682	8	13.5	15	202.5
	3.2 ± 0.18	2 413	4	9.7	20	194.0
	4.2 ± 0.25	3 123	4	12.5	20	250.0
	5.0 ± 0.30	3 676	4	14.7	20	294.0
80 ± 1.10	**2.5** ± 0.16	2 035	4	8.2	20	164.0
	3.5 ± 0.22	2 812	4	11.3	20	226.0
	5.0 ± 0.35	3 939	4	15.8	20	316.0
	9.0 ± 0.65	6 712	4	26.8	20	536.0
85 ± 1.10	**2.5** ± 0.16	2 166	4	8.7	20	174.0
	3.5 ± 0.22	2 996	4	12.0	20	240.0
	5.0 ± 0.35	4 201	4	16.8	20	336.0

Standard Product Range

Tubing

Outside diameter	Wall thickness	Tube weight Length approx. 1,500 mm	Carton contents		Pallet load	
mm	mm	g	Number of tubes	Weight approx. kg	Number of cartons	Weight approx. kg
90 ± 1.10	**2.5** ± 0.16	2 298	4	9.2	20	184.0
	3.5 ± 0.22	3 180	4	12.7	20	254.0
	5.0 ± 0.35	4 464	4	17.9	20	358.0
	7.0 ± 0.45	6 102	3	18.3	15	274.5
	9.0 ± 0.65	7 657	3	23.0	15	345.0
95 ± 1.30	**2.5** ± 0.16	2 429	4	9.7	20	194.0
	3.5 ± 0.22	3 364	4	13.4	20	268.0
	5.0 ± 0.35	4 726	4	18.9	20	378.0
100 ± 1.30	**2.5** ± 0.16	2 560	4	10.3	20	206.0
	3.0 ± 0.18	3 056	4	12.1	9	108.9
	3.5 ± 0.22	3 547	3	10.7	12	128.4
	5.0 ± 0.35	4 989	3	15.0	12	180.0
	7.0 ± 0.45	6 838	3	20.5	12	246.0
	9.0 ± 0.65	8 602	3	25.8	12	309.6
105 ± 1.40	**3.0** ± 0.18	3 214	3	9.6	12	115.2
	5.0 ± 0.40	5 252	3	15.8	12	189.6
110 ± 1.40	**3.0** ± 0.25	3 372	3	10.1	12	121.2
	5.0 ± 0.45	5 514	3	16.5	12	198.0
	7.0 ± 0.60	7 573	3	22.7	12	272.4
115 ± 1.40	**3.0** ± 0.25	3 529	4	14.1	9	126.9
	5.0 ± 0.45	5 777	2	11.6	15	174.0
	7.0 ± 0.60	7 940	2	15.9	15	238.5
120 ± 1.40	**3.0** ± 0.25	3 687	4	14.7	9	132.3
	5.0 ± 0.45	6 039	2	12.1	15	181.5
	7.0 ± 0.60	8 308	2	16.6	15	249.0
	9.0 ± 0.80	10 493	2	21.0	15	315.0
125 ± 1.40	**5.0** ± 0.45	6 302	2	12.6	15	189.0
	9.0 ± 0.80	10 965	2	21.9	15	328.5
130 ± 1.50	**3.0** ± 0.25	4 002	4	16.0	9	144.0
	5.0 ± 0.45	6 565	2	13.1	15	196.5
	7.0 ± 0.60	9 043	2	18.1	15	271.5
	9.0 ± 0.80	11 438	2	22.9	15	343.5
135 ± 1.50	**5.0** ± 0.45	6 827	2	13.7	15	205.5
	7.0 ± 0.60	9 411	2	18.8	15	282.0
140 ± 1.60	**3.0** ± 0.25	4 317	4	17.3	9	155.7
	5.0 ± 0.45	7 090	2	14.2	15	213.0
	7.0 ± 0.60	9 779	2	19.6	15	294.0

Standard Product Range

Tubing

Outside diameter mm		Wall thickness mm		Tube weight Length approx. 1,500 mm g	Carton contents Number of tubes	Carton contents Weight approx. kg	Pallet load Number of cartons	Pallet load Weight approx. kg
145	± 1.60	**5.0**	± 0.45	7 352	2	14.7	15	220.5
150	± 1.70	**3.0**	± 0.25	4 632	2	9.3	12	111.6
		5.0	± 0.45	7 615	2	15.2	12	182.4
		7.0	± 0.60	10 514	2	21.0	12	252.0
		9.0	± 0.80	13 329	2	26.7	12	320.4
155	± 1.75	**5.0**	± 0.45	7 877	2	15.8	12	189.6
160	± 1.75	**5.0**	± 0.45	8 140	2	16.3	12	195.6
		7.0	± 0.70	11 249	2	22.5	12	270.0
165	± 1.75	**5.0**	± 0.45	8 403	2	16.8	12	201.6
		7.0	± 0.70	11 617	2	23.2	12	278.4
170	± 1.75	**5.0**	± 0.45	8 665	2	17.3	12	207.6
		7.0	± 0.70	11 984	2	24.0	12	288.0
		9.0	± 0.90	15 219	1	15.2	20	304.0
180	± 1.95	**5.0**	± 0.45	9 190	1	9.2	20	184.0
		7.0	± 0.70	12 720	1	12.7	20	254.0
		9.0	± 0.90	16 165	1	16.2	20	324.0
190	± 2.05	**5.0**	± 0.45	9 716	1	9.7	20	194.0
		7.0	± 0.70	13 455	1	13.5	20	270.0
200	± 2.30	**5.0**	± 0.70	10 241	1	10.2	20	204.0
		7.0	± 0.80	14 190	1	14.2	20	284.0
		9.0	± 1.00	18 055	1	18.1	20	362.0
215	± 2.40	**5.0**	± 0.70	11 029	1	11.0	9	99.0
		7.0	± 0.80	15 293	1	15.3	9	137.7
		9.0	± 1.00	19 473	1	19.5	9	175.5
225	± 2.60	**7.0**	± 0.80	16 028	1	16.0	9	144.0
		9.0	± 1.10	20 418	1	20.4	9	183.6
240	± 2.80	**9.0**	± 1.10	21 836	1	21.8	9	196.2
250	± 2.90	**5.0**	± 0.70	12 867	1	12.9	9	116.1
		7.0	± 0.90	17 866	1	17.9	9	161.1
		9.0	± 1.10	22 782	1	22.8	9	205.2
270	± 2.90	**5.0**	± 0.70	13 917	1	13.9	9	125.1
		7.0	± 0.90	19 337	1	19.3	9	173.7
		9.0	± 1.10	24 672	1	24.7	9	222.3

Standard Product Range

Tubing

Outside diameter mm		Wall thickness mm		Tube weight Length approx. 1,500 mm g	Carton contents Number of tubes	Carton contents Weight approx. kg	Pallet load Number of cartons	Pallet load Weight approx. kg
300	± 3.70	**5.0**	± 0.70	15 492	1	15.5	9	139.5
		7.0	± 1.10	21 542	1	21.5	9	193.5
		9.0	± 1.40	27 508	1	27.5	9	247.5
315	± 3.80	**7.0**	± 1.10	22 645	1	22.6	9	203.4
		9.0	± 1.40	28 926	1	28.9	9	260.1
325	± 4.00	**9.0**	± 1.40	29 871	1	29.9	4	119.6
		10.0	± 1.40	33 085	1	33.0	9	297.0
350	± 4.00	**5.0**	± 0.80	18 118	1	18.1	4	72.4
365	± 4.50	**7.0**	± 1.40	26 321	1	26.3	4	105.2
400	± 5.00	**6.0**	± 1.50	24 829	1	24.8	4	99.2
415	± 5.00	**7.0**	± 1.50	29 997	1	30.0	4	120.0
420	± 5.00	**9.5**	± 1.50	40 960	1	41.0	4	164.0
430	± 5.00	**6.0**	± 1.00	26 720	1	26.7	4	106.8
440	± 5.00	**7.0**	± 1.00	31 836	1	31.8	4	127.2
450	± 5.00	**7.0**	± 1.00	32 571	1	32.6	4	130.4
		8.0	± 1.00	37 140	1	37.1	4	148.4
460	± 5.50	**8.5**	± 1.20	40 309	1	40.3	4	161.2
465	± 6.00	**7.0**	± 1.00	33 674	1	33.7	4	134.8

Standard length: approx. 1,500 mm

Standard Product Range

Rods

Diameter mm		Rod weight Length approx. 1,500 mm g	Carton contents Number of rods	Carton contents Weight approx. kg	Pallet load Number of boxes	Pallet load Weight approx. kg
3	± 0.13	24	529	12.5	44	550.0
4	± 0.13	42	298	12.5	44	550.0
5	± 0.13	66	183	12.0	44	528.0
6	± 0.13	95	140	13.2	44	580.8
7	± 0.13	129	98	12.6	44	554.4
8	± 0.18	168	80	13.4	44	589.6
9	± 0.18	213	63	13.4	44	589.6
10	± 0.18	263	45	11.8	44	519.2
12	± 0.18	378	35	13.2	44	580.8
14	± 0.26	515	24	12.4	44	545.6
16	± 0.26	672	20	13.4	36	482.4
18	± 0.36	851	20	17.0	27	459.0
20	± 0.36	1 050	16	16.8	27	453.6
22	± 0.40	1 271	12	15.3	36	550.8
24	± 0.40	1 512	12	18.2	27	491.4
26	± 0.50	1 775	9	16.0	27	432.0
28	± 0.70	2 059	9	18.5	27	499.5
30	± 0.70	2 363	6	14.2	36	511.2

Standard length: approx. 1,500 mm

Standard Product Range

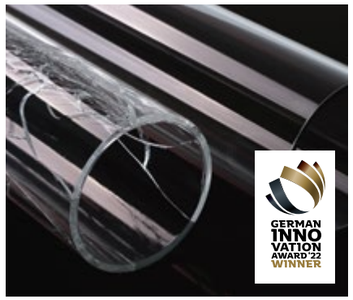
Capillaries

Outside diameter mm		Inside diameter mm		Tube weight Length approx. 1,500 mm g	Carton contents Number of tubes	Carton contents Weight approx. kg
4	± 0.16	**0.8**	± 0.08	40	250	10.0
5	± 0.16	**0.4**	± 0.08	65	154	10.0
		0.6	± 0.08	65	154	10.0
		0.8	± 0.08	64	156	10.0
		1.2	± 0.08	62	161	10.0
6	± 0.16	**0.4**	± 0.08	94	104	10.0
		0.8	± 0.08	93	108	10.0
		1.2	± 0.08	91	110	10.0
		1.7	± 0.10	87	115	10.0
		2.2	± 0.10	82	122	10.0
		2.7	± 0.10	75	133	10.0
7	± 0.18	**0.8**	± 0.08	127	79	10.0
		1.2	± 0.08	125	80	10.0
		1.7	± 0.10	121	83	10.0
		2.2	± 0.10	116	86	10.0
		2.7	± 0.10	110	91	10.0
		3.0	± 0.10	105	95	10.0
8	± 0.18	**0.8**	± 0.08	166	60	10.0
		1.2	± 0.08	164	61	10.0
		1.7	± 0.10	160	62	10.0
		2.2	± 0.10	155	64	10.0
		2.7	± 0.10	149	67	10.0
		3.0	± 0.10	144	69	10.0
9	± 0.18	**0.8**	± 0.08	211	47	10.0
		1.2	± 0.08	209	48	10.0
		1.7	± 0.10	205	49	10.0
		2.2	± 0.10	200	50	10.0
		2.7	± 0.10	194	52	10.0
		3.0	± 0.10	189	53	10.0

Pallet loading capillaries:
number of cartons: 55
weight: approx. 550.0 kg

Standard length: approx. 1,500 mm

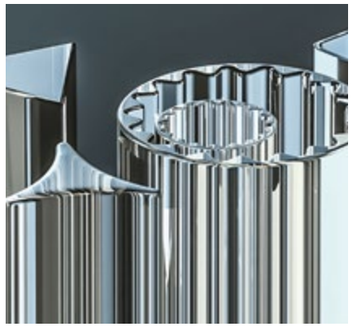
Related Products



DURAN® Tough and CONTURAX® Tough

With its “Tough” product line, SCHOTT offers a coated glass tube for sophisticated exterior and interior design applications. The polymer coating on the inner surface ensures that the glass tube maintains its form and integrity in the event of breakage. Neither the high transparency nor the visual quality of the glass tube is negatively effected by the coating which makes it the ideal choice for architectural and industrial design.

Find out more about DURAN® Tough and CONTURAX® Tough at schott.com/duran-tough and schott.com/conturax-tough.



CONTURAX® and CONTURAX® Pro

DURAN® tubing and rods with cross-sections that have not been rounded but rather contoured are distributed under the brand names CONTURAX® and CONTURAX® Pro. The chemical and physical glass properties of these products are identical to those of DURAN®. With CONTURAX® and CONTURAX® Pro, SCHOTT offers a comprehensive variety of shapes. We will be glad to look into the feasibility of your particular product idea and advise you to that effect.

Find out more about CONTURAX® and CONTURAX® Pro at schott.com/conturax-and-conturax-pro.

DURATAN®

The mechanical strength of DURAN® tubing can be noticeably improved by a hardening process. This thermally prestressed (hardened) DURAN® is distributed under the brand name DURATAN®. The typical chemical and physical features of DURAN® are entirely maintained. We will gladly provide information on standards and assess the ability to harden the dimensions you request.

Find out more about DURATAN® at schott.com/duratan.

BOROFLOAT® 33

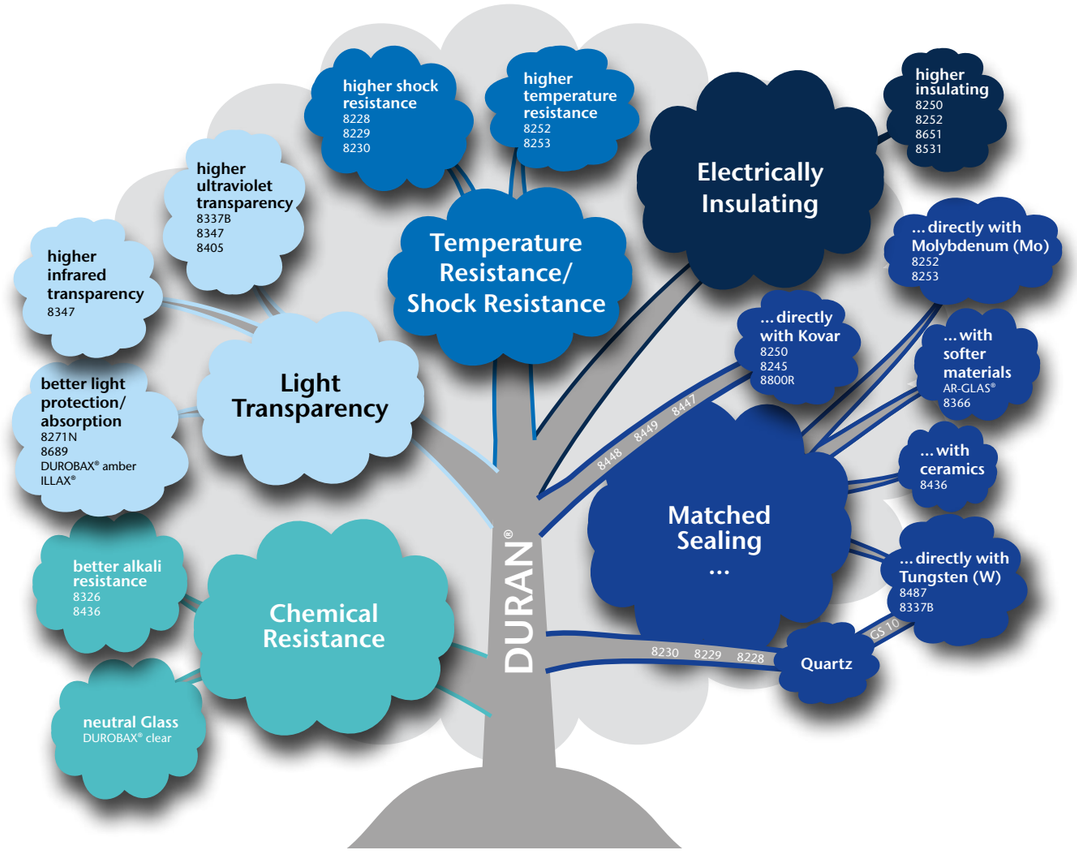
For applications which require the flat-glass features of DURAN®, SCHOTT BOROFLOAT® 33 provides the first floated borosilicate flat glass in the world. Its planarity and one-of-a-kind quality, as well as outstanding thermal, optical, chemical and mechanical characteristics, are impressive.

Find out more about BOROFLOAT® 33 at schott.com/borofloat.

Other Glass Types

for Technical Applications

DURAN® is a very versatile glass. In addition to its chemical resistance, transparency, high thermal endurance and high electric and dielectric insulating features, it can also be fused with metals, for example, by using intermediate glasses. Yet these basic features are not always sufficient for specific demands. For such cases, the SCHOTT portfolio of technical tubing includes specialty glasses which surpass and expand upon certain DURAN® features. The “glass tree” below illustrates these specialty glass types, arranged by their distinguishing features.



Are you interested in the technical data of a specialty glass in our portfolio? Your contact person will be glad to guide you.

Appendix

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