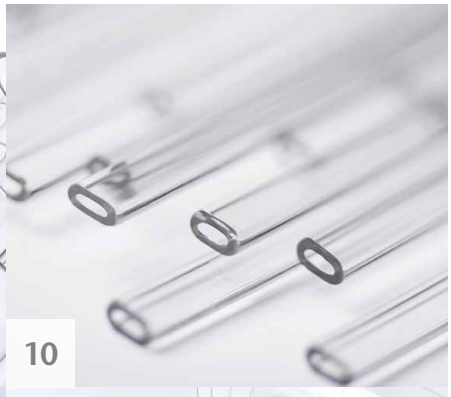
SCHOTT
glass made of ideas

Glass Tubing for industrial and technical applications

SCHOTT is a leading international technology group in the areas of specialty glass and glass-ceramics. With more than 130 years of outstanding development, materials and technology expertise we offer a broad portfolio of high-quality products and intelligent solutions that contribute to our customers' success.

With a production capacity of more than 140,000 tons and production sites in Europe, South America and Asia, SCHOTT's business unit Tubing is one of the world's leading manufacturers of glass tubes, rods and profiles. Approximately 60 glass types are produced in large external diameters and a variety of lengths based on site overlapping strategies in development, production and quality assurance. SCHOTT Tubing provides customised products and services for international growth markets such as pharmaceuticals and electronics as well as industrial and environmental engineering.

Title:
DURAN® and CONTURAX® Pro glass tubes



Contents

Why glass?
Outstanding properties in the spotlight

Glass is a remarkable material – discover its versatile features.

Transparency	Glass materials that have high transparency in various ranges of the electromagnetic spectrum as well as filter properties to block parts of the spectrum. For example ILLAX®, it is an amber glass that blocks UV and blue light (to store sensitive materials such as glue) or glass 8337B which is a clear glass with transparency far into the UV-C range (for UV-lamps)
Chemical resistance	Glass types for high resistance in corrosive environments, including DURAN® and DUROBAX® fulfil the requirements of labware in chemical laboratories and the pharmaceutical industry, respectively
Temperature resistance	Nonflammable and high temperature resistance materials such as glass 8487 used in high performance flash lamps or glass 8253 in halogen lamps
Electrically insulating	Highly electrically insulating glass types such as glass 8250 are used for example in medical imaging devices where high voltage is used to generate X-rays
Thermal expansion	Glass as a sealing partner for hermetic seals with metals, alloys and ceramics, for example glass 8253 to directly seal an electrode into a halogen lamp bulb
Impermeability	Glass is very well suited to seal and contain a vacuum (or special gas mixtures such as in a halogen lamp). It is especially strong as a glass to metal seal when used to hermetically link to different materials such as in solar receiver tubes.
Refractive index	Wide range of refractive indices to choose from, important for fibre optics
Dielectric strength	High shielding properties such as glass 8651 used for encapsulation of semiconductor materials
Mechanical properties	Glass is brittle, this may sound like a disadvantage, but we put this to good use. Whether it's the option to be able to break glass (e.g. sprinkler) or the challenge of producing especially durable glass: We provide individual solutions for a wide range of challenges

Why tubing?
High-tech for your ideas

Your value is the empty space inside our tube. You decide if the tube has to be invisible or a light filter, if it should be durable (thermally and mechanically) or breakable and if it has to work as a spacer, transition or insulating material. The function is only limited by your creativity.

- Outstanding optical clarity among hollow glasses for an undisturbed view due to the free forming process for tube glass
- High strength against pressure and impacts given by the tube shape
- Facile automated processing using the rotational symmetry of the tube
- Maximised easy-to-clean properties of glass by tube geometry that has no edges
- Compact design by minimized surface area
- Maximum suitability for machine processing and light weight design due to reliable homogeneity of material thickness by SCHOTTs characteristic high geometric precision
- Precise inner tube volume due to reliable and precise inner tube dimensions

Precision makes the difference

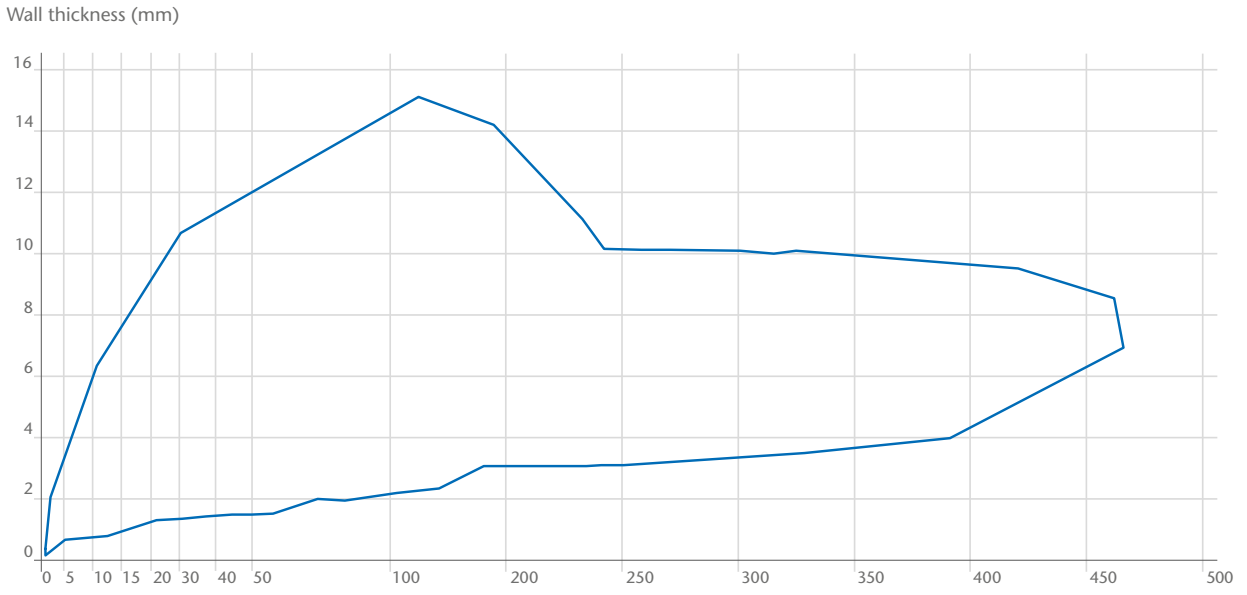
Smooth large scale automated processing of hollow glass tubes into final products is unthinkable without maximum geometrical precision. For that reason precision is one essence of our tubing products.

Long term reliable precise geometry in SCHOTT tubing products is achieved with a self developed machine park of sorting and surveillance equipment for almost all thinkable features a cylindrical geometry can have.

Constant improvement of our processes through our customers' feedback and our own efforts are incremental to our manufacturing, while the strict quality management system ensures that our customers supply is safe and reliable.

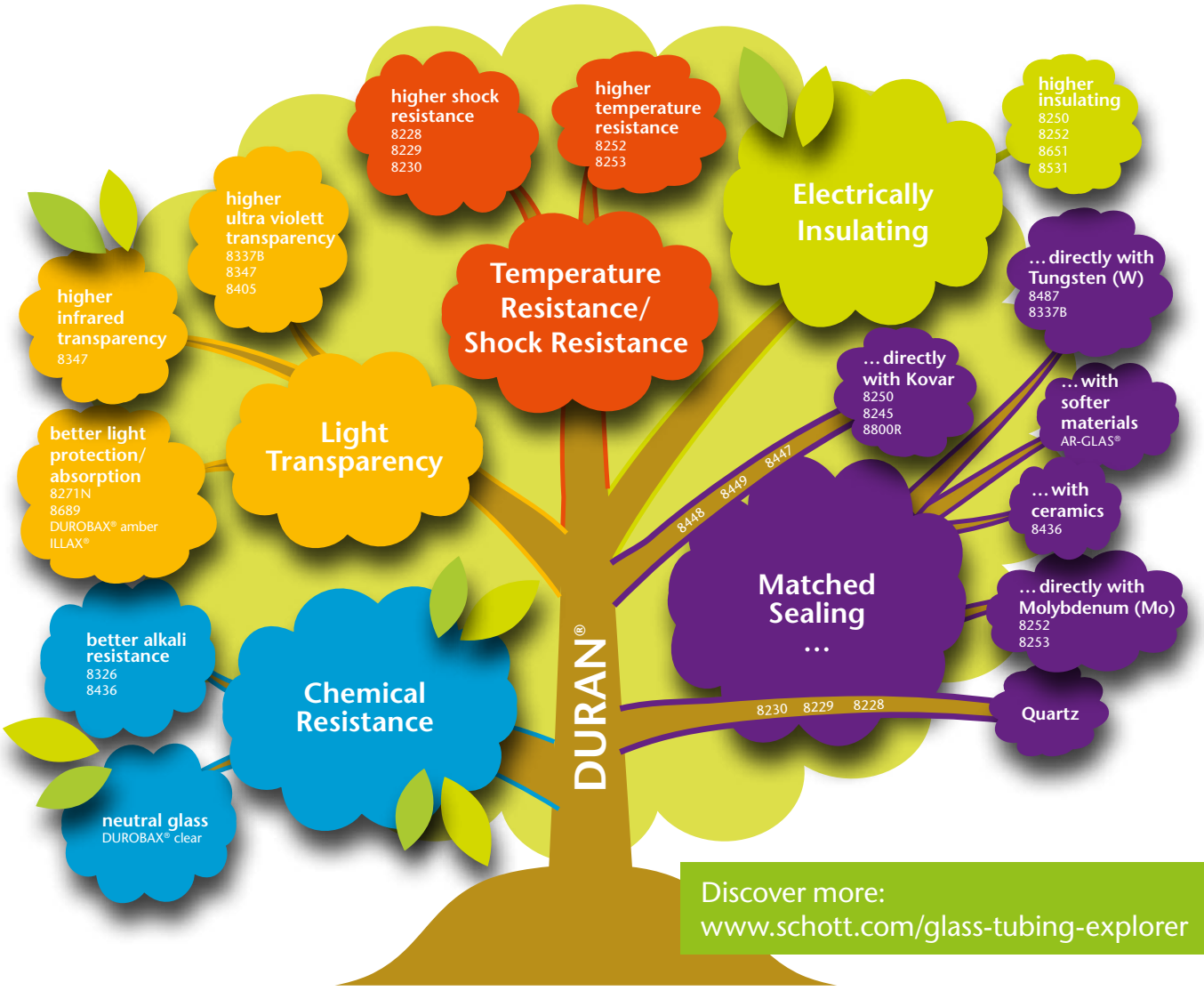
Possible tubing dimensions

The graphics show the range of possible tubing dimensions from the portfolio of glass types.



The Main Technical Tubing Portfolio

SCHOTT Tubing has over 60 glass types, see a selection below.



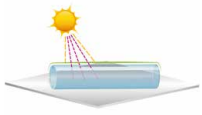
How to find the glass type in the tree

DURAN® forms the trunk of the portfolio tree. Its major properties and strengths are chemical resistance (blue), light transparency (yellow), resistance to high temperatures (red) and insulation (green). The other glass types from the portfolio (cited by a 4 digit material number such as 8250 or a brand name) form a ring around these major properties because they go beyond what DURAN® can offer. For example glass 8253 offers an even higher temperature resistance than DURAN®, while glass 8337B is transparent far into the UV-C range and glass 8250 is designed to match the thermal expansion of the alloy Kovar and can form a direct seal with it.

To seal DURAN® to Kovar the respective transition glass types on the purple branch are necessary as a bridge.

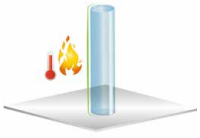
Glass Properties

Chemical Resistance	hydrolytic resistance class	acid resistance class	alkali resistance class	coefficient of mean linear thermal expansion [· $10^{-6}K^{-1}$]
DURAN®	1	1	2	3.3
DUROBAX® clear	1	1	2	4.9 (neutral glass expansion)
8326	1	1	2	6.6
8436	1	2	1	6.6



Light Transparency	ultra violett (UV)	visible range	infrared (IR)
DURAN®	poor	good	good
8337B	very good (T > 80 % at 254 nm - WT 1 mm)	very good	
8347	very good (T > 70 % at 254 nm - WT 1 mm)	very good	very good
8405	good	very good	
8271N	blocked	good	
8689	blocked	good	
DUROBAX® amber	blocked	partly blocked	partly blocked
ILLAX®	blocked	partly blocked	

T = transmission, WT = wall thickness



Temperature Resistance / Shock Resistance	transformation temperature (°C)	coefficient of mean linear thermal expansion
DURAN®	525	3.3
8252	720	4.6
8253	790	4.7
8228	700	1.3
8229	600	2.0
8230	570	2.7

Matched Sealing …	directly with:			
	Kovar	Tungsten (W)	Molybdenum (Mo)	others
8250	x			
8245	x			
8800R	x			
8447	x			
8487		x		
8337B		x		
8252			x	
8253			x	
8436				ceramics
AR-GLAS®				other metals (Platinum, ...)
8228				Quartz
8448				DURAN®
8449				links DURAN® with 8447
8229				links DURAN® with 8228

Electrically Insulating	electric volume resistivity (Ω · cm) (logarithm) at 250 °C	electric volume resistivity (Ω · cm) (logarithm) at 350 °C
DURAN®	8	6.5
8250	10	8.3
8252	–	12
8531	11	9.8
8651	11.2	10

Glass Profiles – CONTURAX® and CONTURAX® Pro

CONTURAX®

CONTURAX® and CONTURAX® Pro

The CONTURAX® line also contains glass rods and tubing with a wide variety of profiles of non-round cross section. The CONTURAX® Pro line contains rectangular glass tubing profiles. Both CONTURAX® and CONTURAX® Pro are made out of high grade borosilicate glass 3.3. Products are available in oval, triangular and many more individually specified shapes, and are manufactured in a patented, continuous and direct drawing process. CONTURAX® and CONTURAX® Pro glass tubing are used in different fields such as wall systems, design objects and lighting applications.

Processed solutions with glass tubing

Manifolds for Photobioreactors

Discs and square forms out of glass 8250 and 8337B

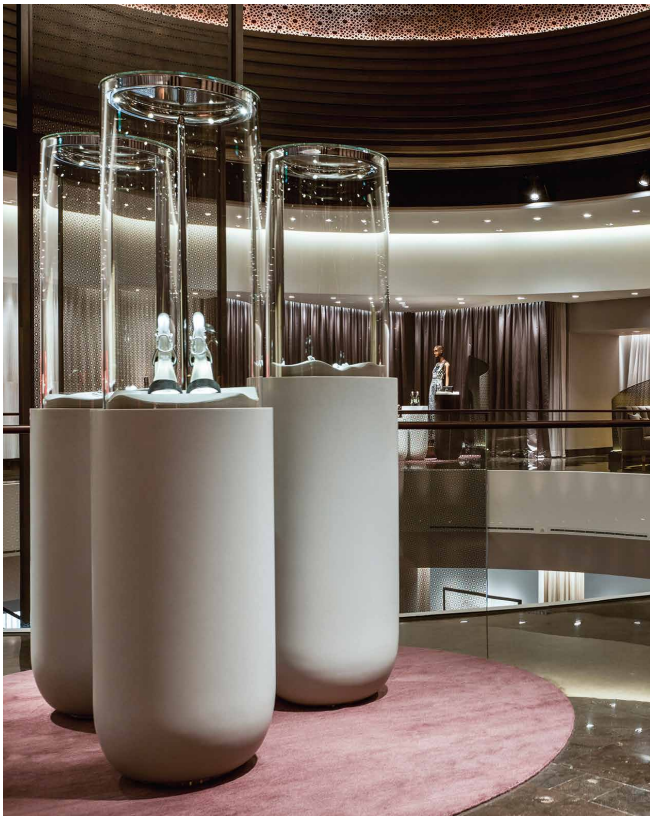
Algae growth in closed tubes

All components from one source for a tubular algae growth reactor plant in established standard dimensions for budgetary installations and fast logistics. Components include manifolds, patented coupling system and bends.
With the development of special DURAN® glass tubing with a thin wall, we enable algae producers to grow microorganisms even more efficiently.

Saw-cut forms

Glass discs from many of our specialty glasses namely glass 8337B (UV transparent) and 8250 (Kovar sealing) for windows applied in industry, electronics and lighting.

Glass Bends



Qela Store, Doha, Qatar
DURATAN®, Image by Adrian Haddad for Qela

Glass Bends – Durable alternative for pneumatic conveying systems

SCHOTT offers high precision glass bends made from optimum quality DURAN® in a wide range of diameters with various bend angles. Resistance free flow is ensured by accurately matching inner diameter of the glass bends to existing conveying systems. The transparency of the glass ensures simple monitoring of the material flowing through.

Glass and coatings

Maximise light by using an anti-reflective (AR) coating on various glass types such as DURAN® tubing. With tunable spectral range for maximum reduction of reflection in the visible or infrared range.
Anti-fingerprint coating can also be applied (in combination with AR coating) for example: showcases in museums or display arrangements in shops.
Enhanced safety properties of glass cylinders based on protective polymer coating.

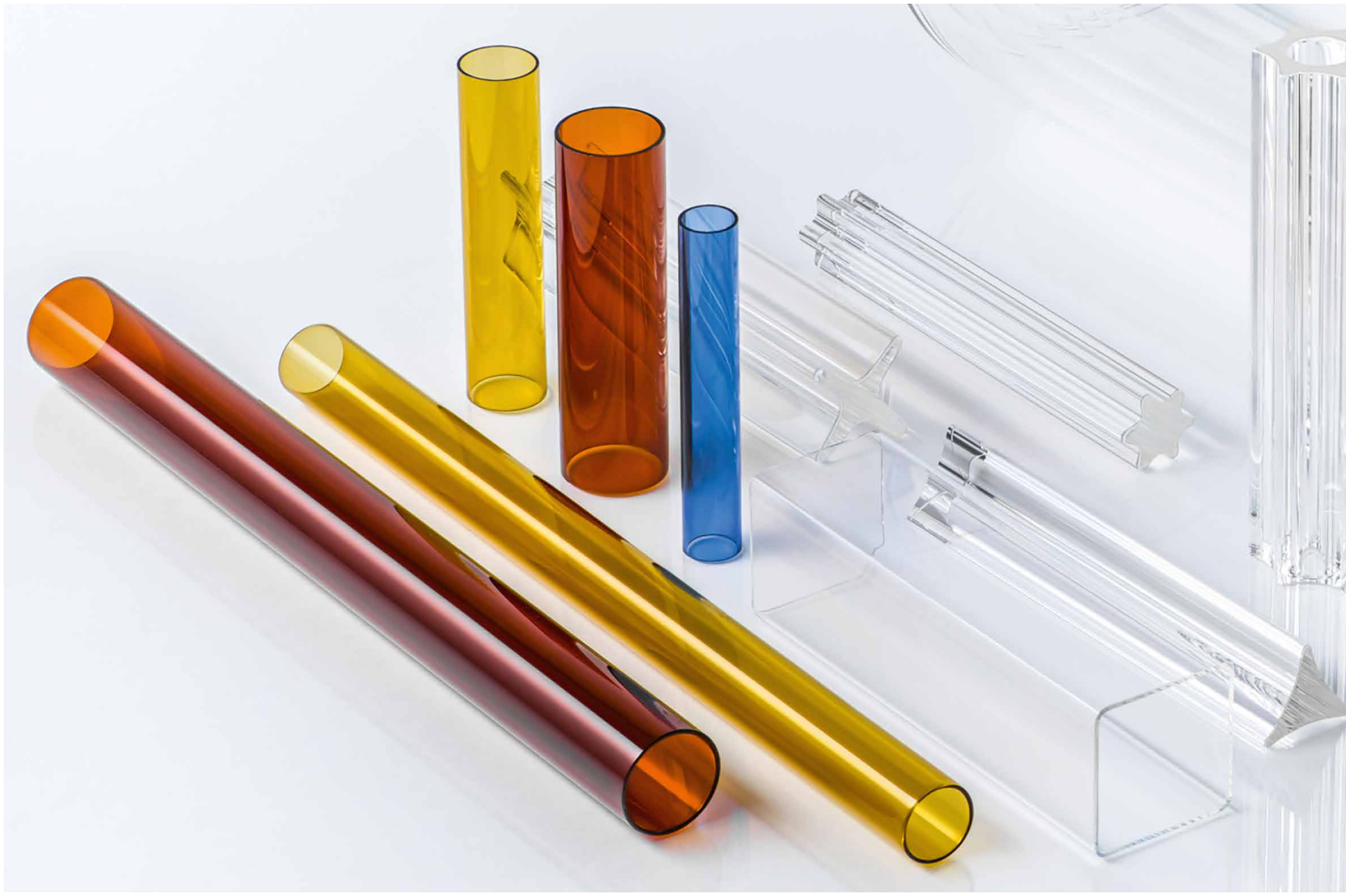
Exceptional expertise and capacity for innovation
Discover glass in all its variety

We have dealt with glass for over 130 years and have never stopped developing it. Nowadays we make it possible for our customers to deliver products that exceed expectations and stoke enthusiasm. The challenges that our customers and markets face drive us to improve existing products and to innovate. Together we can change markets.

Would you like to take on new challenges by further developing your products with our glass materials?
Would you like to develop a new product and wondering whether glass is the appropriate material?

SCHOTT Tubing is your contact for targeted development of existing glass products or for establishing innovative products in new markets. As your sparring partner you reap the benefits of two way exchanges – together we will spawn ideas and solutions to constantly set new standards in scores of industries – often by virtue of small details, and time again with far reaching leaps in innovation.

That's why we will ask you the following question again in the future:
What's your next milestone?



Scientific Services from SCHOTT Tubing
Our Experts in glass

The glass specialists at SCHOTT Tubing will assist you with in depth expertise for queries on production, processing and applying glass tubes and rods. Take advantage of this expert knowledge and don't hesitate to get in touch. Our highly qualified employees have comprehensive know-how of processes and the properties of glass. From material selection and technical feasibility studies to product development - we provide outstanding individual consulting and services.

Technical and scientific consulting

Do you need assistance in material selection or in processing our glass tubes or rods?
Are you seeking material data or would you like to assess unspecified material properties?
Our technical consultants offer you access to the experience and knowledge that has been filled with 130 years of expertise in the development and manufacture of glass. We know the specifications of about 60 types of special glass and we deliver individual, custom tailored recommendations. We respond quickly and reliably to over 500 enquiries a year that we receive.

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