

**DURAN®**  
PRECISION BORE TUBING



**DURAN®**  
INDUSTRIAL GLASS



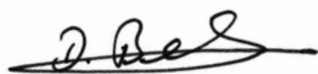
Precision is our standard.

## WELCOME TO DURAN® INDUSTRIAL GLASS

Thank you for your interest in speciality glass. With a skilled workforce of more than 650 at our sites in Mainz and Wertheim in Germany and Pula in Croatia, and over 100 years of experience of working with borosilicate glass 3.3, you will find us the perfect partner for your exacting requirements.

We would welcome the opportunity to discuss your particular application in detail, work with you to find possible solutions and deliver convincing results.

This product catalogue gives you an overview of our range of DURAN® precision bore glass tubing products and services. If you would like further information, our glass specialists will be happy to discuss the numerous applications and properties of this speciality material with you in person.



Detlef Below  
Sales Director Industrial Glass Products

### EXCELLENCE IN YOUR HANDS

In June 2017 the companies DURAN Group, Wheaton Industries and Kimble Chase merged to form a new global company – DWK Life Sciences.

DWK Life Sciences combines the expertise of the acclaimed product brands DURAN®, WHEATON® and KIMBLE® and is one of the world's leading manufacturers of premium lab glass.

**Find out more: [www.DWK-LifeSciences.com](http://www.DWK-LifeSciences.com)**



## PRECISION BORE TUBING FROM DURAN®

### An understanding of glass and a passion for precision.

DURAN® precision bore tubing is characterised by its outstanding chemical and physical properties. Minimal thermal expansion and resistance to thermal shock make DURAN® borosilicate glass 3.3 suitable for a particularly wide range of applications.

We manufacture our precision bore tubing (KPG®) with optimal precision by heating glass tubes and vacuum heat shrinking them onto precision mandrels.

This technique enables DURAN® Industrial Glass to manufacture precision bore tubing with a defined internal diameter with the smallest possible tolerances in the micro-metre ( $\mu\text{m}$ ) range.

KPG® production is one of the most challenging fields in the speciality glass industry. DURAN® Industrial Glass offers a unique range of products designed specifically to meet your individual requirements.

The dimensions shown in the tables serve merely as an example of our capabilities. With over 400 different cylindrical and 150 conical KPG® dimensions to choose from, combined with various wall thicknesses and individual hot and cold processing methods, we can manufacture your product based on your ideas and designs. Please contact us to discuss your requirements.

**We turn your ideas into reality.**

A one-stop-shop, from individual parts to series production.



## TOLERANCES AND MEASUREMENT

### Committed to precision.

#### Hot processing

##### Inside diameter

0.15 mm to 296.00 mm

Minimum tolerance:

**± 0.003 mm**

(depending on inside diameter,  
wall thickness and length)

#### Cold processing

##### Outside diameter

2.00 mm to 420.00 mm

Minimum tolerance:

**± 0.003 mm**

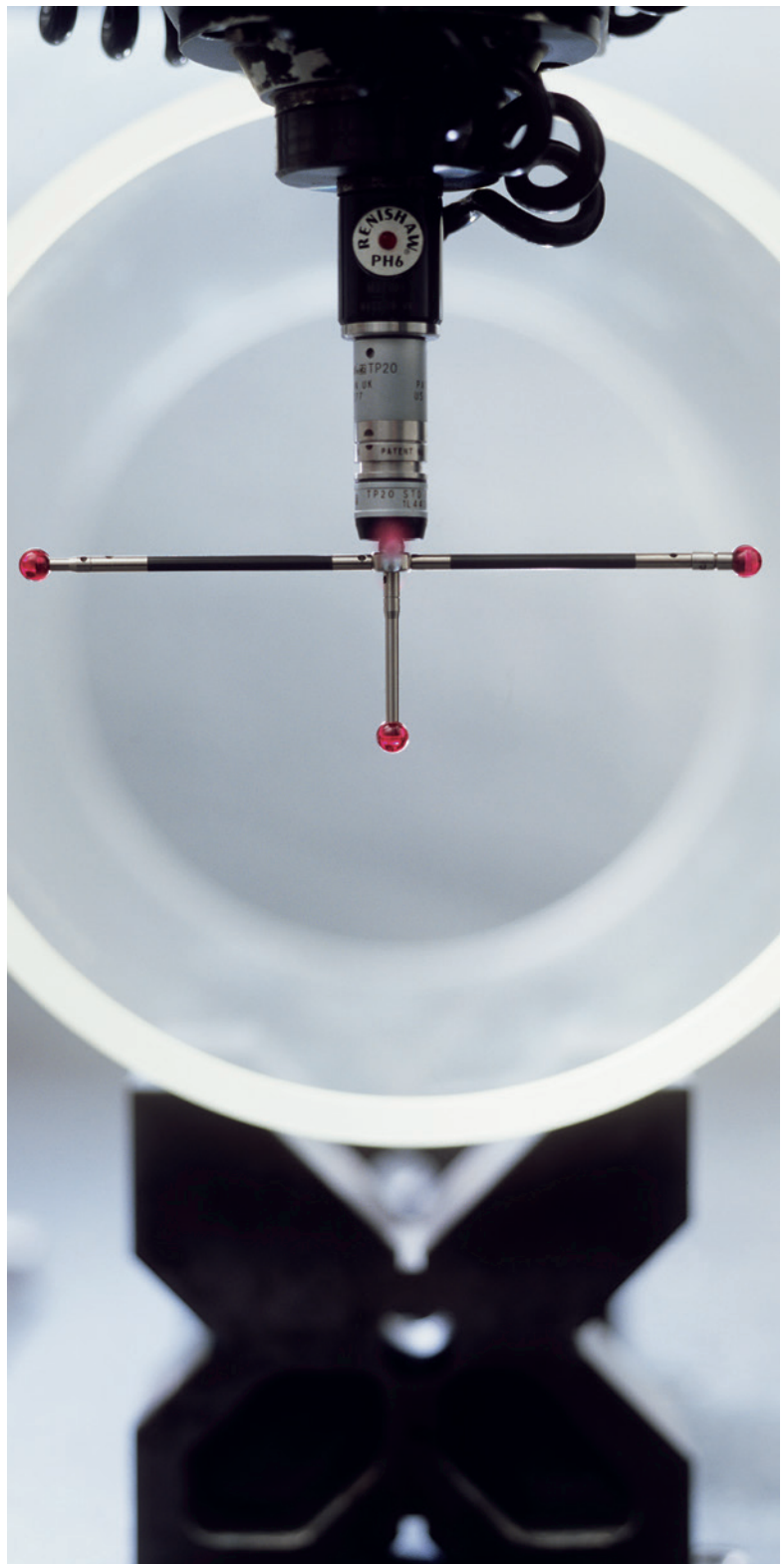
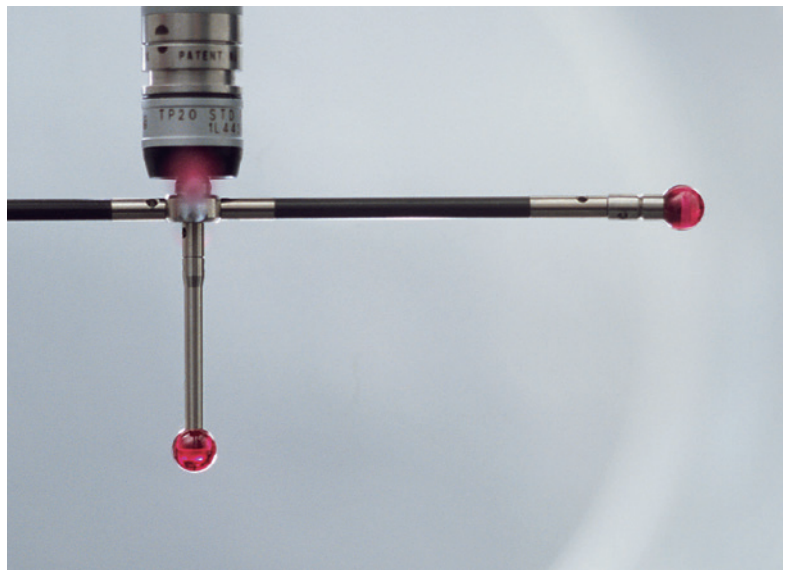
(depending on inside diameter,  
wall thickness and length)

##### Length

max. 1000 mm

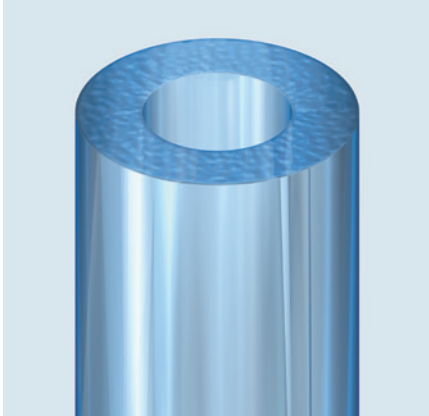
Minimum tolerance:

**± 0.05 mm**



## END FINISHING EXPERTISE

**Optimum quality, flexibility and innovation are our strengths.**

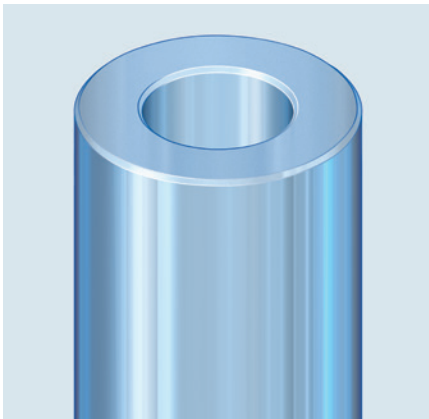


### Cold processing

#### **Cracked-off or cut**

The cut or cracked-off plane has a rough surface and sharp edges.

This type of end finish is used mainly for further processing.



#### **Facing cut ground**

Grinding the facing cut gives the cut edge a smooth surface.

#### **Ground square and parallel**

This grinding method gives a smooth cut surface and parallel planes at both ends.

#### **Ground parallel and perpendicular to the axis**

In this variation the ends are ground parallel and perpendicular to the axis to achieve the optimum surface finish.

#### **Chamfered edges**

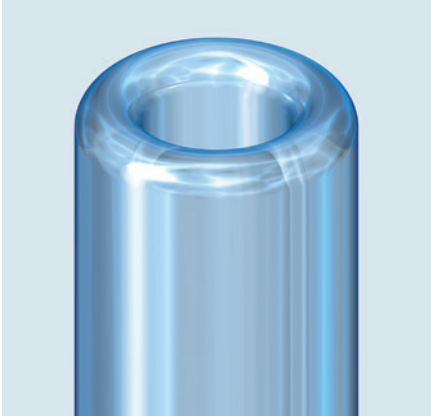
We can provide the finished ends with additional internal and/or external chamfered edges to protect the edges from damage and chips.



Hot processing

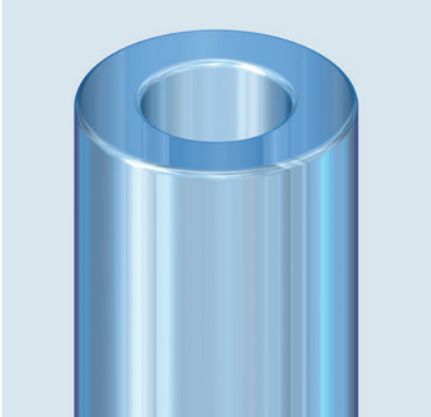
**Ends melted**

After cracking off or cutting, the ends are melted to give a round finish as required. This generates a very smooth, round edge.

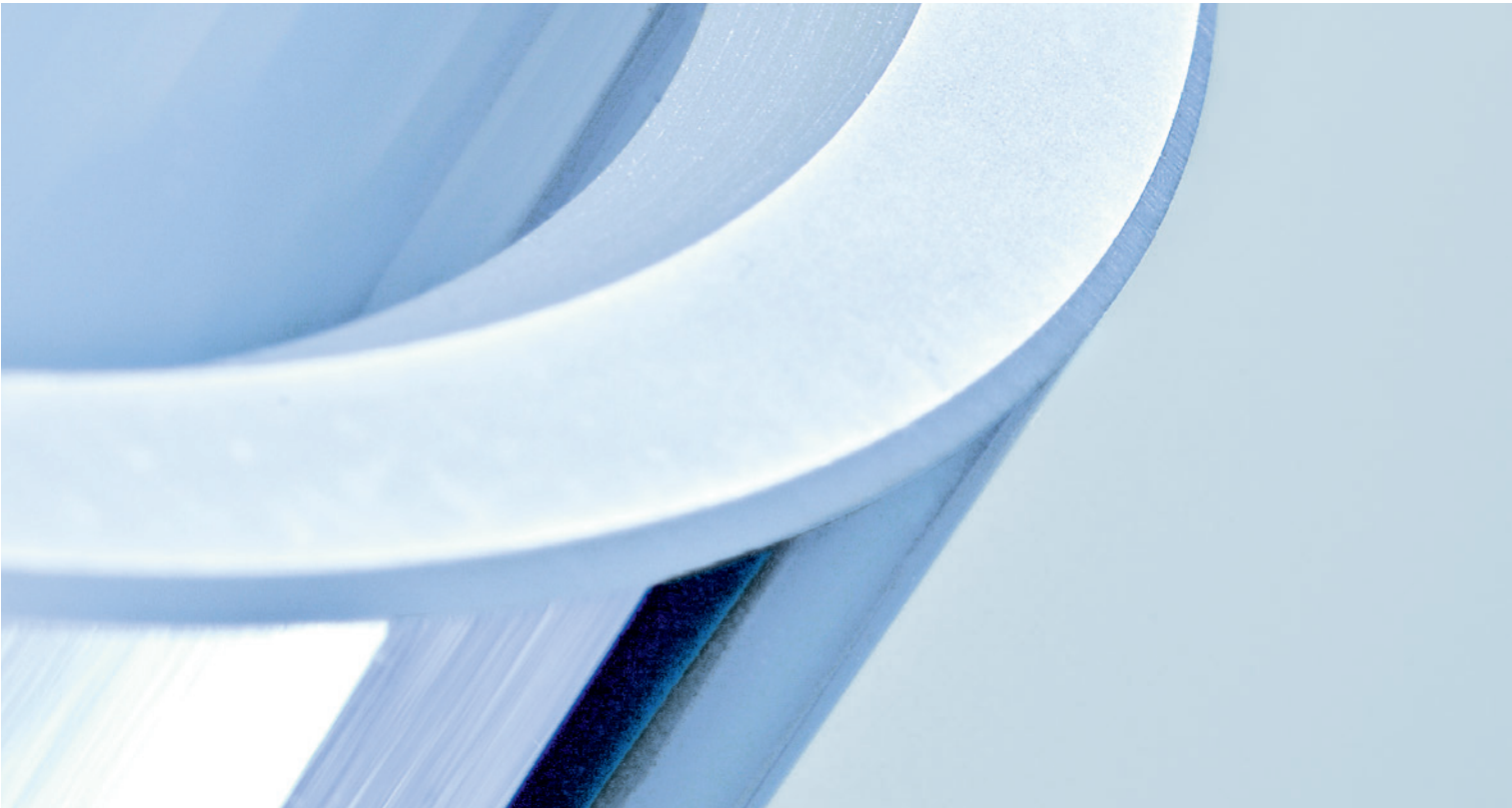


**Ends fire polished**

The ends are fire polished after grinding. This gives a lightly rounded edge and additional protection, whilst retaining the edge geometry.



**Please note!**  
Hot processing of glass ends affects the inside and outside diameter of the part.

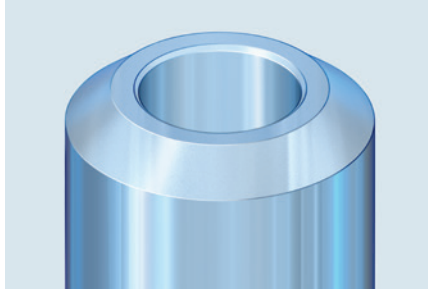




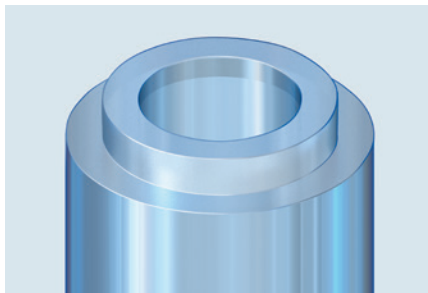
# PROCESSING EXPERTISE

We put your ideas and designs into practice. A one-stop-shop.

Cold processing



Defined special chamfers

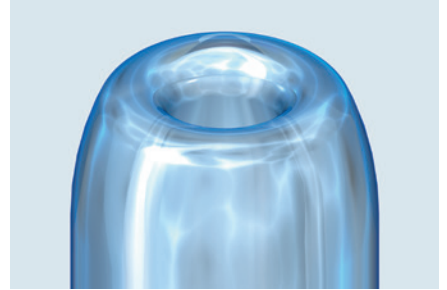


Internal and external ground steps

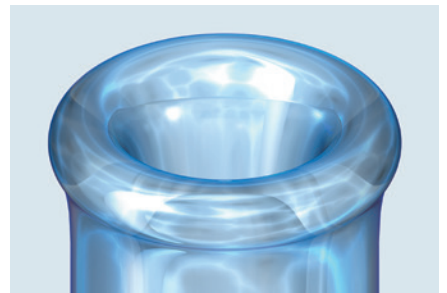


Drilled holes

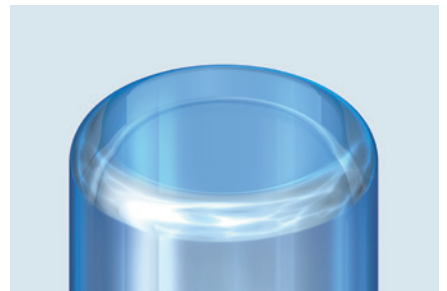
Hot processing



Defined tapering



Defined flaring



Flat bottom



Round bottom





## We don't just scratch the surface.

### Ground surface

Using diamond grinding tools, we can produce external diameters with the tightest of tolerances in the micrometre ( $\mu\text{m}$ ) range; we can even achieve exacting surface roughness values.

### Polished surface

Surface polishing is an additional finishing process that enables us to produce a technically transparent surface.

### Plastic coating for surface protection

We guarantee the safety of your products. A plastic coating provides effective chip, impact and leakage protection.



## SPECIAL SHAPING

### Maximum precision, individual geometries.

#### KPG® cone

We also manufacture conical precision glass tubing tailored to your specific requirements. We have considerable expertise and extensive experience in this field.

### High pressure.

#### Multi-walled KPG® tubing

We produce multi-walled DURAN® precision bore glass to satisfy your particular requirements for pressure resistance. We shrink several tubes on top of one another for outstanding compressive strength.



## SYSTEMATIC QUALITY MANAGEMENT

### Uncompromising quality.

Systematic quality management is an investment in the future. Our quality management system is based on DIN EN ISO 9001:2015 certification and provides a guarantee that your individual quality needs will be met.



In addition we are approved and recognized in accordance with the AD-2000-Merkblatt HP 0.

### You demand quality, we guarantee it.

Our products are continually checked using precise measuring instruments. We inspect the products to ensure that they meet your requirements for surface finish and diameter, shape and location tolerances.

We will gladly provide you with DIN EN 10204 certificates.

### Complete documentation from a grain of sand to the finished part.

Our products are documented from the raw materials to the finishing stage. We will gladly provide traceability documentation on request.



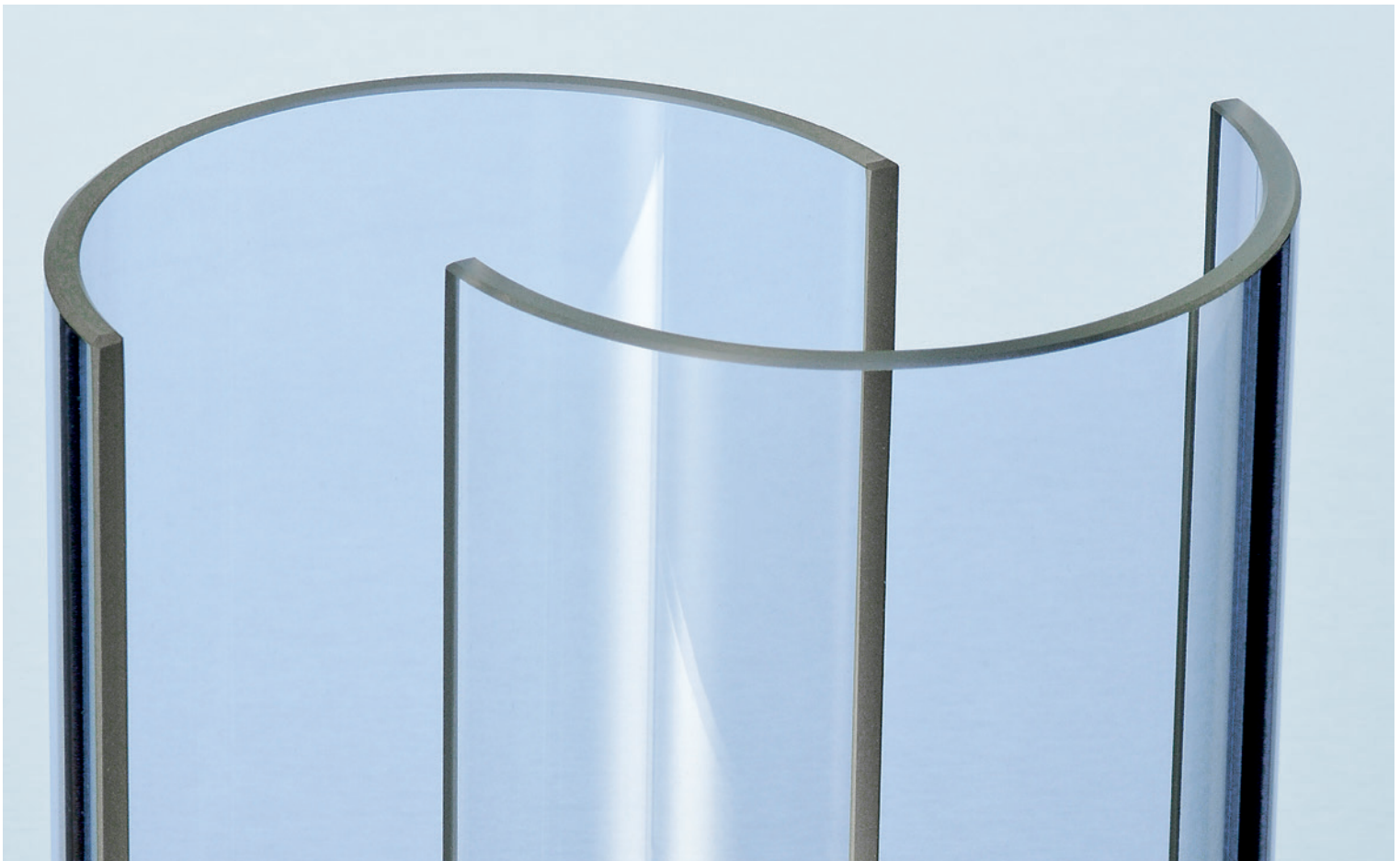
## PHYSICAL AND CHEMICAL PROPERTIES

### Physical data

Coefficient of mean linear thermal expansion $\alpha$ (20 °C; 300 °C) acc. to DIN ISO 7991	$3.3 \cdot 10^{-6} \text{ K}^{-1}$	
Transformation temperature $T_g$	525 °C	
Temperature of the glass at viscosity $\eta$ in $\text{dPa} \cdot \text{s}$ : $10^{13}$ (annealing point)	560 °C	
$10^{7.6}$ (softening point)	825 °C	
$10^4$ (working point)	1260 °C	
Maximum short-time working temperature	500 °C	
Density $\rho$ at 25 °C	$2.23 \text{ g} \cdot \text{cm}^{-3}$	
Modulus of elasticity E (Young's modulus)	$63 \cdot 10^3 \text{ N} \cdot \text{mm}^{-2}$	
Poisson's ratio $\mu$	0.20	
Thermal conductivity $\lambda_w$ at 90 °C	$1.2 \text{ W} \cdot \text{m}^{-1} \cdot \text{K}^{-1}$	
Temperature for the specific electrical resistance of $10^8 \Omega \cdot \text{cm}$ (DIN 52 326) $t_{k 100}$	250 °C	
Logarithm of the electrical volume resistance ( $\Omega \cdot \text{cm}$ )	at 250 °C 8/at 350 °C 6.5	
Dielectric properties (1 MHz, 25 °C)	Dielectric constant $\epsilon$	4.6
	Dielectric loss factor $\tan \delta$	$37 \cdot 10^{-4}$
Refractive index ( $\lambda = 587.6 \text{ nm}$ ) $n_d$	1.473	
Stress-optical coefficient (DIN 52 314) K	$4.0 \cdot 10^{-6} \text{ mm}^2 \cdot \text{N}^{-1}$	

### Thermal shock resistance

Resistance to thermal shock for tubing, capillary and rod is dependent on the wall thickness, the shape and size of the quenched area, the state of the surface, the stress which may be present and the end finish. Rapid heating or cooling can easily lead to breakage as a result of tensile strength. It is recommended not to exceed a temperature difference of 100 K.





## Pressure resistance

Calculation of compressive strength for a given wall thickness and outside diameter:

$$P = \frac{WT \cdot 20 \cdot \frac{K}{S}}{OD - WT}$$

Calculation of wall thickness for a given compressive strength and outside diameter:

$$WT = \frac{OD \cdot p}{20 \cdot \frac{K}{S} + p}$$

Permitted for DURAN® borosilicate glass 3.3:  $K/S = 7 \text{ N} \times \text{mm}^{-2}$  as per DIN EN 1595:

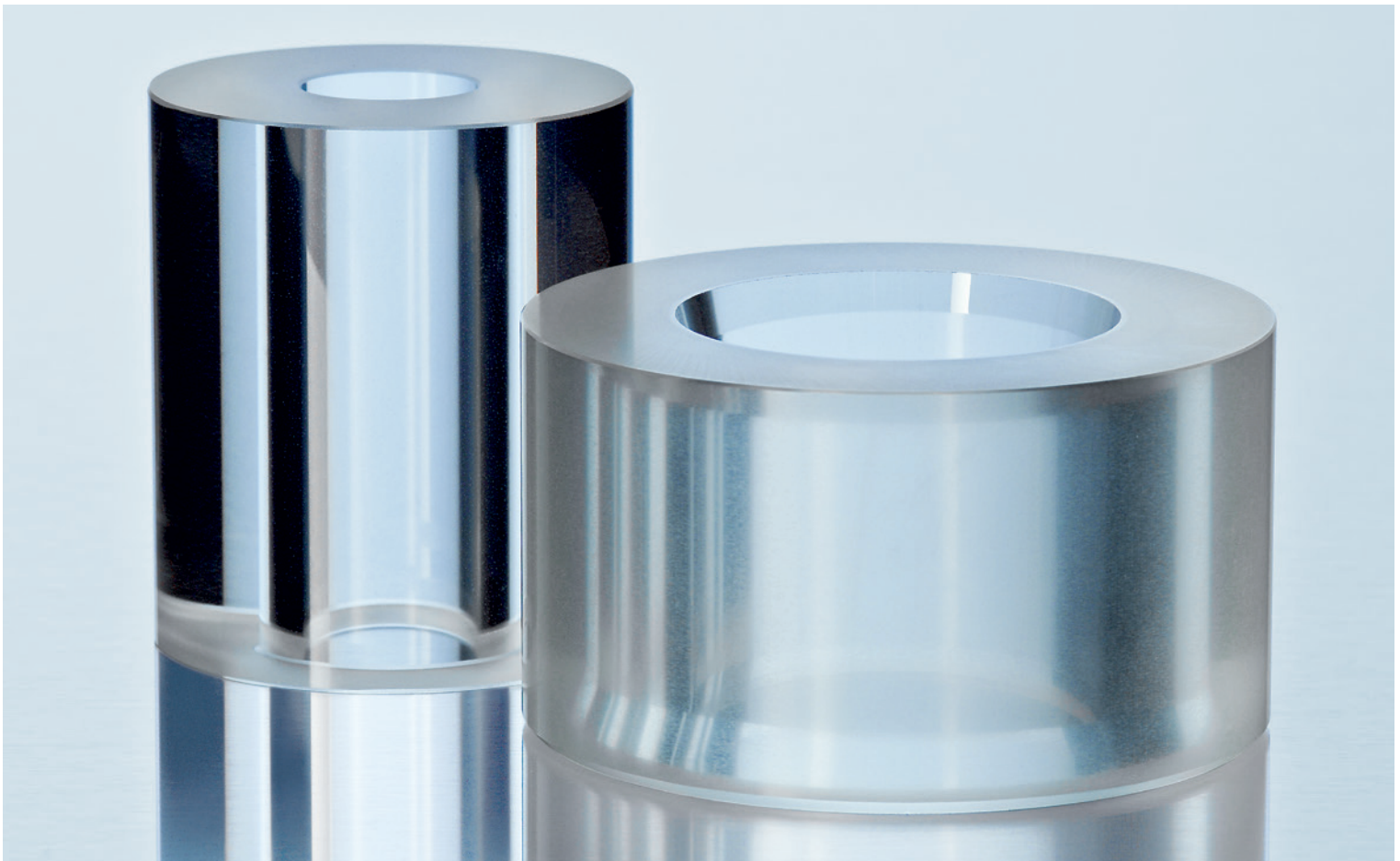
Pressure equipment made from borosilicate glass 3.3; general rules for design, manufacture and testing.

Pressure resistance is also affected by:

- temperature difference between internal and external wall
- surface finish
- end processing
- installation conditions

We can provide your individual calculations on request.

OD = outside diameter in mm  
 WT = wall thickness in mm  
 p = pressure resistance in bar  
 K/S = permitted load in  $\text{N} \times \text{mm}^{-2}$



## PHYSICAL AND CHEMICAL PROPERTIES

### Chemical composition of DURAN®

(Main components in approx. weight %)

SiO <sub>2</sub>	B <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> O + K <sub>2</sub> O	Al <sub>2</sub> O <sub>3</sub>
81	13	4	2

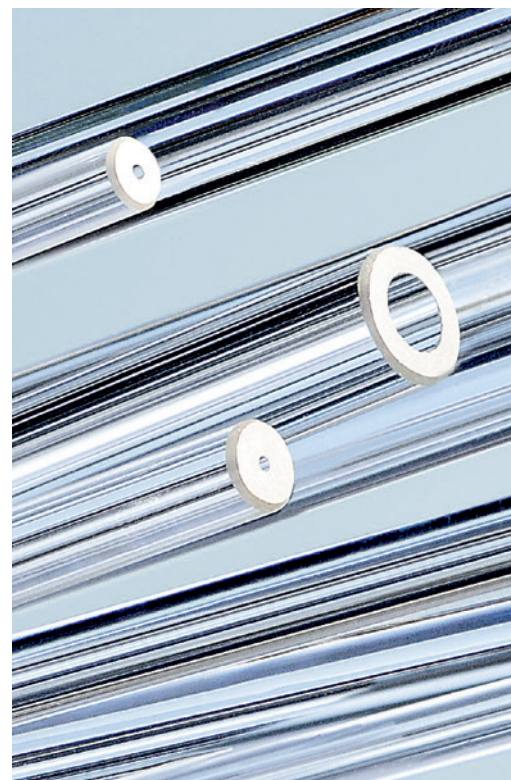
### Chemical resistance

Hydrolytic resistance class (DIN ISO 719)	HGB 1
Acid class (DIN 12 116)	Class S 1
Alkali class (DIN ISO 695)	Class A 2

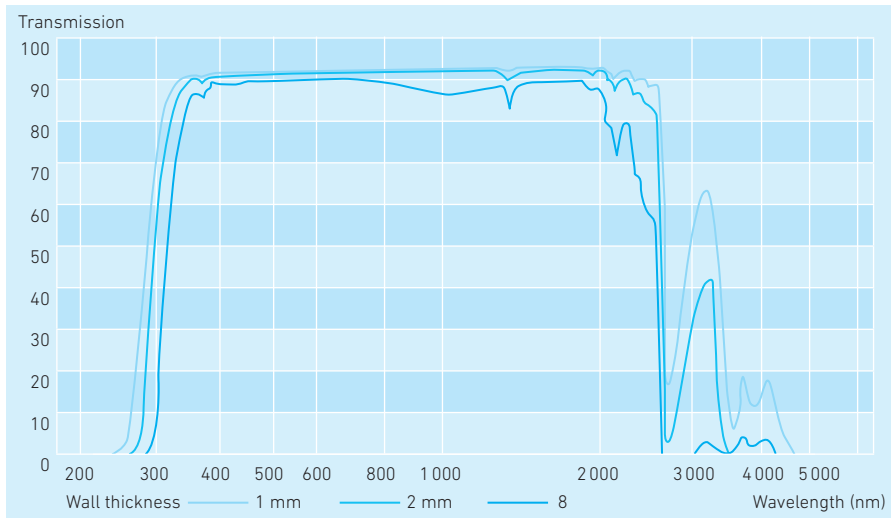
DURAN® borosilicate glass 3.3 is highly resistant to water, neutral and acid solutions, concentrated acids and acid mixtures, and to chlorine, bromine, iodine and organic substances.

Its chemical resistance is superior to that of most metals and other materials, even during prolonged periods of exposure and at temperatures above 100 °C.

Exposure to water and acids releases only small quantities of predominantly monovalent ions from the glass. This leads to the formation of a very thin layer of silica gel on the surface of the glass which inhibits further attack. Depending on the temperature and concentration, hydro-fluoric acids, hot phosphoric acid and alkaline solutions may attack the surface of the glass.



## Transmission



## Processing and annealing recommendations

DURAN® tubing and capillaries have optimum material properties which enable them to be readily processed using standard technical glass forming and cutting techniques. To eliminate temporary stresses that arise during processing, the glass is thoroughly heated to a maximum temperature of 550 °C and kept at this temperature for a maximum of 30 min.; thinner wall thicknesses generally require only a fraction of this time.

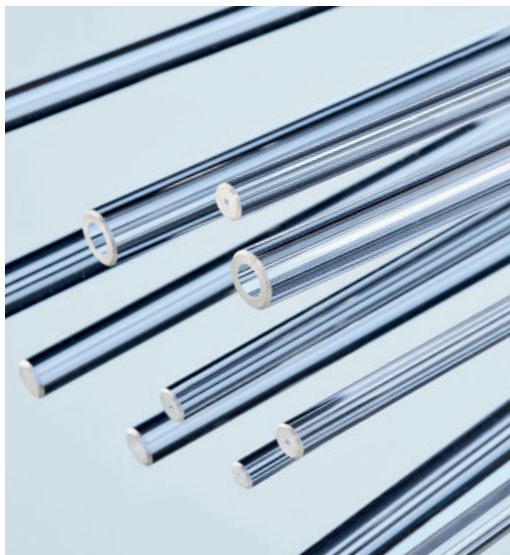
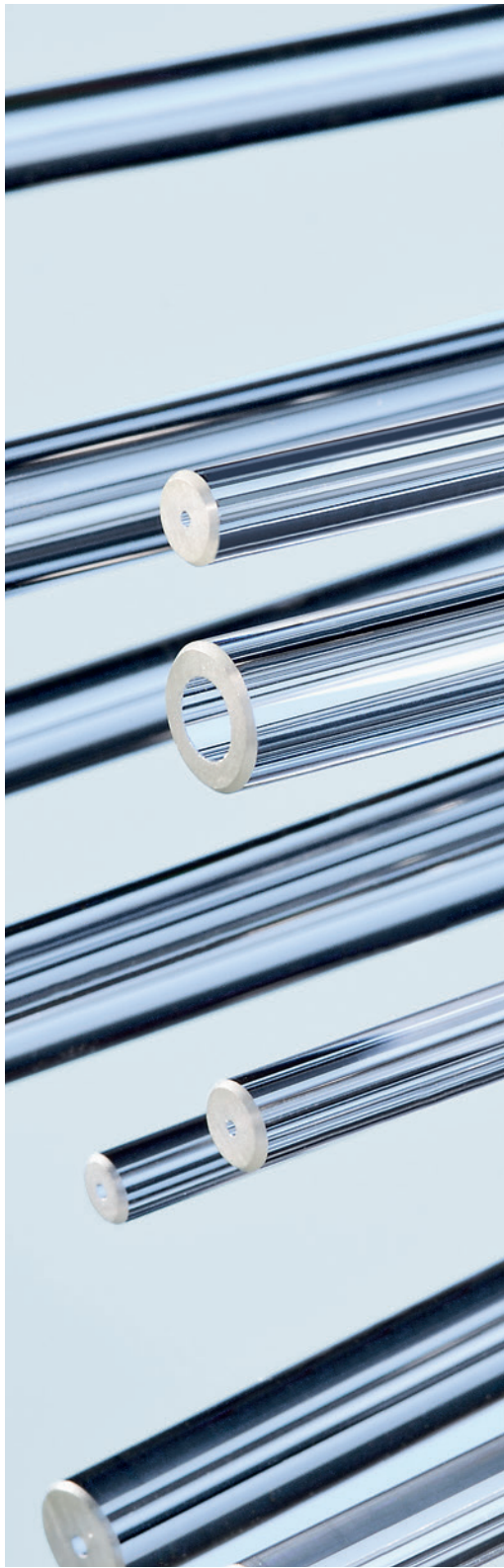
## Annealing schedule

wall thickness in mm	temperature range		
	550 to 480 °C	480 to 400 °C	400 to 20 °C
3	12 °C/min	24 °C/min	bis 480 °C/min
6	3 °C/min	6 °C/min	bis 120 °C/min
12	0.8 °C/min	1.6 °C/min	bis 32 °C/min








## KPG® CAPILLARY






inside diameter [mm] 	outside diameter [mm] 	maximum length [mm] 
0.15 ± 0.01	4.00 ± 0.50	350
	5.00 ± 0.50	
	6.00 ± 1.00	
	7.00 ± 1.00	
0.20 ± 0.01	4.00 ± 0.50	350
	5.00 ± 0.50	
	6.00 ± 1.00	
	7.00 ± 1.00	
0.30 ± 0.01	4.00 ± 0.50	1 000
	5.00 ± 0.50	
	6.00 ± 1.00	
	7.00 ± 1.00	
	8.00 ± 1.00	
0.40 ± 0.01	4.00 ± 0.50	1 000
	5.00 ± 0.50	
	6.00 ± 1.00	
	7.00 ± 1.00	
	8.00 ± 1.00	
	9.00 ± 1.00	
0.50 ± 0.01	4.00 ± 0.50	1 000
	5.00 ± 0.50	
	6.00 ± 1.00	
	7.00 ± 1.00	
	8.00 ± 1.00	
	9.00 ± 1.00	
0.60 ± 0.01	5.00 ± 0.50	1 000
	6.00 ± 1.00	
	7.00 ± 1.00	
	8.00 ± 1.00	
	9.00 ± 1.00	
0.70 ± 0.01	5.00 ± 0.50	1 000
	6.00 ± 1.00	
	7.00 ± 1.00	
	8.00 ± 1.00	
	9.00 ± 1.00	






inside diameter [mm] 	outside diameter [mm] 	maximum length [mm] 
0.80 ± 0.01	5.00 ± 0.50	1 000
	6.00 ± 1.00	
	7.00 ± 1.00	
	8.00 ± 1.00	
	9.00 ± 1.00	
0.90 ± 0.01	5.00 ± 0.50	1 000
	6.00 ± 1.00	
	7.00 ± 1.00	
	8.00 ± 1.00	
	9.00 ± 1.00	
1.00 ± 0.01	5.00 ± 0.50	1 000
	6.00 ± 1.00	
	7.00 ± 1.00	
	8.00 ± 1.00	
	9.00 ± 1.00	
1.50 ± 0.01	5.00 ± 0.50	1 000
	6.00 ± 1.00	
	7.00 ± 1.00	
	8.00 ± 1.00	
	9.00 ± 1.00	
2.00 ± 0.01	6.00 ± 1.00	1 000
	7.00 ± 1.00	
	8.00 ± 1.00	
	9.00 ± 1.00	
2.50 ± 0.01	6.00 ± 1.00	1 000
	7.00 ± 1.00	
	8.00 ± 1.00	
	9.00 ± 1.00	



## KPG® TUBING

inside diameter [mm] 	wall thickness [mm] 	maximum length [mm] 
3.00 ± 0.01	1.30 ± 0.10	1 000
	1.70 ± 0.20	
	3.50 ± 0.30	
3.50 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	3.30 ± 0.30	
4.00 ± 0.01	1.20 ± 0.10	1 000
	1.70 ± 0.20	
	2.60 ± 0.30	
	3.10 ± 0.30	
	4.00 ± 0.30	
4.50 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.50 ± 0.30	
	4.20 ± 0.30	
5.00 ± 0.01	1.10 ± 0.10	1 000
	1.70 ± 0.20	
	2.30 ± 0.30	
	3.70 ± 0.30	
5.20 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.50 ± 0.30	
5.40 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.30 ± 0.30	
5.60 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.30 ± 0.30	
5.80 ± 0.01	1.20 ± 0.10	1 000
	1.70 ± 0.20	
	2.40 ± 0.30	






inside diameter [mm] 	wall thickness [mm] 	maximum length [mm] 
6.00 ± 0.01	1.10 ± 0.10	1 000
	1.70 ± 0.20	
	2.30 ± 0.30	
6.20 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.50 ± 0.30	
6.40 ± 0.01	1.20 ± 0.10	1 000
	1.70 ± 0.20	
	2.40 ± 0.20	
6.60 ± 0.01	1.00 ± 0.10	1 000
	1.70 ± 0.20	
	2.40 ± 0.30	
6.80 ± 0.01	1.00 ± 0.10	1 000
	1.70 ± 0.20	
	2.40 ± 0.30	
7.00 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.50 ± 0.30	
7.20 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.50 ± 0.30	
7.40 ± 0.01	1.10 ± 0.10	1 000
	1.70 ± 0.20	
	2.40 ± 0.30	
7.60 ± 0.01	1.00 ± 0.10	1 000
	1.60 ± 0.20	
	2.40 ± 0.30	



## KPG® TUBING






inside diameter [mm] 	wall thickness [mm] 	maximum length [mm] 
8.00 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.30 ± 0.30	
8.20 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.40 ± 0.30	
8.40 ± 0.01	1.20 ± 0.10	1 000
	1.70 ± 0.20	
	2.00 ± 0.20	
	2.40 ± 0.30	
8.60 ± 0.01	2.80 ± 0.30	1 000
	1.10 ± 0.10	
	1.60 ± 0.20	
	2.00 ± 0.20	
8.80 ± 0.01	2.40 ± 0.30	1 000
	1.10 ± 0.10	
	1.70 ± 0.20	
	1.90 ± 0.20	
	2.30 ± 0.30	
9.00 ± 0.01	2.70 ± 0.30	1 000
	1.10 ± 0.10	
	1.60 ± 0.20	
	1.90 ± 0.20	
	2.30 ± 0.30	
	3.80 ± 0.30	
9.20 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.30 ± 0.30	
	2.60 ± 0.30	
9.40 ± 0.01	3.70 ± 0.30	1 000
	1.10 ± 0.10	
	1.60 ± 0.20	
	2.20 ± 0.30	
9.60 ± 0.01	3.70 ± 0.30	1 000
	1.10 ± 0.10	
	1.90 ± 0.20	
	2.40 ± 0.30	
9.80 ± 0.01	3.60 ± 0.30	1 000
	1.10 ± 0.10	
	1.60 ± 0.20	
	2.40 ± 0.30	
	4.80 ± 0.50	






inside diameter [mm] 	wall thickness [mm] 	maximum length [mm] 
10.00 ± 0.01	1.10 ± 0.10	1 000
	1.60 ± 0.20	
	2.00 ± 0.20	
	2.70 ± 0.30	
	3.50 ± 0.30	
10.50 ± 0.01	1.00 ± 0.10	1 000
	1.90 ± 0.20	
	2.70 ± 0.30	
	3.40 ± 0.30	
11.00 ± 0.01	1.10 ± 0.10	1 000
	1.30 ± 0.20	
	2.00 ± 0.20	
	2.70 ± 0.30	
11.50 ± 0.01	1.30 ± 0.20	1 000
	1.90 ± 0.20	
	2.60 ± 0.30	
12.00 ± 0.01	1.30 ± 0.20	1 000
	2.00 ± 0.20	
	2.60 ± 0.30	
12.50 ± 0.01	1.30 ± 0.20	1 000
	1.90 ± 0.20	
	2.60 ± 0.30	
	2.70 ± 0.30	



## KPG® TUBING




inside diameter [mm] 	wall thickness [mm] 	maximum length [mm] 
13.00 ± 0.01	1.20 ± 0.20	1 000
	2.00 ± 0.20	
	2.60 ± 0.30	
13.50 ± 0.01	1.30 ± 0.20	1 000
	1.90 ± 0.20	
	2.40 ± 0.30	
	2.70 ± 0.30	
14.00 ± 0.01	1.20 ± 0.20	1 000
	1.90 ± 0.20	
	2.40 ± 0.30	
	2.60 ± 0.30	
14.50 ± 0.01	1.30 ± 0.20	1 000
	1.90 ± 0.20	
	2.80 ± 0.30	
15.00 ± 0.01	1.20 ± 0.20	1 000
	1.90 ± 0.20	
	2.70 ± 0.30	
	5.00 ± 0.50	
15.50 ± 0.01	1.30 ± 0.20	1 000
	1.90 ± 0.20	
	2.60 ± 0.30	
16.00 ± 0.01	1.30 ± 0.20	1 000
	1.90 ± 0.20	
	2.60 ± 0.30	
	3.90 ± 0.40	
16.50 ± 0.01	1.30 ± 0.20	1 000
	2.00 ± 0.20	
	2.80 ± 0.30	






inside diameter [mm] 	wall thickness [mm] 	maximum length [mm] 
17.00 ± 0.01	1.20 ± 0.20	1 000
	1.90 ± 0.20	
	2.70 ± 0.30	
	4.80 ± 0.50	
17.50 ± 0.01	1.30 ± 0.20	1 000
	1.90 ± 0.20	
	2.70 ± 0.30	
18.00 ± 0.01	1.30 ± 0.20	1 000
	1.90 ± 0.20	
	2.60 ± 0.30	
18.50 ± 0.01	1.30 ± 0.20	1 000
	2.00 ± 0.20	
	3.00 ± 0.30	
19.00 ± 0.01	1.20 ± 0.20	1 000
	1.90 ± 0.20	
	3.00 ± 0.30	
19.50 ± 0.01	1.20 ± 0.20	1 000
	1.90 ± 0.20	
	2.90 ± 0.30	
20.00 ± 0.01	1.30 ± 0.20	1 000
	2.20 ± 0.20	
	3.10 ± 0.30	
21.00 ± 0.01	1.20 ± 0.20	1 000
	1.50 ± 0.20	
	2.10 ± 0.20	
	2.90 ± 0.30	
22.00 ± 0.01	1.50 ± 0.20	1 000
	2.20 ± 0.20	
	3.00 ± 0.30	
23.00 ± 0.01	1.50 ± 0.20	1 000
	2.10 ± 0.20	
	2.90 ± 0.30	
24.00 ± 0.01	1.50 ± 0.20	1 000
	2.10 ± 0.20	
	3.00 ± 0.30	



## KPG® TUBING




inside diameter [mm] 	wall thickness [mm] 	maximum length [mm] 
<b>25.00</b> ± 0.01	1.50 ± 0.30	1 000
	2.10 ± 0.30	
	2.90 ± 0.30	
	5.10 ± 0.50	
<b>26.00</b> ± 0.01	1.50 ± 0.30	1 000
	2.10 ± 0.30	
	3.00 ± 0.30	
	5.50 ± 0.50	
<b>27.00</b> ± 0.01	1.50 ± 0.30	1 000
	2.10 ± 0.30	
	2.90 ± 0.30	
	5.40 ± 0.50	
<b>28.00</b> ± 0.01	1.50 ± 0.30	1 000
	2.10 ± 0.30	
	3.00 ± 0.30	
	5.30 ± 0.50	
	8.30 ± 0.70	
	9.80 ± 0.80	
<b>29.00</b> ± 0.01	1.50 ± 0.30	1 000
	2.10 ± 0.30	
	2.90 ± 0.30	
	5.10 ± 0.50	
	8.10 ± 0.70	
	9.60 ± 0.80	
<b>30.00</b> ± 0.01	1.50 ± 0.30	1 000
	2.10 ± 0.30	
	3.00 ± 0.30	
	5.60 ± 0.50	
	7.90 ± 0.70	
	9.40 ± 0.80	
<b>35.00</b> ± 0.01	1.70 ± 0.30	1 000
	2.40 ± 0.30	
	3.40 ± 0.40	
	5.50 ± 0.50	
	7.10 ± 0.70	
	10.20 ± 0.80	






inside diameter [mm] 	wall thickness [mm] 	maximum length [mm] 
40.00 ± 0.01	1.70 ± 0.30	1 000
	2.40 ± 0.30	
	3.30 ± 0.40	
	3.70 ± 0.40	
	5.50 ± 0.50	
	7.80 ± 0.70	
	9.30 ± 0.80	
45.00 ± 0.02	1.90 ± 0.30	1 000
	2.60 ± 0.30	
	3.60 ± 0.40	
	5.50 ± 0.50	
	7.10 ± 0.70	
50.00 ± 0.02	10.00 ± 0.80	1 000
	2.60 ± 0.30	
	3.40 ± 0.40	
	4.30 ± 0.50	
	5.40 ± 0.50	
55.00 ± 0.03	7.60 ± 0.70	1 000
	9.30 ± 0.90	
	2.40 ± 0.30	
	3.40 ± 0.40	
60.00 ± 0.03	4.30 ± 0.50	1 000
	5.40 ± 0.50	
	9.20 ± 0.90	
	2.40 ± 0.30	
	3.40 ± 0.40	
65.00 ± 0.03	4.30 ± 0.50	1 000
	5.30 ± 0.60	
	9.70 ± 0.90	
	2.30 ± 0.30	



## KPG® TUBING

inside diameter [mm] 	wall thickness [mm] 	maximum length [mm] 
70.00 ± 0.03	2.70 ± 0.30	1 000
	3.60 ± 0.40	
	5.30 ± 0.60	
	7.50 ± 0.80	
	9.20 ± 0.90	
75.00 ± 0.03	2.70 ± 0.30	1 000
	3.60 ± 0.40	
	5.30 ± 0.60	
	7.90 ± 0.80	
	9.70 ± 0.90	
80.00 ± 0.03	2.60 ± 0.30	1 000
	3.60 ± 0.40	
	5.30 ± 0.60	
	7.40 ± 0.80	
	9.20 ± 1.00	
85.00 ± 0.03	2.70 ± 0.30	1 000
	3.60 ± 0.40	
	5.30 ± 0.60	
	7.80 ± 0.90	
	9.60 ± 1.00	
90.00 ± 0.03	2.60 ± 0.30	1 000
	3.10 ± 0.30	
	3.60 ± 0.40	
	5.30 ± 0.80	
	7.40 ± 0.90	
	10.00 ± 1.00	
95.00 ± 0.03	3.10 ± 0.50	1 000
	5.20 ± 0.80	
	7.40 ± 0.90	
	9.60 ± 1.00	



inside diameter [mm] 	wall thickness [mm] 	maximum length [mm] 
100.00 ± 0.04	3.10 ± 0.60	1 000
	5.20 ± 0.80	
	7.40 ± 0.90	
	9.50 ± 1.00	
110.00 ± 0.04	3.10 ± 0.60	1 000
	5.20 ± 0.80	
	7.30 ± 1.00	
120.00 ± 0.04	3.10 ± 0.70	1 000
	5.20 ± 0.80	
	7.30 ± 1.00	
	9.80 ± 1.10	
140.00 ± 0.04	3.10 ± 0.70	1 000
	5.20 ± 0.80	
	7.30 ± 1.10	
	9.70 ± 1.20	
150.00 ± 0.05	5.20 ± 0.80	1 000
	7.30 ± 1.10	
	9.60 ± 1.30	
160.00 ± 0.05	5.30 ± 0.80	1 000
	7.20 ± 1.10	
	10.10 ± 1.30	
200.00 ± 0.07	7.40 ± 1.20	
	9.30 ± 1.40	
210.00 ± 0.07	9.50 ± 1.40	1 000
225.00 ± 0.08	7.30 ± 2.00	1 000
	9.30 ± 2.00	
240.00 ± 0.60	9.40 ± 2.00	1 000
296.00 ± 0.60	10.30 ± 1.80	1 000



## CORE COMPETENCES AND APPLICATIONS

### Comprehensive range for individual solutions.

Production of KPG® tubing, cone and capillary from DURAN®

Further processing of precision and standard glass:

- grinding, milling and drilling
- centerless precision grinding
- surface polishing
- hot forming of glass components
- multi-walled tubing for high pressure resistance
- production and fusion of glass filters and glass components
- application of intermediate sealing glass
- amber colouring of glass surface for UV protection
- application of scaling and logos using film printing technique
- screen printing

High levels of vertical integration enable us to provide for a wide range of applications, some of which are listed below:

- KPG® cone for flow measurement
- KPG® tubing for metering cylinders and chromatography columns
- KPG® capillary for viscosity measurement
- glass components for laser resonators
- glass bulbs for x-ray and transmission tubes made from special glass types
- internally coated glass tubes for ozone extraction
- glass bulbs and components for cathode ray tubes





## INDUSTRIES AND AREAS OF APPLICATION

### **Our customers present up with tough challenges. It's all in a day's work!**

Our manufacturing and processing technologies are as varied as the applications and requirements for our precision bore glass. Innovative technologies and decades of experience enable us to produce precision bore tubing with tolerances in the micrometer ( $\mu\text{m}$ ) range.

Our DURAN® tubing is extensively used in the following industries and areas of application:

- electrical industry
- laboratory technology
- laser technology
- machine and plant construction
- mechatronic industry
- medical engineering
- measurement and analysis engineering
- ozone technology
- paper processing industry
- Deep Sea Research / Oceanography

**Our highly skilled team will transform your ideas and designs into reality with passion, commitment, expertise and innovation.**



## TAKE ADVANTAGE OF OUR PASSION FOR PRECISION!

We have the advantage of more than 100 years of experience of working with DURAN® glass. Our unique understanding of glass coupled with target oriented project management enables us to put your ideas and designs into practice. We work with passion and commitment to plan and develop first class customised solutions for you.

We will gladly prepare a quotation according to your requirements.

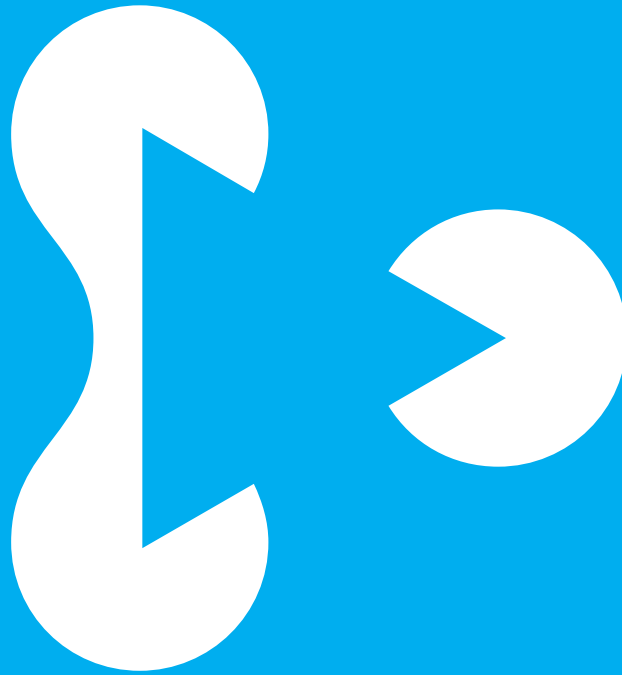
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