



DURAN® HAND-MADE PRODUCTION

Competence in custom-made technical glass products



DURAN GROUP
magic of precision

WELCOME TO THE DURAN GROUP

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

In this brochure we present to you DURAN d.d. Pula – a worldwide known manufacturer and supplier of custom-made technical glass products. To illustrate both the diversity of products and the challenges presented to sales staff, we give you an overview of our core competences in hand-made production as well as a closer look at some of the most important production segments and applications of DURAN® borosilicate glass 3.3.

We invite you to contact our glass specialists who will be happy to discuss any particular requirements with you and help you to turn your ideas into reality.



Armin Reiche
Managing Director

DURAN D.D. – FASCINATION OF HAND-MADE PRODUCTION

DURAN d.d. manufactures special glasses which meet the highest requirements of our customers in the most important areas of the industry and the home sector:

Our leading position on the market is primarily due to the top-quality products made of DURAN®. Besides being manufactured as specified in the international standard ISO 3585, its highest possible chemical resistance, the minimum thermal expansion, its resistance to rapid changes in temperature as well as its mechanical strength make DURAN® borosilicate glass 3.3 suitable for a particularly wide range of applications and custom-made solutions.

The quality of our products is ensured by the use of the most modern melting methods, unique production technology, excellent glass-blowing experience of our workers as well as by our quality assurance system which has been certified according to DIN EN ISO 9001:2008.

DURAN d.d. is continuously committed to comply with the tightest standards in relation to human safety and protection of environment. In addition to being certified according to ISO 14001:2004, our company observes all significant environmental requirements.



CORE COMPETENCES

Stand to benefit from our know-how, experience and flexibility.

More than a century of experience in working with DURAN® glass make us the first choice for you to meet your demands. Our unique understanding of hand-made production processes as well as of final processing, coupled with targeted project management, enables us to offer solutions to almost every customer's requests. Having well-known customers from all over the world and from various industry sectors proves the broad confidence in the quality of our products and in the quick and efficient services.

Our business activities comprise:

- Professional skills in hand-made blown and pressed forming
- Broad spectrum of hot and cold final processing expertise
- Flexibility for small and medium-scale production series
- Production of large-volume articles (up to 50 l)
- High flexibility for customer-specific solutions

Specifications and options:

Technology	Volume	Weight (g)	External diameter (mm)	Wall thickness (mm)	Max. height (mm)
Blown articles	500 ml – 72 l	100 – 13 500	80 – 520	1 – 16	750
Pressed articles		25 – 6 400	35 – 450	3 – 18	400
Blown-blown articles	100 ml – 5 l	100 – 2 150	50 – 170	1 – 8	310

Technology/Production series	Small serie (pcs)	Medium serie (pcs)
Blown performance	10 – 2 000	2 001 – 20 000
Pressed performance	100 – 5 000	5 001 – 50 000
Blown-blown performance	100 – 2 000	2 001 – 10 000

Further processing of articles:

- Drilling
- Grinding
- Cutting
- Seaming
- Glass blowing
- Rim moulding
- Thread cutting
- Grading
- Screen printing
- Colouring
- Decorating
- Sandblasting



INDUSTRIES AND AREAS OF APPLICATION

Our philosophy is simple: To provide fast, creative and cost-efficient solutions to help our clients to be successful.

Our manufacturing and processing technologies are as varied as the range of our customer requirements. We provide solutions for nearly all industries and areas of applications. Amongst others our products are already extensively used in the following areas: dairy industry, lighting industry, electrical industry, chemical and petrochemical industry, pharmaceutical industry, paper processing industry, shipbuilding industry, mining, environmental protection, scientific marine research, aviation, solar collectors, household sector as well as grappa and wine industry. On the following pages we would like to show you a small selection of our main areas of application.

MILK JARS FOR DAIRY INDUSTRY

DURAN® is the perfect material – for your products it's ultimate pureness.

We supply blown glass milk jars from 4 – 50 l to the world's leading suppliers of milking machines.

Our product range comprises:

- Recorders
- Receivers
- Sanitary traps

Please see the following table for precise specifications and options:

Product	Volume (l)
Recorders	4-7-23-28-33-39
Receivers	20-23-25-28-33-50-70
Sanitary traps	5-10

External diameter of openings and outlets	19-22-33-40-50-52 mm
Diameter of the drilled holes	17-25-43-50-60-76-128 mm

Logos, scales and graduations are applied according to standard or special customer requirements.

The main advantages of our milk jars:

- Proven DURAN® properties
- Uniform overall wall thickness distribution of the article guarantees stability and mechanical strength and enables working under pressure and resistance to temperature changes without breaking
- Transparency enables perfect visual control of the content
- Hygienic in use due to smooth and pore-free surface (no bacteria development)
- Optimal cleaning with aggressive media due to chemical and thermal shock resistance
- Taste and odour neutral
- With easy to read scale and large labelling
- Cleaning by autoclave or hot sterilization possible



ILLUMINATION AND LIGHTING PROGRAMME

Excellence, reliability and safety – the reasons why we have long lasting relations with our customers.

The requirements of our customers to develop and manufacture reliable and safe products in accordance with the highest possible international quality standards and directives are an integral part of our quality policy.

Our lighting glass for outdoor and indoor environments is particularly suitable for applications where a high risk of explosion, high pressure, extremely high or low temperatures as well as large temperature and weather variations occur, or when contact with sea water is inevitable: in chemical and petrochemical industries, on oil and gas platforms, in mining, marinas, tunnels, streets, airports and many other industrial or potentially hazardous or explosive environments.

We offer many benefits to suppliers of professional lighting systems:

- Blown and pressed articles of consistent quality according to customer drawings and specifications
- A wide range of precision finishing processes which guarantee very good fitting accuracy, functionality and special appearance of the products (drilling, grinding, cutting, seaming, colouring, decoration, sandblasting, etc.)
- Custom-made solutions due to high level of technical support
- Stress-free products thanks to technically advanced annealing processes
- Good tempering of products in order to strengthen the inner structure of the glass and enable better impact, pressure as well as thermal shock resistance
- Excellent visual quality
- Fast moulds adaptation as well as fabrication of new tools
- Rapid sample production and preliminary serial production runs
- Excellent inspection of produced articles
 - dimensional and glass quality inspection
 - visual examination under cross-polarised light
 - impact (2/4l) and thermal shock testing

Our product range comprises:

- Lenses
- Protective glass covers
- Domes
- Cylinders
- Fishing globes

Most of our products are made exclusively according to specific individual customers' demands, but we also have standard products like fishing globes and special protective covers.

On the basis of our own moulds we offer standard dimensions of protective covers:

Protective covers	External Diameter (mm)	Height (mm)
8163050054	113	101
8163060054	131	142
8163070054	157	161
8163080054	176	212



WASHING MACHINE GLASSES

Keep everything in view.

Thanks to the optimal chemical and physical properties of DURAN®, our products are also used in washing machines. These glass panels are produced according to specific demands of washing machine manufacturers in close cooperation with our experts.

You can find our glass as:

- Washing machine glass panels for industrial washing machines
- Spare parts for domestic washing machines
- Pilot-run series

We offer to our customers:

- Pressed articles of outstanding quality according customer drawings and specifications:

Weight (g)	External diameter (mm)	Wall thickness (mm)	Max. height (mm)
max. 4 600	260 – 450	4 – 9	150

- Post processing options for special applications: drilling and sandblasting
- Technical consulting in article and mould construction
- Fast mould, sample and pilot-run production
- Excellent inspection of produced articles

COMPONENTS FOR SMALL ELECTRICAL DEVICES

You come across our products everyday. Everywhere in the world.

DURAN® borosilicate glass with its linear thermal expansion coefficient of $3.3 \cdot 10^{-6} \text{ K}^{-1}$ makes it ideal for any application where heat resistance is required. It is used in a wide range of technically sophisticated, attractive and functional everyday products as components for small household appliances, e. g. boilers, mixer beakers, coffee machines and ovens.

We have been able to bring every detail of the production and finishing processes to perfection to offer our customers glass of the highest quality. The perfect interaction between our technical expertise and the close cooperation with our customers is essential.

HOUSEHOLD GLASSWARE

Our products make your life easier.

DURAN® glass provides the basis for a broad spectrum of household applications: from universal jugs, coffee and tea carafes, dishes and containers for microwave use, casseroles with lids and other ovenware and serving bowls to design-orientated brandy bottles and attractive gifts.

The following product characteristics apply to this product group:

- High heat resistance (up to 450° C/ 842° F)
- High resistance to temperature changes (up to 140 K)
- Mechanical strength
- Transparency
- Enduring brilliance of the surface
- Suitable for healthy and safe food preparation
- Easy to clean and hygienic in use due to smooth and pore-free surface
- Microwave, oven and dishwasher safe
- High chemical resistance

SOME SPECIAL APPLICATIONS

DURAN® – magic glass for bright ideas.

A highly motivated team will meet your special requirements and develop constructive solutions for your special inquiries. We provide established technical knowledge, ability and skills as well as a high motivation to turn ideas into glass.

A small selection from other special applications:

- Glass part for the Olympic Torch (Salt Lake City 2002)
- Coils for the textile industry
- Insulators for the electrical industry
- Safety glass for museums, displays and exhibits
- Special safety glass for aircrafts
- Blank flanges
- Cylinders for paper industry

If you should have any additional questions or ideas, please contact us. We are always glad to work together with you in order to find the best solution for your special requirement.

PROPERTIES OF DURAN® BOROSILICATE GLASS 3.3

Chemical composition

(Main components in approx. weight %)

SiO ₂	B ₂ O ₃	Na ₂ O + K ₂ O	Al ₂ O ₃
81	13	4	2

Chemical properties

Hydrolytic resistance class (DIN ISO 719)	HGB I
Acid class (DIN 12 116)	Class S1
Alkali class (DIN ISO 695)	Class A2

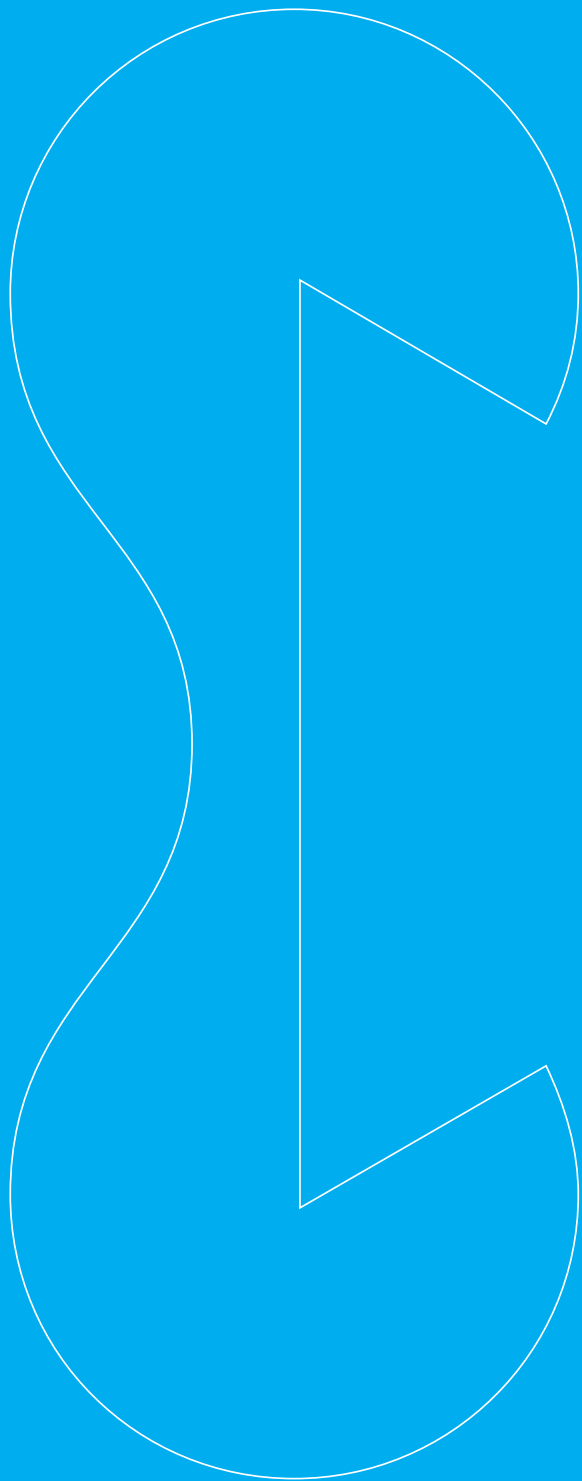
Physical properties

Coefficient of mean linear thermal expansion α (20 °C; 300 °C) as per DIN ISO 7991	$3.3 \cdot 10^{-6} \text{ K}^{-1}$
Transformation temperature T _g	525 °C
Maximum short-time operating temperature	500 °C

Optical properties

In the spectral range from about 310 to 2 200 nm the absorption of DURAN® is negligibly low. It is clear and colourless.





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