Technical Requirements
Test criteria for the fabrication of highly acid resistant glass-lined steel piping and valves
Certifications

Safety through approved quality

Highest standards are set by the pharmaceutical and chemical industry for safety through operation and production as well as in maintenance and servicing. Technical enamels of Düker can meet all these demands at all levels.

The production of pressure parts according to the ASME-Code (American Society of Mechanical Engineers) calls for specially defined materials, welding processes and documentation.

A quality management system in accordance with ISO 9001 was already incorporated in the Düker quality policy in 1994. All the glass lined Division Works at all locations have been successfully audited by the appropriate German authorities and have been awarded the TÜV Certificate.

Highly efficient quality management with dedicated employees ensures documented safety at all levels.

ISO 9001 : 2008

ISO 14001 : 2004 + Cor 1 : 2009

ISO 50001 : 2011

BS OHSAS 18001 : 2007

Düker GmbH & Co. KGaA

Würzburger Straße 10-16

97753 Karlstadt

Germany

Valid from

2015-03-21

2015-05-12

2015-07-10

2015-05-12

2015-06-04

2015-07-10

2015-08-12

2015-05-12

2018-03-23

2018-06-03

2018-07-09

2018-05-11

2018-05-11

Certificate registration no.

511876 QM08

511876 UM

511876 EMSt

511876 BSOH

2015-05-12

2018-05-12

2018-06-03

2018-07-09

2015-05-12

2015-06-04

2015-07-10

2015-08-12

2015-05-12

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A quality management system in accordance with these demands at all levels.

Highly efficient quality management with dedicated employees ensures documented safety at all levels.

BS OHSAS 18001 : 2007

Enamel and enamel-tests / External protection

Material and quality certificates for raw materials

Pressure Equipment Directive – 97/23/EG

Operating Instructions

Excerpt from our installation instructions for glass lined pipework

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Fabrication

Düker only uses pipe material in grades of steel suitable for glass-lining with all necessary quality certificates.

The stub flanges and pipe components are joined on automatic welding machines. The root is laid by inert gas-shielded tungsten arc welding (TIG) and the final pass provided by inert gas metal arc welding (MAG). Inert gas welding is a reliable and fast method particularly for smaller nominal diameters.

Submerged arc-welding is particularly suitable for larger nominal diameters. It guarantees extremely low weld seam porosity as well as fast welding. Düker welds one final pass on both the inside and outside.

Special parts are produced on semi-automatic welding machines. The root, fill and pass are welded in two to three welding operations by this method.

All weld seams are machined and slurred. Absolutely non-porous and clean round weld seams are essential for glass-lining. Before glass-lining, each piece is checked for exact dimensional accuracy.

Two ground coats of glass are applied to the previously annealed and sandblasted parts. These serve as the bonding layer between the base material and the cover-lining. The enamel is applied by spraying, dipping or pouring.

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The dried parts are fired in electric or gas heated furnaces at temperatures between 800 °C (1472 °F) and 900 °C (1652 °F). This firing is repeated six to seven times until the glass-lining will have the required thickness.

Apart from mechanical gripping at a high firing temperature a chemical reaction takes place which leads to positive adherence of metal and glass (composite material).

A first visual inspection takes place immediately after glasslining. All glass-lined parts are subject to a spark test to identify any porosity.

Other test criteria include measuring the thickness of the glass coating and testing the angularity and plane parallelism. The tested glass-lined parts are provided with a quality seal by the QA-department.

Glass lined products from Düker have excellent characteristics against corrosion resistance, wear and diffusion resistance.
Technical Requirements for Fabrication

1. Materials

Düker only uses the materials listed in DIN EN ISO 28721-4 with quality certificates in accordance with the AD Directives, Series W, for producing highly acid resistant glass-lined pipeline components. In case parts are subject to an acceptance procedure the material has to be marked prior to cutting to size. Our workers have the approval for restamping granted by the appropriate German authorities (TÜV).

2. Welding

All weld seams are produced in two final passes. Our welding methods comply by AD2000 leaflet HPO and DIN EN ISO 3834-2. Our qualified welders have valid test certificates issued by the appropriate German authorities (TÜV). These must be renewed every two years.

3. Tests

Welds are subject to a non-destructive test according to AD 2000, HP 100 R, "Tafel 3". The spark test follows after glass-lining. Since pore-free glass-lining automatically calls for a perfect surface on the weld seam, these tests also serve as a substitute for the water pressure test.

4. Certificates

If required by the customer, we supply glass-lined pipe parts and fittings with Works Certificates (Certificate 2.2 to EN 10 204). The type of certificate demanded for special conditions (i.e. highly toxic media, large nominal diameters and higher pressures) is to be agreed when ordering.

Enamel & Enamel Tests / External Protection

Düker has its own technique for melting the mixture of quartz, minerals and metal oxides into a glass frit at a temperature of 1,400 °C (2552 °F). In this way samples are constantly analysed and compared with given standards in order to guarantee a consistent quality.

According to following standards the tests are going to be carried out on enamelled samples:
- Acid resistance: DIN EN ISO 28706-2
- Alkali resistance: DIN EN ISO 28706-4
- Thermal shock: DIN EN ISO 13807

Our QA-department subjects every glass-lined part to the following tests:

1. Preliminary spark test of 20,000 V.
2. Check on lining thickness (especially on all convex radii) according to DIN EN ISO 28721-4.
3. Dimension and tolerance check according to DIN 2 873.
4. Visual examination of surface condition by refraction.
5. Final 12,000 V spark test and visual recheck prior to despatch.

After glass-lining all pieces are sandblasted and, unless other instructions are specified by the customers, prepared with a heat-resistant anti-rust primer (dry coat thickness min. 60 μm).
**Pressure Equipment Directives (PED)**

Our glass lined products are subject to PED if they are considered as being valves, columns, vessels and pipe parts.

Düker handles the PED as follows:

1. Valves to module A1, monitored by TÜV with CE-mark (CE 0036).
2. Pipelines, columns and vessels to module G, single inspection by TÜV, with CE-mark (CE 0036).
3. Pipe spools to module A1, monitored by TÜV with CE-marking DN 32-100 (CE), DN 125-350 (CE 0036).

**Materials**

for pressure vessels, pipes and fittings

in accordance with PED 97/23/EG

<table>
<thead>
<tr>
<th>Description</th>
<th>Material codename</th>
<th>Material No.</th>
<th>Standard</th>
<th>Regulation</th>
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<tbody>
<tr>
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<td>DIN EN 10 216-2</td>
<td>AD 2000-W4</td>
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<td>DIN EN 10 025</td>
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<td>Stub ends</td>
<td>P 285 GH</td>
<td>1.0425</td>
<td>DIN EN 10 218-2</td>
<td>AD 2000-W1</td>
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<td>GE S8</td>
<td>1.0420</td>
<td>DIN EN 10 212-2</td>
<td>AD 2000-W4, AD 2000-W5</td>
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</table>

1 seamless pipes  
2 welded pipes

Careful quality conformance inspection guarantees that only the correct materials are used. We check our pre-defined analysis by examining random samples with a spectrometer in our own laboratory.

Düker products are in accordance with PED 97/23/EC

**Zertiﬁkat**  **ZERTIFIKAT**  **CERTIFICATE**  **ZERTIFIKAT**  **CERTIFICATE**

Düker GmbH & Co. KGaA  
TE Technisches - Email  
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Düker products are in accordance with PED 97/23/EC

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Installation Instructions
for glass lined pipes and fittings (part of our installation instructions)

Transport and Storage

- Do not remove the protective caps from the pipeline parts
- Avoid external loads, vibration and impact

Installation

- Use soft gaskets (PTFE or PTFE-envelope)
- Connection bolts are to be fastened with the recommended tightening torques

Support system

- DN 25 bis 100: max. distances 3 000 mm
- DN 125 bis 400: max. distances 4 000 mm
- Select kind of support (fixed, guiding or loose support)

Working conditions

- Pressure testing of the installed pipeline is to be carried out at 1.1 times of the admissible working pressure to AD 2000 - HP 30
- Consider working pressure conditions (pressure, temperature) and admissible bending of the glass lined pipes

General

- Do not weld on glass lined pipe parts
- Earthing studs are to be used in case where electrostatic charges are likely to occur (contact Düker)

Please ask for our detailed installation manual or download from [www.dueker.de](http://www.dueker.de)