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Deutsche  
Akkreditierungsstelle  
D-PL-18634-01-00

# Test Report

0779-15

on

**determination of the flexural strength  
(3-point bending strength)**

for

**Prismatik dentalcraft, Inc.  
2212 Dupont Drive  
Irvine, CA 92612-1525  
USA**

presented by

**Forschungsinstitut für Anorganische Werkstoffe  
- Glas/Keramik - GmbH  
Heinrich-Meister-Straße 2  
56203 Höhr-Grenzhausen  
Germany**

31 August 2015

## 1. Test specimen

Two samples, 30 test specimens each, labelled as “A” and “B”.

## 2. Date of arrival

08/07/2015

## 3. Test realization

26/08/2015

## 4. Test methods

Determination of flexural strength (3-point bending strength) according to DIN EN 843-1 (●) incl. Weibull statistics according to ISO 20501.

## 5. Sampling/sample preparation

Sampling and delivery to the FGK was under responsibility of the customer. From the rods supplied, 30 test specimens of each sample with the dimensions 3 mm x 4 mm x 45 mm were prepared by a cooperation partner. The preparing procedure was in accordance with EN 843-1, chapter 6.3.3 (Surface finish II: finishing by grinding) and is briefly described below.

Machine type:	Surface grinding machine
Rough grinding:	Diamond grinding disk D91 C75 (Ø 300 mm x 15 mm)
Infeed:	4 - 5 µm per double stroke
Lateral oscillation:	~ 5 mm
Grinding direction:	Parallel to the longitudinal axis
Finish grinding:	Diamond grinding disk D25 C75 (Ø 300 mm x 15 mm)
Abrasion:	~ 60 µm
Infeed:	2 µm per double stroke

After reaching the final dimension a surface finish by two times grinding without infeed was prepared. The grinding direction was parallel to the longitudinal axis. The edges were chamfered by grinding with a D25 grinding disk parallel to the longitudinal axis. All grinding processes were wet grinding processes by the use of cutting fluid. After grinding all samples were cleaned with water.

## 6. Results

30 specimens were tested.

Table 1: 3-Point-Bending-Strength

Test Specimen	Sample "A" [MPa]	Sample "B" [MPa]
1	735.319	446.786
2	743.345	766.794
3	692.875	789.325
4	688.607	681.871
5	699.592	707.069
6	615.857	808.893
7	538.570	793.952
8	775.184	843.618
9	661.325	810.280
10	725.121	882.599
11	843.118	755.098
12	842.826	819.704
13	676.074	782.999
14	795.473	809.034
15	782.957	642.563
16	656.758	762.872
17	805.086	515.933
18	823.437	735.231
19	752.130	787.371
20	748.822	822.725
21	596.197	650.526
22	733.121	639.561
23	797.048	788.229
24	702.778	857.951
25	865.945	929.770
26	786.937	891.502
27	762.628	793.606
28	673.978	787.623
29	632.144	903.358
30	816.329	568.268
<b>Arithmetic mean</b>	<b>732.319</b>	<b>759.170</b>
Standard deviation	79.377	111.938

**Determination of the flexural strength (3-point bending strength)**
Measured parameters

Measurement geometry:	3-point-bending-equipment
Support distance:	40 mm
Roll diameter:	5 mm
Preload:	10 N
Test speed:	3000 $\mu\text{m}$ / min. (*)
Failure criterion:	75 % reduction in force $F_{\text{max}}$
Temperature:	24 °C
Humidity:	60 % rel.

(\*): The testing speed was chosen such that failure took place within a time period of 5 seconds to 15 seconds.

Table 2: Weibull statistics

	Sample "A"	Sample "B"
Number of specimens	30	30
Confidence interval [%]	90	90
<b><math>\sigma_0</math> [MPa]</b>	<b>766</b>	<b>803</b>
$\sigma_0, \text{lb}$ [MPa]	744	774
$\sigma_0, \text{ub}$ [MPa]	790	833
<b><math>M_{\text{corrected}}</math></b>	<b>10.7</b>	<b>8.7</b>
$M_{\text{corrected, lower bound}}$	8.4	6.8
$M_{\text{corrected, upper bound}}$	13.6	11.1

$\sigma_0, \text{lb}$ :  $\sigma_0$ , lower bound

$\sigma_0, \text{ub}$ :  $\sigma_0$ , upper bound

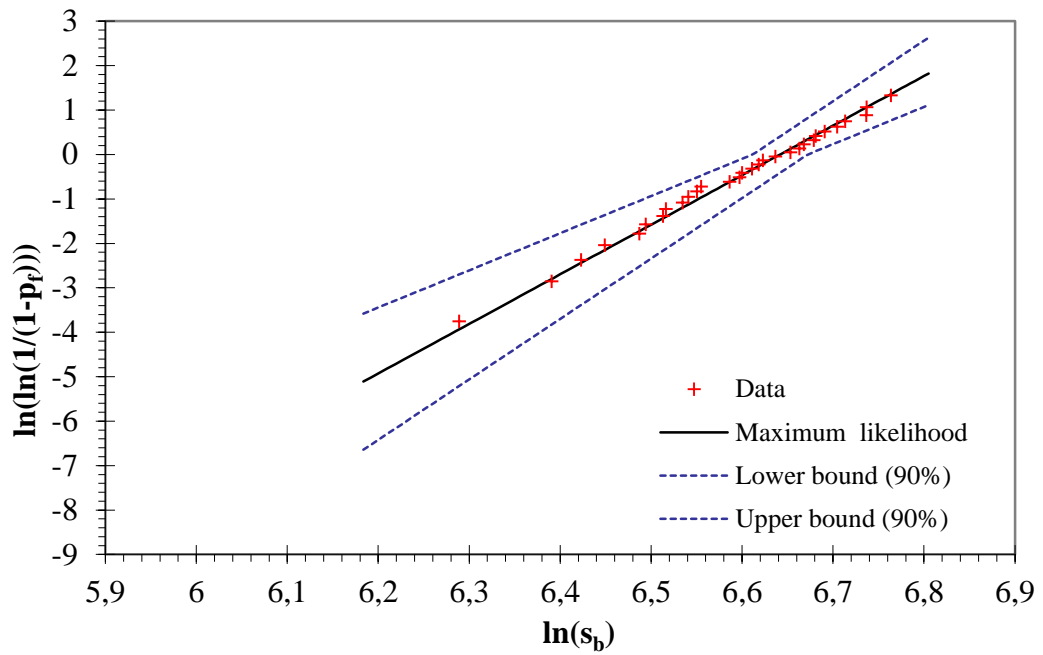


Illustration 1: Sample "A", Weibull plot.

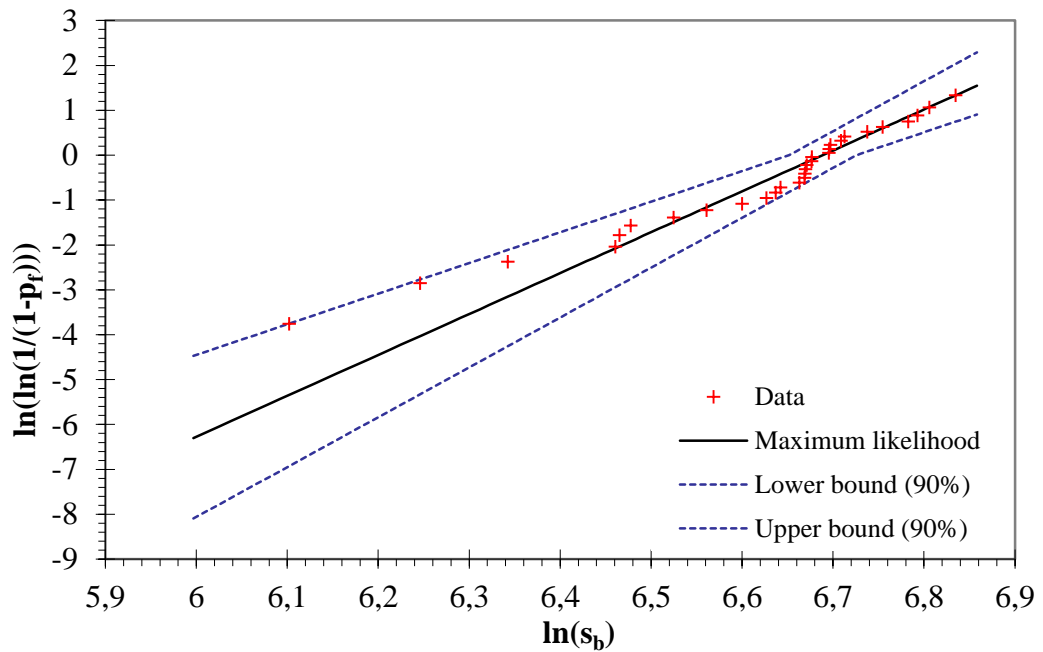


Illustration 2: Sample "B", Weibull plot.

## 7. Testing uncertainties

The total measurement uncertainty of the 3-point-bending test was calculated at 1.1 % and has been established as a combination of the single measurement uncertainty of the length measurement using a micrometer gauge and the strain measurement using a load cell.

## 8. Epilogue

All investigations were done in view of the latest scientific-technical trends and to the best of one's knowledge and belief.

The test results exclusively relate to the test specimen.

The test report consists of 6 pages.

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31.08.2015

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i.V. / p.p. Dr. Markus Pohlmann-Lortz  
Laborleiter / Laboratory Manager



Contact person for enquiries: Dr. Markus Pohlmann-Lortz.

Phone: +49 (0) 26 24/186-27

Fax: +49 (0) 26 24/186-9927

E-mail: markus.pohlmann-lortz@fgk-keramik.de