



Staatliche Materialprüfungsanstalt Darmstadt
Leitung: Prof. Dr.-Ing. C. Berger
Grafenstr. 2
64283 Darmstadt
Abteilung Metalle

TEST REPORT M 01 0363
1. Issue

Customer: HELICAL SYSTEMS LTD (in association with Brutt Saver GmbH)
The Old Police Station
195 Main Road
Biggin Hill
Kent
TN16 3JU
United Kingdom

Date of Order: 20.02.2001 Order Number: 1265-16-02.2001

Order: Tension Tests performed on Parts of "HeliTie Bar-System"

Parts tested:	Pos.	Number	Object ¹⁾
	1	10	"HeliTie Bar-System": 10 x 400 NG No. 97 E 17812
	2	10	"HeliTie Bar-System": 8 x 400 NG No. 00 E 17236
	3	10	"HeliTie Bar-System": 6 x 400 NG No. 00 E 17236
	4		various pipe segments and casting resin

¹⁾ specifications according to customer

Selection of Tested Parts: Delivered by Customer

Date of Receipt: 20.03.01 3 pages
Darmstadt 04.04.01 3 charts



Signed: Dr. Ing. R. Landgrebe
Dipl.Ing. J. Karnes

1. Tested Material

The customer provided helically-shaped, profiled parts of bars, 400 mm long and with an external diameter of 6, 8 and 10mm. According to the customer, these parts are specified as “HeliTie Bar-System” made of 1.4567 (304 Cu) and are used to repair cracks in walls and masonry. Pipe parts with inner diameters corresponding to all bar sizes and casting resin were also made available. By means of the pipe parts and the casting resin, the material to be tested had to be fixed inside a testing device and exposed to tension in order to determine tensile strength, resistance to rupture and the “rigidity module”, comparable to the E-Module, of the material.

2. Tests Performed and Results

The cross-sectional areas of the bar parts of the “HeliTie Bar-System” were determined by means of density ($7,86 \text{ g/cm}^3$), mass and length parameters of the sample material. Subsequently, the parts were filled on both ends with casting resin into segments of about 50 mm. Thus prepared, the material was then fixed inside a testing device and exposed to stress to rupture. Rigidity characteristics $R_{p0,2}$ and R_m , as well as ultimate strength (elongation) $A_{100\text{mm}}$ were determined. The “rigidity module” of the samples in relation to the cross-section was calculated between the tension limits as indicated in the charts below. The material tested, rigidity values, ultimate strength and “rigidity modules” are given in charts 1 to 3. The charts also show mean values \bar{x} , standard deviations s and the 5% - fraction values.

Chart 1: Tension Tests performed on “HeliTie Bar-System” 10x400 NG No. 97E17812

Pos.	Sample Cross Section mm^2	Elongation Limit $R_{p0,2}$ N/mm^2	Tensile Strength R_m N/mm^2	Ultimate Strength $A_{100\text{mm}}$ %	Rigidity Module Tension Limits 10 N/mm^2 to 200 N/mm^2 N/mm^2
1	13,92	670	907	--- ¹⁾	14620
2	13,77	--- ²⁾	889	3,5	--- ²⁾
3	13,83	695	902	3,0	150760
4	13,81	662	900	--- ¹⁾	142030
5	13,88	673	902	3,0	148010
6	14,04	655	918	5,5	136590
7	13,97	643	918	5,0	150310
8	13,82	644	890	--- ¹⁾	151610
9	13,81	668	897	--- ¹⁾	143510
10	13,91	696	909	5,0	149590
\bar{x}		667	903	4,24	146114
s	---	19,22	9,92	1,20	5141
$F_{5\%}$		629	883	3,44	135832

1) Sample rupture close to point of fixation

2) Elongation device on sample slipped out of place

Chart 2: Tension Tests performed on “HeliTie Bar System” 8x400 NG No. 00E17236

Pos.	Sample Cross Section mm ²	Elongation Limit Rp _{0,2} N/mm ²	Tensile Strength R _m N/mm ²	Ultimate Strength A _{100mm} %	Rigidity Module Tension Limits 125 N/mm ² to 300 N/mm ² N/mm ²
1	10,15	--- ²⁾	944	--- ¹⁾	--- ²⁾
2	10,19	796	948	--- ¹⁾	169420
3	10,24	769	939	--- ¹⁾	145850
4	10,28	791	959	4,0	151090
5	10,20	748	946	4,0	143720
6	10,23	772	950	--- ¹⁾	148500
7	10,15	755	945	4,5	143900
8	10,13	755	928	4,0	143190
9	10,14	753	935	5,5	145120
10	10,23	770	941	4,5	148530
x		768	943	4,7	148813
s	---	16,94	8,54	0,63	8171
F _{5%}		734	926	3,44	132571

- 1) Sample rupture close to point of fixation
2) Elongation device on sample slipped out of place

Chart 3: Tension Tests performed on “HeliTie Bar System” 6x400 NG No. 00E17236

Pos.	Sample Cross Section mm ²	Elongation Limit Rp _{0,2} N/mm ²	Tensile Strength R _m N/mm ²	Ultimate Strength A _{100mm} %	Rigidity Module Tension Limits 125 N/mm ² to 300 N/mm ² N/mm ²
1	8,52	772	916	--- ¹⁾	156330
2	8,36	749	900	--- ¹⁾	151600
3	8,52	793	940	--- ¹⁾	156950
4	8,55	760	922	4,5	162470
5	8,54	771	910	--- ¹⁾	153260
6	8,54	775	918	5,0	155270
7	8,57	761	911	5,0	158700
8	8,44	766	934	--- ¹⁾	158670
9	8,46	--- ²⁾	912	5,5	156590
10	8,37	775	910	--- ¹⁾	152850
x		786	917	5,12	156269
s	---	13,29	11,79	0,48	3236
F _{5%}		741	894	4,16	149797

- 1) Sample rupture close to point of fixation
2) Elongation device on sample slipped out of place