

Test report no.: 69431/05-III

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ITALY

Order: Determination of tensile creep-rupture behaviour according to
EN ISO 13431 on the geogrid "ARTER® GTS 30-30-30 tipo 265"

Letter of: 2005-07-21 **Ref:** Luciano Gabino.
Sample received: 2005-08-02 **Sample taken:** -
Test period: 2005-08-04 till 2007-06-08


This test report comprises 6 pages.

Würzburg, 2007-06-25

Za/Nem/mo

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Clamps:	Capstan, Ø 34 mm (specimens with 3 tensile elements) and capstan, Ø 110 mm (specimens with 7 tensile elements)
No. of tensile elements per specimen:	3 (MD) and 7 (MD)
Condition of the specimens:	dry
Number of specimens:	5 in machine direction (MD)
"Free length" of the specimens:	140 mm (specimens with 3 tensile elements), 275 mm (specimens with 7 tensile elements) (distance of rollers from centre to centre)
Preload:	25 N (specimens with 3 tensile elements) 60 N (specimens with 7 tensile elements)
Strain rate:	(20 ± 5) %/min
Strain measurement:	cross head position transducer

3.2 Tensile creep-rupture tests

The tensile creep-rupture tests were carried out according to EN ISO 13431: 1999 "Geotextiles and geotextile-related products - Determination of tensile creep and creep rupture behaviour".

The following test parameters have been submitted:

Loading equipment:	Steel weights, applying a lever
Clamps:	Capstan, Ø 34 mm
Specimen width:	90 mm (3 tensile elements)
"Free length" of the specimens:	140 mm (distance of rollers from centre to centre)
Number of specimens:	16 in MD
Pre-load:	< 1 % of maximum tensile force
Load:	76 %, 75 %, 72 %, 65 % and 60 % of the average maximum tensile force
Time for applying the total load:	< 60 s
Climate:	(20 ± 2) °C, (65 ± 5) % relative humidity



4 Test results

The test results are summarised in table 1 till 3 and in figure 1.

Table 1: Tensile properties; geogrid "ARTER® GTS 30-30-30 tipo 265", MD, 3 tensile elements

Characteristics	Unit	Test method	Result	
			3 tensile elements	
			\bar{x}	v
Maximum tensile force	kN	DIN EN ISO 10319	2.76	5.2%
Tensile strength	kN/m		31.3	5.2%
Strain at maximum tensile force	%		10.1	7.1%

\bar{x} = arithmetic mean value, v = coefficient of variation

Table 2: Tensile properties; geogrid "ARTER® GTS 30-30-30 tipo 265", MD, 7 tensile elements

Characteristics	Unit	Test method	Result	
			7 tensile elements	
			\bar{x}	v
Maximum tensile force	kN	DIN EN ISO 10319	6.80	4.8%
Tensile strength	kN/m		33.0	4.8%
Strain at maximum tensile force	%		9.1	3.9%

\bar{x} = arithmetic mean value, v = coefficient of variation



Table 3: Tensile creep-rupture behaviour; geogrid "ARTER® GTS 30-30-30 tipo 265", MD

Nr.	Load in % of average maximum tensile force	Test method	Time to rupture in h
1	76	EN ISO 13431	0.5
2	75		58
3	72		107
4	72		2516
5	72		135
6	72		933
7	65		7328
8	65		14544 ²⁾
9	65		315
10	60		13927
11	60		13537 ²⁾
12	75 ¹⁾		1688
13	75 ¹⁾		0.5
14	75 ¹⁾		1.4
15	75 ¹⁾		1.9
16	72 ¹⁾		33
17	72 ¹⁾		6552 ²⁾
18	72 ¹⁾		36

¹⁾ related to the tensile strength of the same tensile elements, used for the tensile creep rupture test

²⁾ test was interrupted



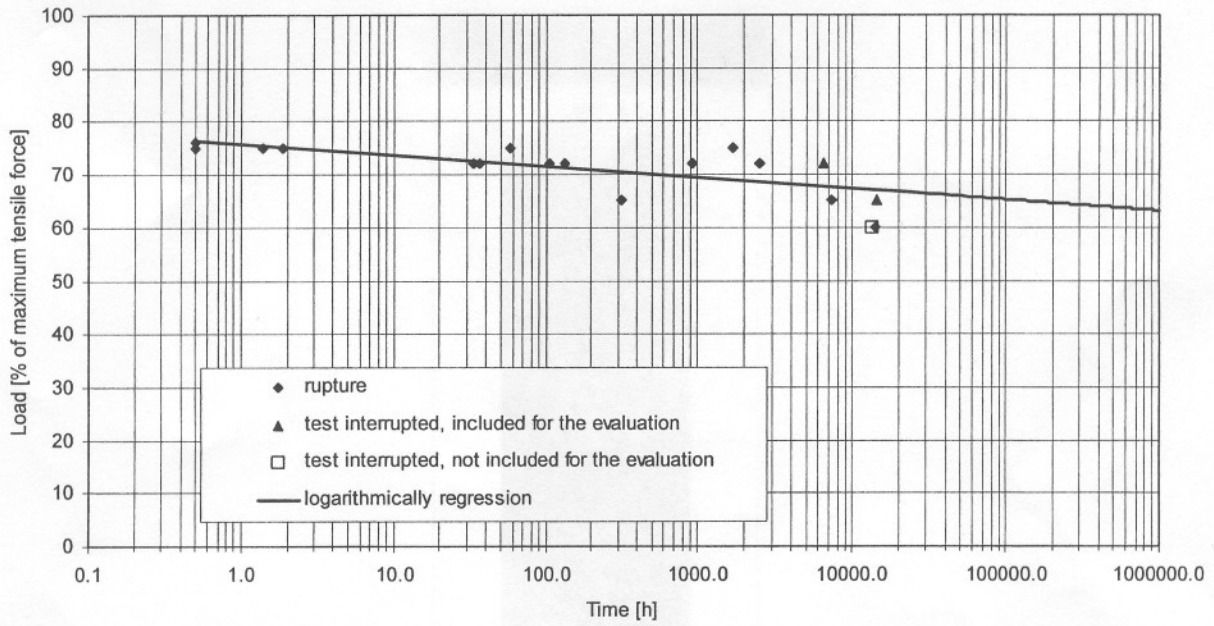


Figure 1: Tensile creep-rupture diagram; geogrid "ARTER[®] GTS 30-30-30 tipo 265", MD

Table 4: Regression line

Equation for the regression line (Figure 1)	Load [% of maximal tensile force] = $-0.91 \cdot \ln(\text{Time [h]}) + 75.7$
Load for 10^6 h (114 years) lifetime	63 % of maximal tensile force

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