Tensar technical note
TN_PR_Triax_TX_150/18.02.10

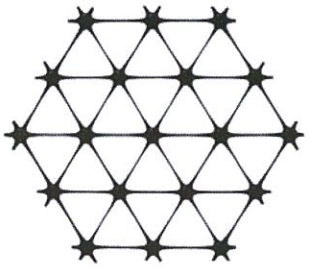
Performance-related Product Specification
Tensar TX 150 geogrid

Tensar INTERNATIONAL

General

1. The geogrid is manufactured in accordance with a management system which complies with the requirements of BS EN ISO 9001:2008.
2. The geogrid is manufactured from a punched polypropylene sheet, which is then oriented in three equilateral directions so that the resulting ribs of the triangular apertures have a high degree of molecular orientation which continues through the mass of the integral node.
3. The properties contributing to the performance of a mechanically stabilised layer are:

Tensar TriAx Geogrid



Geometrical	Longitudinal	Diagonal	Transverse	General
Rib pitch (mm)	40	40	-	
Mid-rib depth (mm)	-	1.4	1.1	
Mid-rib width (mm)	-	1.0	1.2	
Nodal thickness (mm)				3.0
Rib shape				rectangular
Aperture shape				triangular
Mechanical				
Junction efficiency (%) [1,8]				90
Isotropic stiffness ratio [2,7]				>0.75
Mean radial secant modulus at low strain (kN/m @ 0.5% strain)[2,9]				390±90
Durability				
Resistance of chemical degradation[3]				96%
Resistance to weathering[4]				98%
Resistance to oxidation				90%
Resistance to installation damage[5]				>87%

Notes

1. Load transfer capability determined in accordance with GRI-GG2 and GRI-GG1 and expressed as a percentage of ultimate tensile strength.
2. Stiffness, (secant modulus), is determined in a test conducted in any in-plane direction and which records the maximum and minimum values when tested in accordance with ISO 10319:1996
3. Resistance to loss of load capacity when subjected to chemically aggressive environments in accordance with testing to EN12960 as part of a durability assessment in accordance with ISO13434:1999 7.3
4. Resistance to loss of load capacity when subjected to ultra-violet light and weathering in accordance with testing to EN12224 as part of a durability assessment in accordance with ISO13434:1999 7.2
5. Resistance to loss of radial stiffness when subjected to the effects of installation from a graded engineering fill. The procedure is in accordance with BS 8006:1995 and the radial stiffness is derived as in Note 2.
6. All geometrical and durability values are quoted as typical.
7. Declared as the ratio between the minimum and maximum value on a sample at the 95% confidence limit.
8. Declared at 95% confidence limit.
9. Declared at mean ± standard deviation

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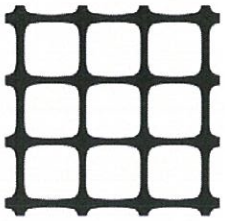
BSI EMS 86463 ISO 14001:2004 BSI Q 05288 ISO 9001:2008

Tensar technical note
TN_PR_SS20/08.01.10

Performance-related Product Specification Tensar SS20

Tensar INTERNATIONAL

Tensar Biaxial Geogrid



General

1. The mechanical stabilisation element shall be a geogrid manufactured in accordance with a management system which complies with the requirements of BS EN ISO 9001:2000 and BS ISO 14001:2004. If required by the Engineer, the Contractor shall provide evidence of the manufacturer's certification of its Quality Assurance System and the Environmental Management System.
2. The mechanical stabilisation element shall be a geogrid manufactured from a punched polypropylene sheet, which is then oriented in two directions so that the resulting ribs shall have a high degree of molecular orientation, which continues through the mass of the integral node.
3. The properties identified as having a contribution to the performance of a mechanically stabilised layer are:

Geometrical	**Longitudinal**	**Transverse**	**General**
Rib pitch (mm)	39	39	
Mid-rib depth (mm)	1.1	0.8	
Mid-rib width (mm)	2.2	2.4	
Nodal thickness (mm			4.1
Rib shape			rectangular
Mechanical			
Junction efficiency[1] (%) (min)	95	95	
Aperture stability[2] (N.mm/deg) (min)			410
Radial stiffness at low strain[3] (kN/m @ 0.5% strain)			150
Durability			
Resistance of chemical degradation[4]			100%
Resistance to ultra-violet light and weathering[5]			100%
Resistance to installation damage[6]			>90%

Notes

1. Load transfer capability determined in accordance with GRI-GG2-87 and GRI-GG1-87 and expressed as a percentage of ultimate tensile strength.
2. In-plane torsional rigidity measured in accordance with U.S. Army Corps of Engineers Methodology for measurement of Torsional Rigidity, (Kinney, T.C. Aperture Stability Modulus rev 3.1.2000).
3. Radial stiffness is determined from tensile stiffness measured in any in-plane axis and derived from testing in accordance with ISO 10319:1996.
4. Resistance to loss of load capacity when subjected to chemically aggressive environments in accordance with testing to EN12960 as part of a durability assessment in accordance with ISO13434:1999 7.3
5. Resistance to loss of load capacity when subjected to ultra-violet light and weathering in accordance with testing to EN12224 as part of a durability assessment in accordance with ISO13434:1999 7.2
6. Resistance to loss of load capacity or structural integrity when subjected to mechanical installation stress in crushed stone classified as poorly graded gravel (GP). The geogrid shall be sampled in accordance with BS 8006:1995 and load capacity shall be determined in accordance with ISO 10319:1996.
7. All dimensions are typical unless otherwise stated

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BSI EMS 86463 ISO 14001:2004 BSI Q 05288 ISO 9001:2008

GEO PP TC nõeltöötlusega, kuumkalandeeritud kõrge venivusega polüpropüleen geotekstiil, UV-kindel

TOODE			TC 100	TC 120	TC 140	TC 150	TC 160	TC 180	TC 200	TC 220	TC 250	TC 280	TC 300	TC 330	TC 350	TC 400	TC 500	TC 700
	Standard	**Ühik**																
Füüsikalised omadused																		
Kaal	EN ISO 9864	g/m^2	100	120	140	150	160	180	200	220	250	280	300	330	350	400	500	700
Paksus 2 kPa koormuse juures	EN ISO 9863-1	mm	0,65	0,65	0,75	0,8	0,9	0,95	1,0	1,1	1,2	1,25	1,45	1,5	1,6	1,9	2,1	3,0
Mehaanilised omadused																		
Tõmbetugevus MD	EN ISO 10319	kN/m	6,0	7,5	9,5	10,0	11,0	13,0	14,0	16,0	19,0	21,0	22,0	24,0	26,0	29,0	34,0	45,0
Tõmbetugevus CMD	EN ISO 10319	kN/m	6,0	7,5	9,5	10,0	11,0	13,0	14,0	16,0	19,0	21,0	22,0	24,0	26,0	29,0	39,0	50,0
Venivus MD	EN ISO 10319	%	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Venivus CMD	EN ISO 10319	%	60	70	65	65	60	60	60	60	60	60	60	60	60	60	60	50
Staatiline läbilöök (CBR katse)	EN ISO 12236	N	1100	1300	1600	1650	2000	2250	2600	2900	3300	3500	3700	4300	4500	5300	6000	8400
Dünaamiline perforatsioon (koonuse katse)	EN 918	mm	33	31	29	28	27	26	23	22	20	17	15	14	13	10	7	0
Hüdraulilised omadused																		
Kiiruse indeks	EN ISO 11058	m/s	0,086	0,075	0,070	0,065	0,060	0,050	0,040	0,040	0,035	0,027	0,025	0,015	0,015	0,014	0,010	0,005
Normaalläbilaskvus	EN ISO 11058	$l/(s\ m^2)$	86	75	70	65	60	50	40	40	35	27	25	15	15	14	10	5
Permitiivsus	EN ISO 11058	s^{-1}	1,72	1,50	1,40	1,30	1,20	1,00	0,80	0,80	0,70	0,54	0,50	0,30	0,30	0,28	0,20	0,10
Läbilaskevõime alla 20 kPa	EN ISO 12958	$m^2/s \times 10^{-6}$	0,45	0,50	0,85	1,0	1,2	1,2	1,2	1,2	1,3	1,4	1,4	1,4	1,5	1,6	1,6	1,7
Veevool pinnases (20 kpa, i=1)	EN ISO 12958	l/(m h)	1,8	1,8	3,2	3,6	4,3	4,3	4,3	4,3	4,7	5,0	5,0	5,0	5,4	5,8	5,8	6,1

Kestvus	EN 12224	Tuleb katta ühe kuu jooksul pärast paigaldamist. Arvatav vastupidavus üle 25 aasta looduslikus pinnases PH tasemega 4<ph<9 ja pinnase temperatuuril < 25 °C	
Oksüdeerumisvastupidavus	ENV ISO 13438	Säilitatav tugevus	MD 100% CMD 100%
Keemiline vastupidavus	EN 14030	Säilitatav tugevus	MD 100% CMD 99%
Mikrobioloogiline vastupidavus	EN 12225	Säilitatav tugevus	MD 90% CMD 99%
Geotekstiilid tsiviilehituse jaoks GEO PP TC geotekstiile saab kasutada ehitustöödel eraldamiseks, filtreerimiseks, drenaažiks, kaitseks ja tugevduseks. Kõik tooted on UV-kindlad.	**Kvaliteedijuhtimine:** **Geo&Tex 2000 tootekontroll on sertifitseeritud CE-markeeringu tasemega 2+** CE **0799-CPD-15** **Kvaliteedisüsteem on sertifitseeritud vastavalt rahvusvahelisele kvaliteedijuhtimissüsteemile EN ISO 9001:2000**		Peamised sertifikaadid: ASQUAL (Prantsusmaa) RVS (Austria) NorGeoSpecs 2002 (Skandinaavia turg)

Tehniliste väärtuste kohal on keskmised väärtused, mis põhinevad toodangul läbiviidud mõõtmistel ja sõltumatute uurimisasutuste poolt läbiviidud testi tulemustel

MD (machine direction) - masina pikitelje suunaline
CMD (cross machine direction) - risti masina pikitelje suunaga

NOTIFIED BODY No. 1023
Institute for Testing and Certification, Inc., Zlin, Czech Republic

Certificate of Factory Production Control

No. 1023 – CPD – 0073 F/e

issued in the compliance with the Directive 89/106/EEC as subsequently amended, whose requirements are implemented by the Czech Government Order No. 190/2002 Coll., in the wording of subsequent amendments, certifies that the construction product

EUROBENT, LANDOBENT, ViaBent, Bentotex, STRATEC, BENTOPROOF, MACLINE, BENFELT, ONETEX
– Geosynthetic Barriers, type „GBR-C"

introduced on the market by company

EUROBENT Sp. z o.o.
ul. Kliczkowska 42, 58-100 Świdnica, Poland
NIP: PL8842651736

and produced in the factory

EUROBENT Sp. z o.o.
ul. Kliczkowska 42, 58-100 Świdnica, Poland

is submitted by the manufacturer to initial type-testing and to the factory production control (FPC) and to the further testing of samples taken at the factory in accordance with a prescribed test plan and there are fulfilled all provisions concerning the management and attestation of FPC, as they are stated in the Annex ZA of the harmonized technical standards:

ČSN EN 13361+A1:2007 "Geosynthetic barriers – Characteristics required for use in the construction of reservoirs and dams"
ČSN EN 13362:2005 "Geosynthetic barriers – Characteristics required for use in the construction of canals"
ČSN EN 13491+A1:2007 "Geosynthetic barriers – Characteristics required for use as a fluid barrier in the construction of tunnels and udergrounds structures"
ČSN EN 13492+A1:2007 "Geosynthetic barriers – Characteristics required for use in the construction of liquid waste disposal sites, transfer stations or secondary containment"
ČSN EN 13493:2005 "Geosynthetic barriers – Characteristics required for use in the construction of solid waste storage and disposal sites"

The Notified Body No. 1023 has performed the initial inspection of the factory and of the factory production control and performs the continuous surveillance, assessment and approval of the FPC according to Article 13, paragraph 3, item b) of the Directive 89/106/EEC. The detailed product descriptions, assessment procedures and inspections results including their evaluation are presented in the ITC's Final Report No. **753500624/2011**.
This Certificate remains valid as long as the referred harmonized standard, manufacturing conditions or the FPC are not modified. The validity of the Certificate is also contingent on the positive results of the surveillance inspections.

CE

Issued in Zlín on **30th June 2008**
Revision /e: **3rd August 2011**

RNDr. Radomír Čevelík
Representative of the Notified Body No. 1023

(Replaces the withdrawn certificate No. 1023 – CPD – 0073 F/d issued on 17th December 2010)

NOTIFIED BODY No. 1023
Institute for Testing and Certification, Inc., Zlín, Czech Republic

Certificate of Factory Production Control

No. 1023 – CPD – 0295 F

issued in the compliance with the Directive 89/106/EEC as subsequently amended, whose requirements are implemented by the Czech Government Order No. 190/2002 Coll., in the wording of subsequent amendments, certifies that the construction product

EUROBENT CS – Geosynthetic Barriers, type „GBR-C" completed with sheet for waterproofing

introduced on the market by company
EUROBENT Sp. z o.o.
ul. Kliczkowska 42, 58-100 Świdnica, Poland
NIP: PL8842651736

and produced in the factory
EUROBENT Sp. z o.o.
ul. Kliczkowska 42, 58-100 Świdnica, Poland

is submitted by the manufacturer to initial type-testing and to the factory production control (FPC) and to the further testing of samples taken at the factory in accordance with a prescribed test plan and there are fulfilled all provisions concerning the management and attestation of FPC, as they are stated in the Annex ZA of the harmonized technical standards:

ČSN EN 13361+A1:2007 "Geosynthetic barriers – Characteristics required for use in the construction of reservoirs and dams"
ČSN EN 13362:2005 "Geosynthetic barriers – Characteristics required for use in the construction of canals"
ČSN EN 13491+A1:2007 "Geosynthetic barriers – Characteristics required for use as a fluid barrier in the construction of tunnels and udergound structures"
ČSN EN 13492+A1:2007 "Geosynthetic barriers – Characteristics required for use in the construction of liquid waste disposal sites, transfer stations or secondary containment"
ČSN EN 13493:2005 "Geosynthetic barriers – Characteristics required for use in the construction of solid waste storage and disposal sites"
ČSN EN 13967+A1:2007 "Flexible sheets for waterproofing - Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet"

The Notified Body No. 1023 has performed the initial inspection of the factory and of the factory production control and performs the continuous surveillance, assessment and approval of the FPC according to Article 13, paragraph 3, item b) of the Directive 89/106/EEC. The detailed product descriptions, assessment procedures and inspections results including their evaluation are presented in the ITC's Annual inspection Report No. **343502689/2010** that is an integral part of this Certificate.
This Certificate remains valid as long as the referred harmonized standard, manufacturing conditions or the FPC are not modified. The validity of the Certificate is also contingent on the positive results of the surveillance inspections.

CE

Issued in Zlín, on December 17th 2010

INSTITUTE FOR TESTING AND CERTIFICATION NOTIFIED BODY 1023

RNDr. Radomír Čevelík
Representative of the Notified Body No. 1023

Eurobent

Technical Data

Eurobent 4000

CE
1023-CPD-0073F

Mechanically bonded composite, consisting of pulverized or granulated bentonite, embedded and fixed between two layers of geotextile.

Mass per unit area (average)

Carrier Layer	PP Woven	100 g/m²
Inlay	Na-Bentonite	4,000 g/m²
Cover Layer	PP Nonwoven	215 g/m²
Total Product Weight		4,315 g/m²

Bentonite Properties

Montmorillonite Content		> 75%
Swelling Capacity	ASTM D 5890	> 24 ml/2g
Water Absorption Capacity	DIN 18132	> 450%
Moisture Content		max. 12%

Physical Properties of the Composite

Thickness (dry)			5.5 mm
Index Flux		ASTM D 5887	< 2.0×10^{-9} m³/m²/s
Permeability		ASTM D 5887-99	< 1.2×10^{-11} m/s
Tensile Strength	MD CD	EN ISO 10319	10.4 kN/m 8.5 kN/m
CBR Puncture Strength		EN ISO 12236	1.8 kN

Standard Roll Dimensions

Length / Width	40 m / 5 m

These data are average values derived from standard tests and are subject to usual product variation.
The right is reserved to make changes without notice at any time.

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AS TEEDE TEHNOKESKUS
LABORATOORIUM

TEHNOKESKUSE LABORATOORIUM
AS TEEDE TEHNOKESKUS
DOKUMENDI ORIGINAAL

Akrediteeritud L036

LAASERI PUIT OÜ
Märjamaa vald, Varbola
78203 RAPLAMAA

26.07.11 nr 3-7/3166

Katseprotokoll nr 1614/11

Tellija: LAASERI PUIT OÜ – hr Raivi Laaser

Töö ülesanne: Mustu karjäärist võetud purukruusa fr 0/63 mm katsetamine.

Proovide kirjeldus: Proov võeti 21.07.11 kell 14.00 ja toodi laborisse katsetamiseks samal päeval tellija esindaja poolt.

Laboris registreeriti proov registreerimisnumbriga 2417.

Katsetamine ja tulemused: * - Eesti Akrediteerimiskeskuse poolt akrediteerimata katse.
Los Angelese katse jaoks vajamineva fraktsiooni saamiseks purustati proov eelnevalt laboratoorses lõugpurustis.

Jrk nr	Omadus	Katsemeetod	Proovi		Katsetamise		Tähis
			nr	fr mm	fr mm	tulemus	
1.	Peenosiste sisaldus	EVS-EN 933-1:2007 (pesemine ja sõelumine)	2417	0/63	-	3,0 %	f
2.	Filtratsioonimoodul	*Sojuzdornii meetod	2417	0/63	0/5	1,8 m/ööp	-
3.	Purunemiskindlus Los Angelese katsel	EVS-EN 1097-2:2010	2417	0/63	10/14	29	LA

4. Terakoostis EVS-EN 933-1:2007 (pesemine ja sõelumine) järgi:

reg. nr	Läbib sõela ava (mm) massi %-des											
	63	31,5	16	12,5	8	6,3	4	2	1	0,5	0,25	0,125
2417	100	72	53	49	43	40	36	32	27	17	8	4

Saadud tulemused kehtivad ainult kirjeldatud proovide kohta.

Vastutav teostaja: Labori peaspetsialist Märt Hain

Protokolli osaliseks kopeerimiseks tuleb taotleda labori kirjalik luba.
Labor väljastab ainult värvilise templiga katseprotokolle.

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METROSERT SERTIFITSEERITUD / CERTIFIED ISO 9001