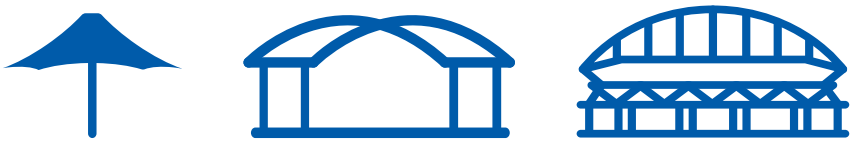
MakMax Australia

MakMax Australia
PVC Sustainability Statement
2022



MakMax Australia believes that operating in a sustainable, responsible manner is an important business practice. We are conscious of our responsibility to the environment and ensure our people are engaged with our environmental protection processes. We are committed to continually improving our systems and performance and our environmental management system is certified to ISO 14001.

In addition our own Environmental Policy, we are proud to partner with Mehler Texnologies through the use of their PVC Membrane Products.

Sustainability Statement:

- MakMax Australia fabricates our membrane structures in Australia in an ISO 14001 approved facility.
- MakMax Australia uses Mehler Texnologies PVC membranes, which are manufactured in Germany according to ISO 14025 and EN 15804.
- Mehler Texnologies PVC product is produced with PES and PVC and is recyclable.
- Mehler Texnologies PVC product is REACH compliant (Registration, Evaluation and Authorisation of Chemicals).
- Mehler Texnologies manufacture their product under an EPD (environmental product declaration); Product Category Technical Textiles, 04-2013
- Mehler's Australian representatives work closely with the STA & VCA's joint initiative (Texback).

Documentation

MakMax Australia
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133 Lavarack Avenue, Eagle Farm, Queensland, Australia 4009

Environmental Policy

The Management of Taiyo Membrane Corporation Pty Ltd and MakMax Australia ("the Company") has adopted a policy to manage the environmental impacts of the Company's activities to minimise the adverse effects of these activities on the environment.

The Company designs, fabricates and constructs the world's best tensile membrane products and is based in Brisbane and Sydney, servicing both the overseas and domestic market.

The commitment is to maintain an Environmental Management System (EMS) which will cover the activities of the Company. The EMS will enable the Company to:

- Conform to all Legislative Regulations and Guidelines
- Carry out its activities in an environmentally responsible manner
- Comply to the requirements of ISO14001:2015
- Maintain a policy of continuous improvement
- Have documented Objectives & Targets that are subject to regular reviews

The Company's environmental objectives are regularly updated through continuous assessments through established programs, audits, reviews and feedback to assess opportunities for improvements at all levels.

The Company is committed to protecting the environment, including the prevention of pollution from all aspects of its operation.

The implementation of this policy will be the responsibility of the Company Quality/Environmental representative who will be given adequate resources and authority to implement the policy.

The employees will be instructed in the intent and implementation of this policy.

This policy is a public document that will be displayed at the Company's office and made available to all interested parties.

Signed: ……

Yoshitaka Inuzuka Reviewed: 05/09/21

Managing Director

Document Name: IMS_POL_002_Environmental Policy

Version No: 11/18

Technical datasheet No.: **1885.5**

Product: **VALMEX®** VALMEX® FR 700 MEHATOP N - TYPE I

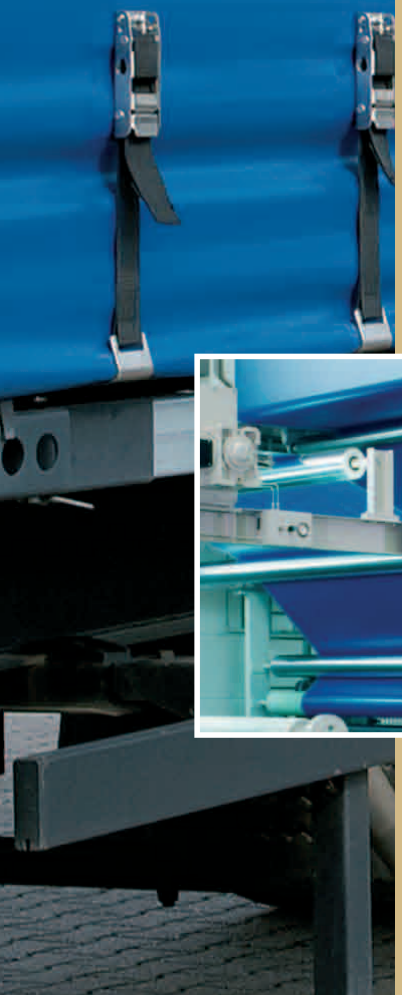
Article No.: 7205 5256

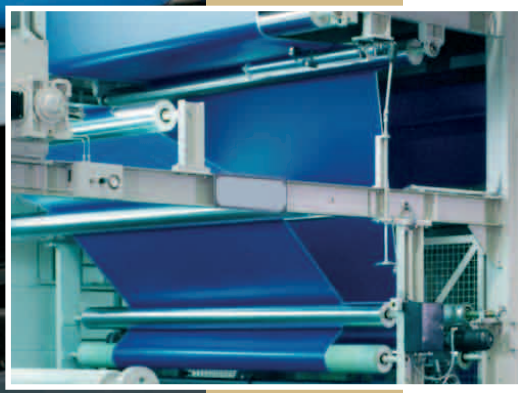
Type of coating and finish				
Type of coating	**PVC**			
Finish	**Nanopolymered fluorinated lacquer, Multi-composed PVDF-lacquer system on both sides, antimicrobial, UV-protected, low-wick, Titaniumdioxide (TiO2) front side primer**			
Burning behaviour	**BS 7837, California T 19, D.M. 26.06.84 (UNI 9177): CL. 2, DIN 4102: B1, NFP 92507: M2, SIS 650082, EN 13501-1: B-s2-d0, ASTM E 84 Class A**			
for Burning behaviour	**always check validity of fire certificate, also check country-specific validity**			
Total weight		**700**	g/m²	EN ISO 2286-2
Tensile strength warp/weft		**3000 / 3000**	N/50 mm	EN ISO 1421/V1
Tear strength warp/weft		**300 / 300**	N	DIN 53363
Adhesion		**20**	N/cm	PA 09.03 (intern)
Cold resistance.		**-40**	°C	EN 1876-1
High Temperature		**+70**	°C	PA 07.04 (intern)
Light fastness		**>6**	Note, Value	EN ISO 105 B02
Crack resistance	no cracks	**100000 x**		DIN 53359 A
Base fabric				
Material		**PES low-wick**		DIN EN ISO 2076
Yarn count		**1100**	dtex	DIN EN ISO 2060
Weave		**L 1/1**		ISO 3572
Remarks	**weldable without grinding and with common welding equipment, All values and Tio2 content related to standard white colour**			
Contact angle water		**100**	°	DIN 55660-2
Polar surface energy		**0**	mN/m	DIN 55660-2

These indicated technical data are based on average results. Due to production procedures deviations up to -5% can occur. All technical data are in accordance with the present standard of knowledge and give product information without legal binding. All data apply to new products. Applications suggested do not release the customer to test material for its intended application.

VL/LB:

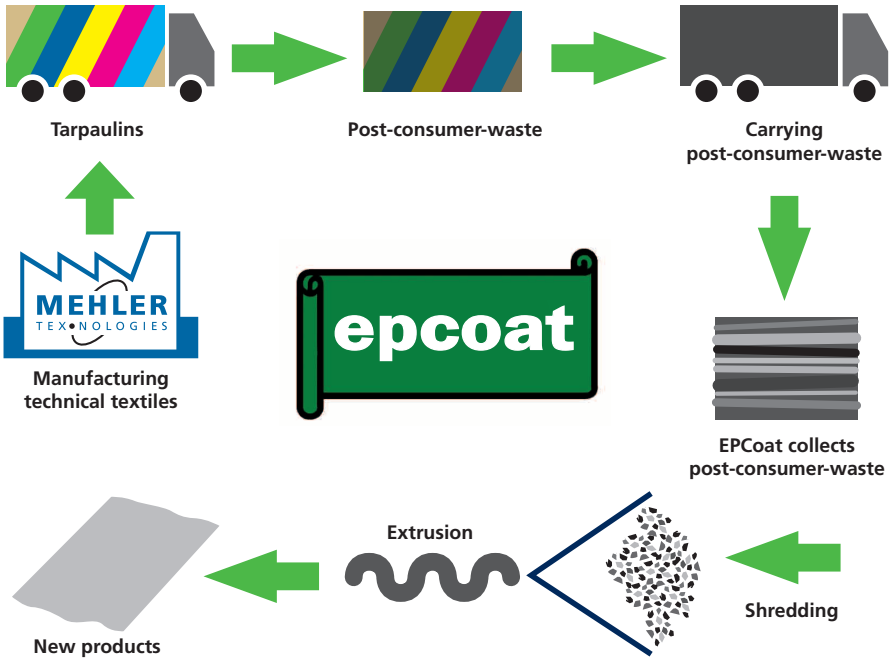
Technical Textiles





Mehler Texnologies recycling activities

As part of the company's eco-care programme, Mehler Texnologies is actively involved in the 'voluntary commitment of the PVC industry' through VinylPlus.
The company's membership of the IVK (Plastic Films Industry Association) gives Mehler Texnologies access to its EPCoat collection and recycling project. Through the EPCoat project post-consumer waste is gathered together, mechanically processed and made by thermo-physical means into new products.



You will find more in-depth information on VinylPlus at www.vinylfoundation.com. Via the 'Contributors' button you can learn more about what is required of VinylPlus partner companies, of which Mehler Texnologies is one.

MEHLER TEXNOLOGIES

Mehler Texnologies GmbH

Rheinstrasse 11 · D-41836 Hückelhoven
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REACH Compliance

REACH-compliant tarpaulins, membranes and print substrates of IVK member companies – because quality means safety!

The primary goal of the REACH regulation ((EC) no. 1907/2006) is to secure a high degree of protection for human health and the environment. The IVK member companies (Coaters Working Group) support this goal and work towards its active implementation. Because quality means safety, the IVK supports the observance of the REACH regulation in the production of PVC tarpaulins, membranes and print substrates.

In keeping with the principle of manufacturer responsibility, the IVK companies exclusively employ substances or substances in mixtures that suppliers have previously registered as REACH conform with ECHA (European Chemicals Agency), or that have been approved for the respective use.

The purchase of REACH-conform tarpaulins, membranes and print substrates provides you, our customers, with safety and security in various different forms:

- **Disposal safety:**
  Preregistered substances can be traced and recycled accordingly – without unpleasant surprises when analysed by disposal companies.

- **Environmental and health protection:**
  As a rule, the products of the IVK companies contain no candidate substances in a quantity of more than 0.1 mass percent. exceptions, which are currently unavoidable under the present state-of the-art, are indicated in accordance with the REACH regulation.

- **Occupational health and safety:**
  No hidden chemicals are released in the processing (e.g. welding) of the materials.

- **Health protection:**
  MAC (Maximum Allowable Concentrations) are not exceeded by „unknown", unregistered substances.

ALL COMPONENTS REACH COMPLIANT

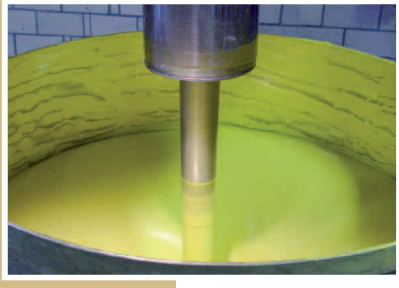
Registration, **E**valuation and **A**uthorisation of **Ch**emicals

- **Communication of use in the supply chain:**
  The IVK companies communicate with all those concerned in the supply chain, in a timely manner, regarding the utilisation of the respective substance, in order to ensure that all substances are registered in all applications. This occurs in colla boration with the PEST (Plastics Exposure Scenario Team) project, in whose development the IVK companies were actively involved.

- **Legal security for downstream users (and their customers):**
  In their terms of delivery and general terms and conditions the IVK members have committed themselves to only supply legally-conform - i.e. REACH-conform substances and preparations to their customers.

With REACH, the responsibility for the secure handling of substances, preparations and products is handed to the industry. REACH-conformity is decisive in the selection of suppliers.

So choose products that offer you the necessary security and safety – with tarpaulins, membranes and print substrates from IVK member companies.



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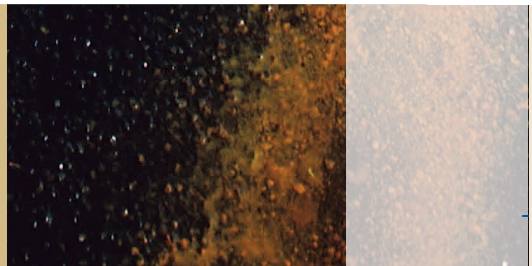
Technical Textiles

MEHLER eco-care

Our commitment to environmental responsibility and sustainability

MEHLER TEXNOLOGIES



Responsible for future generations

Our actions today determine our life tomorrow

The responsible way in which the company deals with energy and resources, its use of environmentally sustainable materials and its activities related to the recycling of coated textiles have been bundled by Mehler Texnologies under one all embracing label.

MEHLER eco-care

The Mehler eco-care concept accompanies Mehler products throughout their entire lifecycle, including the incorporation of ecological criteria in the selection of raw materials, the use of environmentally friendly production processes, sending waste to recycling systems and the utilisation of recyclable packaging materials.

As a company that is conscious of its responsibility for acting in an environmentally compatible manner, Mehler Texnologies is involved in a range of activities related to recycling and to preserving resources.

These break down at Mehler Texnologies into three areas:
1. Participation in external recycling systems
2. In-house recycling
3. Sustainable production

Perserving a healthy environment

Participation in external recycling systems

Via membership of trade associations and cooperative ventures, Mehler Texnologies uses a variety of instruments for the processing and re-utilisation of waste.

- The company's membership of the IVK (Plastic Films Industry Association) opens up access to existing and proven recycling systems.

- Via the EPCoat collection system post-consumer waste is gathered together, mechanically processed and made by thermo-physical means into new products.

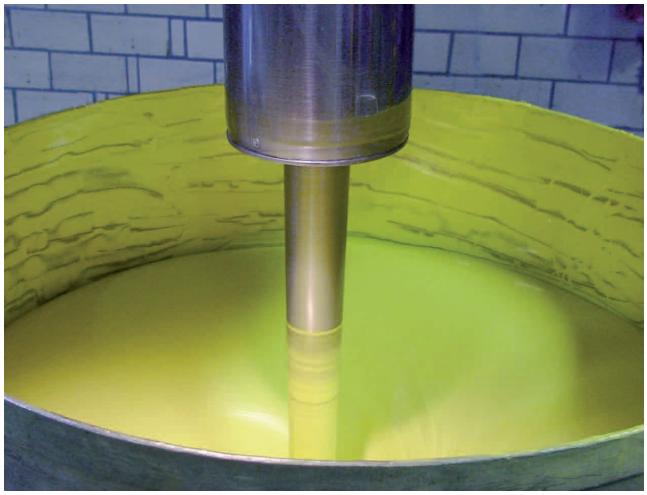
- Mehler Texnologies is participating in VinylPlus. VinylPlus puts into practice the 'voluntary commitment of the PVC industry' made up of PVC manufacturers and processors of products with a PVC content. This commitment covers the entire lifecycle of PVC and PVC products and represents for Mehler Texnologies a set of guidelines for acting in a sustainable manner. The company is also participating in technical improvements and scientific solutions being developed by the PVC industry.

The activities mentioned above are for Mehler Texnologies instruments that enable the company to meet, over and above the requirements of the EU Commission and EU directives, its responsibility for acting in an environmentally conscious manner.

Saving natural resources

In-house recycling

Mehler Texnologies aims to recycle as high a percentage as possible of waste caused by the company's production operations. This waste consists on the one hand of base materials, such as textiles and pastes, and on the other of residual waste from finished products.



Waste created during paste production and residual paste from coating operations is processed and made into products again. The 'eco-sheets' produced in this way get used as tarpaulin. The leftover paste is also used to coat textile remnants, which – depending on the underlying textile – can be used in many different ways. What is key is that each production site recycles exclusively the residual materials generated there. Transport costs and unnecessary gas emissions are thus avoided.

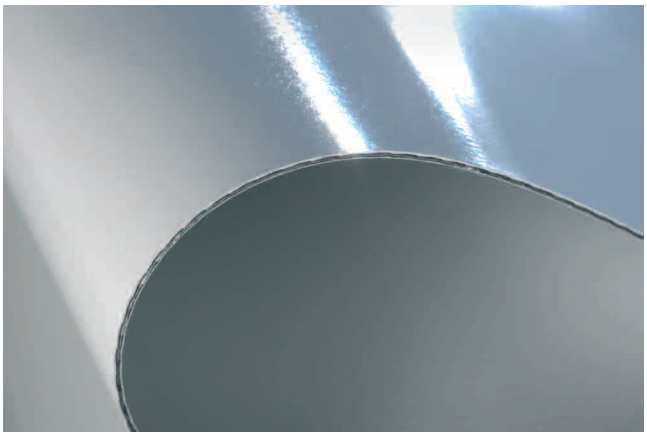
A development project is currently being run at Mehler Texnologies based on mechanically processing residual materials from finished products and making this into new products.

Developing sustainable materials

Investing in a secure future

Over recent years, Mehler Texnologies has invested millions of euros into the purification of waste gases in order to continually reduce CO_2 emissions. Circulation flows have also been developed to utilise thermal energy created during the production process and thus to reduce the consumption of gas and electricity.

In the company's production operations Mehler Texnologies uses only approved components geared, amongst other things, to the new REACH European chemical regulations. All Mehler Texnologies products are free of DOP and of all comparably classified emollients, monomers and other components not permitted in Europe. In order to continue in the future to produce high quality materials free of any harmful substances Mehler Texnologies is carrying out research and tests in its laboratories on substitutions of ecologically and economically relevant raw materials.



Research projects have also been set up for developing new technical textiles. Several of these are being run in collaboration with a number of prestigious institutes. High priority is given in these projects to aspects of energy and resource preservation.

Advancing sustainability

Far-sighted actions open up new horizons

As well as using ecologically harmless raw materials and continuing to develop sustainable production methods, Mehler Texnologies is also investing in improved equipment at its production facilities. Energy efficient manufacturing and the fine-tuning of systems to avoid production waste are further steps being taken to ensure production of reliable and innovative quality products.

When it comes to packaging and transport, Mehler Texnologies also keeps a very close eye on the environment and resources. The company uses predominantly recycled materials for packaging, while the establishment of storage facilities in the countries where it has local sales operations cuts down on long-distance transportation, transport costs and environmental pollution.

In Mehler Texnologies' view acting responsibly towards the environment and preserving resources is a duty towards future generations.

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**Mehler Texnologies GmbH**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-MTX-20130165-IBA1-EN
Issue date	05.09.2013
Valid to	04.09.2018

VALMEX® FR 700

Mehler Texnologies GmbH

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com / https://epd-online.com

MEHLER TEXNOLOGIES

1. General Information

Mehler Texnologies GmbH

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
D-10178 Berlin

Declaration number
EPD-MTX-20130165-IBA1-EN

This Declaration is based on the Product Category Rules:
Technical Textiles, 04-2013
(PCR tested and approved by the independent expert committee)

Issue date
05.09.2013

Valid to
04.09.2018

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Prof. Dr.-Ing. Hans-Wolf Reinhardt
(Chairman of SVA)

VALMEX® FR 700

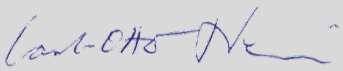
Owner of the Declaration
Mehler Texnologies GmbH
Rheinstraße 11
D-41836 Hückelhoven

Declared product / Declared unit
1m² of VALMEX® FR 700 (7205) technical textile.

Scope:
The declaration covers the product VALMEX® FR 700. The product is a technical textile made out of a combination of Polyester and Polyvinylchloride with a polyvinyl fluoride finish. The fully coated fabric weight is 700g/m². The calculations are based on average production data collected during the period 11/2011 to 10/2012.
The producing company is Mehler Texnologies GmbH. The above named products are produced at the production site in Fulda.
The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

Verification

The CEN Norm EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025
☐ internally ☒ externally



Mr Carl-Otto Neven
(Independent tester appointed by SVA)

2. Product

2.1 Product description

The product is a technical textile made out of a combination of Polyester and Polyvinylchloride with a Polyvinyl fluoride finish. The base fabric is composed of high tenacity multifilament and low wick treated polyester yarns. The coating mass distribution (CMD) ratio is 3:2 asymmetrically distributed (Topside 3 parts: Reverse side 2 parts). On both sides are at least 4 layers of coating, those include adhesion layer, main coating made out of Polyvinylchloride with several additives, Nano-Titanium dioxide primer and top coat made out of a weldable blend of high concentrated polyvinyl fluoride (PVDF) lacquer. The declared product has a weight of 700 g/m².

2.2 Application

The range of application for those products is mainly tensile architecture. These kinds of structures can be easily integrated into regular buildings, can be very variably shaped and adapted to many forms of construction typologies. These can range from roof coverings, sun-shading elements to façade coverings, interior ceilings and divider elements.
A traditional tensile or lightweight structure performs always under tension instead of compression and bending. The material can be used for permanent or temporary applications. Flexible and harmonic forms are characteristic for this type of architecture. These tensile (or tension) structures can be supported mechanically or pneumatically.

2.3 Technical Data

Constructional data

Name	Value	Unit
Yarn density, /DIN EN 1049-2/ - warp/weft	83/88	Yarn count/dm
Yarn count, /DIN EN ISO 2060/	1100	dtex
Total weight, /DIN EN ISO 2286-1/	700	g/m²
Tensile strength, /DIN EN ISO 1421 V1/ - warp/weft	3000/3000	N/5cm
Tear strength, /DIN 53363/ - warp/weft	300/300	N
Stress/strain behaviour, /CEN TC 248 WG 4/ Draft - warp/weft	5/11	13kN/m in %
Adhesion, internal testing method	20	N/cm
Cold resistance, /DIN EN 1876-1/	-40	°C
Heat resistance, internal testing method	+70	°C
Light fastness, /DIN EN ISO 105 B02/	>6	Grade
Crack resistance, /DIN 53359 A/	100.000 no	Visual

	cracks	assessment
Thermal transmittance, /DIN EN ISO 6946/ - vertical/horizontal	5,7/4,8	W/m²K
Light transmittance, /DIN EN 410/ - solar spectral range	9	%
Light reflection, /DIN EN 410/ - solar spectral range	81	%
Light absorption, /DIN EN 410/ - solar spectral range	10	%

2.4 Placing on the market / Application rules

Tensile architecture applications or technical textiles in general are not regulated completely compared to other standard construction materials and methods. Consequently, the currently valid and available standards or rules for applications and materials may change and vary from country to country.
As indicative basic standards for construction and use of technical textiles the below listed standards and rules may be considered.
1. The International Association for Shell and Spatial Structures (IASS) working groups 6 and 7
2. /DIN 4134/ - Air-supported structures; structure at design, construction and operation, 1983
3. Technical Standards for Specific Membrane Structure Buildings by Membrane Structures Association of Japan, 1996
4. American Society of Civil Engineers (ASCE), SEI/ASCE 37-02 Design Loads on Structures during Construction, 2002
5. The Design of Air Supported Structures by The Institution of Structural Engineers, London 1984
6. Standards Council of Canada (SCC), CAN3-S367-M81: Air Supported Structures, 1981
7. SS UNI U50.00.299.0:1996 Tents, Tensile Structures, Air-supported Structures - Instructions for the Design, Realization, Verification, Use and Maintenance, 1996
8. European Design Guide on Tensile Surface Structures, 2004
9. The latest version of Eurocodes and CEN Technical Committees 248 and 250.

Other common information and accomplishment related to the correct usage of technical textiles for architectural application are collected in the Mehler Guideline for tensile structures available at www.mehler-texnologies.com

2.5 Delivery status

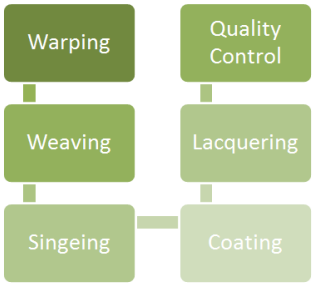
The material is produced as a metre good. The technical textiles are delivered on rolls of different length and width. The amount can be determined by the customer.

2.6 Base materials / Ancillary materials

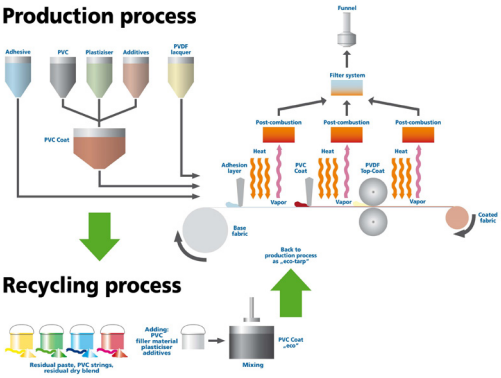
Name	Value	Unit
PVC	35	wt-%
DINP (CAS 28553-12-0)	20	wt-%
PES	30	wt-%
OTHERS including: TiO2 and flame retardants: ATO, ATH	15	wt-%

2.7 Manufacture

During manufacturing the following production steps are processed at Mehler Texnologies GmbH, Fulda.



The quality management system is certified according to /DIN ISO 9001:2008/.
Mehler Texnologies GmbH buys yarns to produce warp beams and weaves fabrics at the weaving mill in Fulda. After weaving, the fabrics undergo a quality control plus a singeing process where minimal fabric irregularities can be corrected as well as defects can be eliminated. Due to the computer controlled coating process a stringent quality control is in place. The products are coated by a knife-coating process. The coating, a PVC plastisol, is brought onto the base fabric and later on dried by infrared emitter. To maintain a good adhesion between fabric and PVC coating an adhesion layer is necessary. Afterwards the PVC coated fabrics are finished by the lacquering process.



The lacquer system is a combination of a primer and a top lacquer. The system contains nano titanium dioxide as well as PVDF. The lacquer is applied on the PVC-polyesters coated base fabric and finally dried by infrared emitters. Thereby the solvents are nearly completely evaporated of the material. The generated vapor is directly treated at post-combustion. Finally, the produced material is inspected and tested according to /DIN ISO 9001:2008/. On customer request a lot certificate and a visual inspection report can be provided.

2.8 Environment and health during manufacturing

The Mehler Texnologies GmbH production sites are subject to the Gefahrstoffverordnung /GefStoffV/, due to its handling of a variety of chemicals.
Furthermore, regular measurements of air quality and noise levels are done. The results are below the compulsory safety value.
In areas where employees are exposed to lacquers, powders etc., prescribed safety clothes and technical safety devices are provided. Regular health checks are mandatory for employees of production sites.

Further regulations and laws which Mehler Texnologies is subject to are:
- Arbeitsschutzgesetz /ArbSchG/
- Betriebssicherheitsverordnung /BetrSichV/
- /Maschinenrichtlinie 2006/42/EG/

2.9 Product processing/Installation

Technical textiles used for architectural application get an interactive functionality with the application performance and need to be handled carefully at several stages, from design to maintenance.

Design:
- Tensile structures are solely subject to tensile stress due to low compressive and bending rigidity. The shape has to be a double curvature to stabilize and distribute the tension, stress and the applied loads on the surface correctly.
- A basic rule in this kind of design is that form follows function
- The structural analysis must be completely integrated into the architectural design. The geometry of the technical textile is established through a "shape generation‘‘(form finding) technique in order to ensure a static equilibrium of the system.
- The pattern of the technical textile is calculated by the deflection finite-element analysis software. During the calculation progressive load deformation is taken into account and consequent compensation or decompensation of the defined fabric pattern geometry is substantial.
- Proper material compensation and application of the biaxial material values are key factors determining project efforts, global costs and long-term performances of the application

Manufacture:
- The production itself can be sub-divided into four phases: intake control and quality inspection of the material, cutting, welding and packing.
- Delivery and quality management consists of practiced good control and re-check of the quality control report. An additional inspection of the material by light tables and seam adhesion tests can be done.
- Once unrolled, the cutting of the patterns can begin. Those are generated using 3D computer models of the whole surface and taking into account the required compensations and the edge corrections for welding seams and edge details.The fabric can be cut by automatic plotting desks or by scissors
- Assembly of the various patterns is done by welding the perimetral edges of the single patterns. Welding is mostly effected by conducting electrical energy in the form of a radio frequency field to the two surfaces that are to be joined together. This stimulates the molecules in the material to move at a speed of approx. 25 million times a second. The friction that arises between the molecules generates the heat that is required to fuse the material layers. A weld seam is thereby created which has the same strength as the surrounding material (tested at 23°C). The fabric can be welded by means of hot air special tools, wherever this operation is mostly chosen for small detail welding processes as corners or on site repairing operation.

Installation:
- The installation of a tensile structure system is a highly specialized field of work requiring experienced staff as well as special and safe access equipment. However the tools and other equipment are standard items used in conventional construction rigging.
- The installation of tensile structures requires reasonable weather conditions. The lightweight of the technical textile, in conjunction with the large surface of exposure, means that work can only proceed at wind speeds of less than 5 m/s. At higher wind speeds lifting operations must be stopped. Installation should also be stopped at temperatures below 10° Celsius.
- The fabric as a secondary structural element is lifted and tied in position by pulling devices and brackets. Afterwards the completed distensile process is secured by linear clamps, steel cables and other permanent fixing devices to the primary structural elements.
- The main task of the technical textile installation team is the approval of the main structure, the installation of the temporary racks, to secure the building site and finally to manage the quality and safety control processes during installation.

Maintenance:
- Regular inspection of the technical textile has to be undertaken as the fabric can be cut, torn or crushed if subjected to high local ‘pinching’ loads, caused by bad design or by inappropriate clamping. If damaged, redistribution of load can result in a concentration of stress that could cause a propagation of tears.
- Fabric Inspection and maintenance manual is provided to the customer with shipment of the goods.

2.10 Packaging

The material is rolled on a cardboard roll core. The finished roll is packed in foil and fixed by PVC tape. Rolls are packed with 3 to 5 rolls on pallets. To guarantee that the rolls are not damaged during transportation, they are covered with cardboard and fastened by steel or plastic strapping.

2.11 Condition of use

There are no changes within the material composition during the use of the product, except extraordinary effects occur (e.g. fire). The long term stability can be measured according to /DIN EN ISO 105 B02/.

2.12 Environment and health during use

Mehler Texnologies GmbH follows a concept that accompanies its products throughout their entire lifecycle, including the incorporation of ecological criteria in the selection of raw materials and the use of environmentally friendly production processes. Mehler Texnologies GmbH only uses substances that suppliers have previously registered as REACH compliant with European Chemicals Agency (ECHA), or that have been approved for the respective use. The products contain no restricted substances in a quantity of more than 0.1 mass percent. None of those substances are persistent, bioaccumulative and toxic according to the criteria set out in Annex XIII to the REACH Regulation (PBT substances). No hidden chemicals are released in the processing (e.g. welding) of the materials and Maximum Allowable Concentrations (MAC) are not exceeded by unregistered substances.

2.13 Reference service life

The documentation of the RSL is not required for the EPD of the company Mehler Texnologies GmbH since not the entire life cycle is declared (without modules B1-B7).
Nevertheless, the producer specifies that an average applicability of PES-PVC fabrics for textile architecture are 20-25 years /Australian Story/. Products service life

may vary due to application, grade of user know-how, location and maintenance.

2.14 Extraordinary effects

Fire
/DIN 4102-1: B1/

Fire protection

Name	Value
Building material class /EN 13501-1/	B
Smoke gas development EN 13501-1	S2
Burning droplets EN 13501-1	D0

Water
The declared product is adequate for the outer use. Water has no influence. The product has a good weatherability.

Mechanical destruction
The mechanical destruction of the declared product doesn't lead to a change of the chemical composition.

2.15 Re-use phase
The company Mehler Texnologies GmbH is conscious of its responsibility for acting in an environmentally compatible manner. Therefore, Mehler Texnologies is involved in a range of activities related to recycling and to preserving resources. These activities are participation in external recycling systems like EPcoat, in-house recycling and a sustainable production manner.
Mehler Texnologies GmbH actively supports the commitment of the Vinyl Plus Committee by the overall goal to recycle 800.000t PVC per year by 2020 and furthermore is a member of the Industrieverband Kunststoffbahnen e.V. (IVK Europe). As a consequence Mehler Texnologies is able to use the EPcoat recycling system. The post-consumer PVC coated fabric is recyclable. The material is then shredded and afterwards processed into the recyclate (plastic granulate), which is applied in the production of e.g. windows, pipes and foils. The shredded material is also used in the production of e.g. riding and sport arenas /Schönmackers/.

2.16 Disposal
The waste code of production waste for PVC coated Polyester fabrics is in accordance with the European Waste Index /AVV/ 04 02 09. Within the category of construction waste Technical textiles are not closer specified. Therefore waste code for plastics would apply 17 02 03.

2.17 Further information
Further information about PVC coated Polyester, technical textiles can be found on the companies' homepage.

3. LCA: Calculation rules

3.1 Declared Unit
The functional unit is a production and final treatment of 1 m² of technical textile - product nr **7205** VALMEX® FR 700 with a total weight of 700 g/m².

Declared unit

Name	Value	Unit
Declared unit	1	m²
Conversion factor to 1 kg	1,42857 1429	m²

3.2 System boundary
The analysis of the product life cycle includes production of the basic materials, transport of the basic materials, manufacture of the product and the packaging materials which are declared in module A1-A3.
In this LCA study scenario of end-of-life (EoL) stage is considered. It is incineration of the technical textiles in the incineration plant which burdens accounted in the module C4.
The collection rate of end-of-life stage is 100%.
In this LCA study the transport of the used product to final disposal was modeled (module C2).
Potential credits for electricity and thermal energy resulting from the waste incineration plant are declared in module D.

3.3 Estimates and assumptions
In this LCA study scenario of end-of-life (EoL) stage is considered. In this case the incineration of the technical textiles has been accounted. The burdens of this process are included in the module C4 (waste incineration plant with R1 < 0,6), but the electricity and energy production – that occurs due to the incineration process – as benefits in the module D.
Even then it has to be mentioned that the post-consumer PVC coated fabrics are recyclable materials (more information in chapter 2.15).
The collection rate of end-of-life stage is 100%.
It has been also assumed that the average transport of post-consumer PVC coated fabrics to the incineration plant is 100 km.

3.4 Cut-off criteria
Several flows (raw materials) were excluded from the LCA study. All excluded flows pass the cut-off criteria: they represent less than 1% and are summing up to less than 5% of the total input (mass) and impact of renewable and non-renewable primary energy usage of mandatory modules (A1-A3).
Machines and facilities required during production are neglected.

3.5 Background data
For life cycle modeling of the considered products, the /GaBi 6 2012 Software System/ for Life Cycle Engineering, developed by PE INTERNATIONAL AG, is used. All relevant background datasets are taken from the GaBi 6 software database. The datasets from the database GaBi used are all PE International datasets and are documented in the online documentation /GaBi 6 2012B/. To ensure comparability of results in the LCA, the basic data of GaBi database were used for energy, transportation and auxiliary materials.

3.6 Data quality
The model for the mandatory modules (A1-A3) was based on primary data (in kg or g per m²) provided by Mehler Texnologies GmbH. Primary data collected covered all the production steps taking place in the

production plant: warping, weaving, singeing coating, lacquering, quality control.
All data used in the model is no more than 10 years old.

3.7 Period under review

Data sets are based on 1 year averaged data (time period: November 2011 to October 2012).

3.8 Allocation

The product is produced in one plant. All data were provided by the producer of the product according to 1 m² of technical textile.
The assumptions according EoL of the product are described in the section 3.3.

The modeled thermal utilization of the combustibles in their end-of-life process takes place in a waste-to-energy plant. The allocation is based on a physical classification of the mass flows or calorific values. Benefit and credit for the thermal energy, which is calculated based on country specific "Thermal energy from natural gas" as well as the credit for electricity from the country specific “Power grid mix”, are given in module D.

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account.

4. LCA: Scenarios and additional technical information

The following information refer to the declared modules and are the basis for calculations or can be used for further calculations. All indicated values refer to the declared functional unit.

End of life (C1-C4)

Name	Value	Unit
Collected separately	0.7	kg

The collection rate of the post-consumer PVC coated fabrics is 100%. The collected material is incinerated with energy recovery. The average distance to the incineration plant is 100 km.

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement[1)]	Refurbishment[1)]	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	MND	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² VALMEX® FR 700

Parameter	Unit	A1 - A3	C2	C4	D
Global warming potential	[kg CO_2-Eq.]	3.995E+0	3.28E-5	1.77E+0	-1.12E+0
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.222E-8	6.86E-16	2.55E-11	-3.38E-10
Acidification potential of land and water	[kg SO_2-Eq.]	1.382E-2	1.49E-7	4.28E-4	-1.55E-3
Eutrophication potential	[kg $(PO_4)^{3-}$ Eq.]	1.676E-3	3.6E-8	3.33E-5	-1.74E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg Ethen Eq.]	2.321E-3	-5.11E-8	2.42E-5	-1.42E-4
Abiotic depletion potential for non fossil resources	[kg Sb Eq.]	1.21E-2	1.51E-12	2.53E-7	-1.16E-7
Abiotic depletion potential for fossil resources	[MJ]	7.544E+1	4.49E-4	8.3E-1	-1.47E+1

RESULTS OF THE LCA - RESOURCE USE: 1 m² VALMEX® FR 700

Parameter	Unit	A1 - A3	C2	C4	D
Renewable primary energy as energy carrier	[MJ]	4.148E+0	-	-	-
Renewable primary energy resources as material utilization	[MJ]	0.0E+0	-	-	-
Total use of renewable primary energy resources	[MJ]	4.148E+0	2.67E-5	7.93E-2	-1.63E+0
Non renewable primary energy as energy carrier	[MJ]	7.163E+1	-	-	-
Non renewable primary energy as material utilization	[MJ]	8.715E+0	-	-	-
Total use of non renewable primary energy resources	[MJ]	8.034E+1	4.5E-4	9.41E-1	-1.71E+1
Use of secondary material	[kg]	0.0E+0	-	-	-
Use of renewable secondary fuels	[MJ]	2.078E-3	3.35E-9	1.16E-5	-2.46E-4
Use of non renewable secondary fuels	[MJ]	2.155E-2	3.5E-8	1.22E-4	-2.58E-3
Use of net fresh water	[m³]	4.654E-2	2.57E-8	4.35E-3	-2.53E-3

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² VALMEX® FR 700

Parameter	Unit	A1 - A3	C2	C4	D
Hazardous waste disposed	[kg]	1.763E-2	0.0E+0	1.78E-1	0.0E+0
Non hazardous waste disposed	[kg]	1.219E-1	8.91E-8	3.61E-4	-6.39E-3
Radioactive waste disposed	[kg]	2.04E-3	6.46E-10	4.55E-5	-9.7E-4
Components for re-use	[kg]	-	-	-	-
Materials for recycling	[kg]	-	-	-	-
Materials for energy recovery	[kg]	-	-	-	-
Exported electrical energy	[MJ]	-	-	3.41E+0	-
Exported thermal energy	[MJ]	-	-	8.2E+0	-

6. LCA: Interpretation

Primary energy demand

The total use of renewable primary energy resources as well as the total use of non-renewable primary energy is dominated by the mandatory modules (A1-A3), within which the raw material supply (A1) plays the most significant role. The production site (A3) has the second highest contribution to both.
The share of module D in the total use of renewable primary energy resources (PERT) value is due to the energy production via incineration of the technical textiles.

Global warming potential (GWP)

GWP is dominated by the supply chain (A1) due to production of raw materials especially PET, DINP, antimony, and PVC. The supply chain makes almost 82% of the GWP for the mandatory modules, where the production (A3) makes less than 18%. The end-of-life stage contributes in about 31% into the summed value of GWP. At the same time thanks to combustion of the technical textiles there is a decline in the total GWP in around 19%.

Formation potential of tropospheric ozone photochemical oxidants (POCP)

POCP is dominated by the supply of basic materials (PET, DINP, epoxised soy bean oil, PVC, antimony) and the production (A3). Transportation has a minor

but visible impact on the product. The main emissions contributing to this impact category are NMVOCs, benzene, butane, sulfur dioxide, butane, carbon dioxide, and nitrogen oxides. The high benzene emissions, which occur during production of epoxised soy bean oil, make an important contribution into the total POCP value.

Acidification potential (AP)

AP is dominated by the supply of basic materials (e.g. antimony, PET) and the production stage due to the nitrogen dioxide emissions that occur during the lacquering process. Mostly the impact refers to emissions to air: ca. 55% comes from sulfur dioxide and 18% from nitrogen oxides.

Eutrophication potential (EP)

EP is influenced by the supply of basic materials, their transport and the production stage. The nitrogen dioxide emissions from the lacquering process have also a significant contribution to the total EP. Mostly the impact refers to emissions to air (mainly nitrogen oxide and dioxide).

Abiotic depletion potential (ADP)

The ADP **for non fossil resources** is significantly dominated by production of antimony trioxides.
The ADP **for fossil element** is mainly dominated by the supply of basic materials (A1). The contribution of the benefits and loads due to incineration of post-consumer PVC coated fabrics in the end-of-life stage in the total ADP fossil value is around 19%. The energy consumption plays a crucial rule in the ADP fossil element value. The most important energy sources are lignite, hard coal, and natural gas.

Depletion potential of the stratospheric ozone layer (ODP)

The ODP is most notably influenced the supply of basic materials and mainly the production of the polyvinylidene fluoride (PVDF). This results mainly from the upstream supply chain due to production of dichloro-1-fluoroethane that is used for the PVDF. The relevant emissions are trichloroethane and R141b.

7. Requisite evidence

Environmental information of used chemicals from “Material Safety Data Sheets”.

During the application of the lacquer on the PVC-polyesters the generated vapor is directly treated at post-combustion and emitted emissions verified according BImSchV /TÜV SAAR and BImSchV/.

7.1 VOC emissions
The information of the formaldehyde and VOC emissions by /AgBB schema/ AgBB are not relevant for the product because it is applied outside.

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