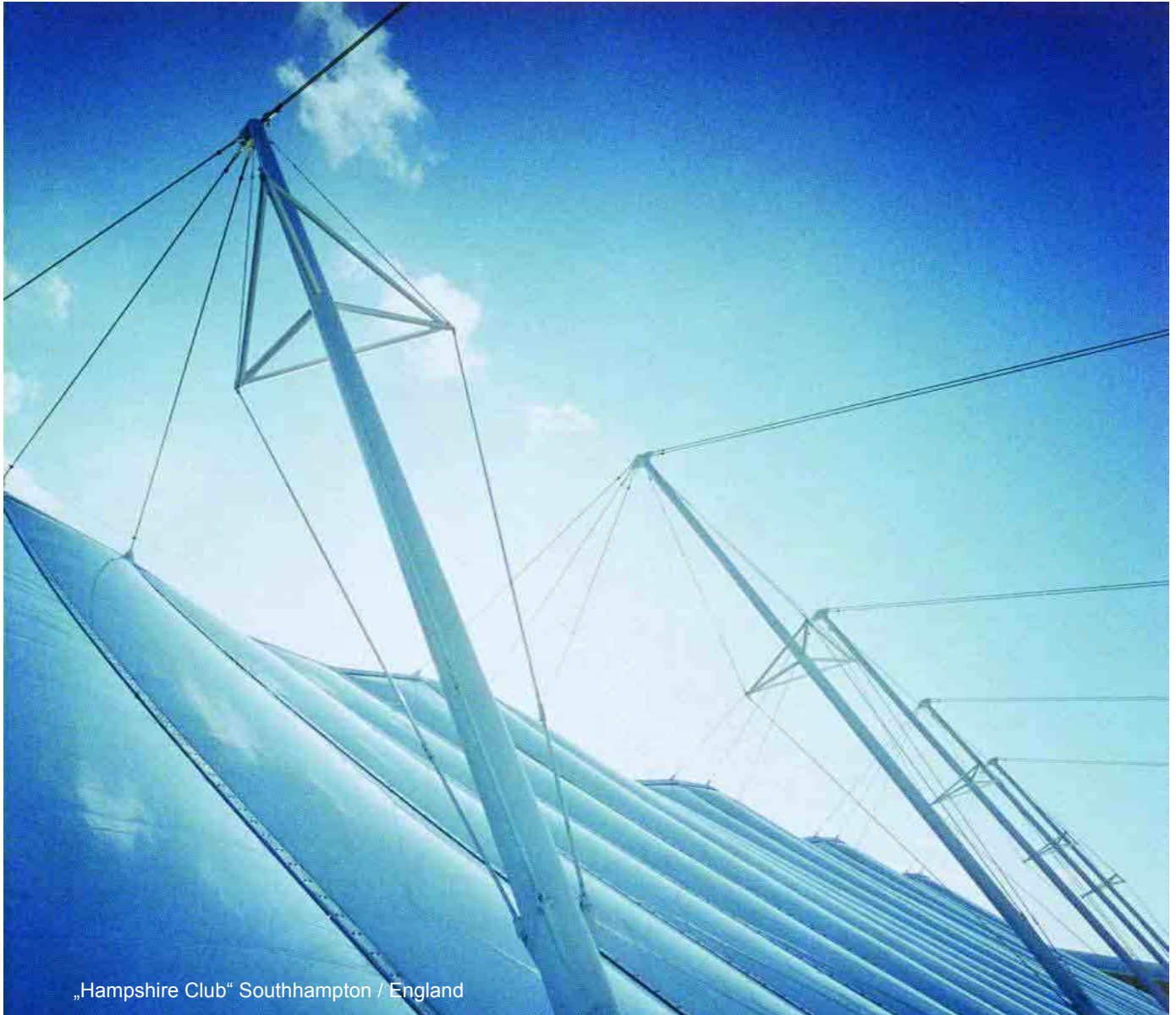


NOWOFLON[®] ET

Fluoropolymerfilm
-Technical information -



NOWOFLON[®] ET-6235
NOWOFLON[®] ET-6235 J
NOWOFLON[®] ET-200

NOWOFLON[®] ET

- Technical information - - Film Typs -



NOWOFLON[®] ET-6235

is a fluoropolymerfilm, produced out of the raw material ETFE (copolymer from ethylene and tetrafluorethylen) which is manufactured exclusively as a not oriented cast film, with outstanding biaxial tensile properties.

NOWOFLON[®] ET-6235 J

relating to the molecular structure, this film-type is comparable to NOWOFLON[®]ET-6235, the remarkable features of this film quality are brilliant light transmittance, excellent thermoforming property and high flexibility.

NOWOFLON[®] ET-200

molecular structure is also comparable to NOWOFLON[®]ET-6235; due to extremely high melt stability, the manufacturing of thin films until 12 µm thickness is possible.

General Film properties

- High light transmittance from UV- to IR-range
- excellent weather stability
- high tensile- and tear strength
- outstanding separating and self cleaning property, due to low surface tension
- flame retardant according DIN 4102 – Class B1, without additives
- excellent weldability
- high variety of mechanical film connection possibilities like sewing, nailing, clamping etc.
- wide range of service temperature
- high Chemical stability
- tailor made optimizing of film properties

NOWOFLON[®] ET

- Technical information – - Applications -

1. Membrane roofings

NOWOFLON[®] ET-film is an ideal membrane material for transparent and translucent roofing systems due to its broad spectrum of extraordinary technical properties. Additional to that, various roof-manufacturing types, as

- pneumatic cushionelements with high thermal insulating, or
- one layer elements with high light transmittance are possible.

NOWOFLON[®] ET film has an optimal welding property, but because of the excellent tear strength, also other, mechanical connection possibilities like sewing, clamping, nailing, riveting o. a. are compatible for stabile roof constructions.

A Transparent roofings

Since 18 years, NOWOFLON[®] ET is used as high transparent membrane for textile roof constructions, and becomes more and more well known by architects and investors due to the outstanding technical properties, which are described in the following. The international knowledge about NOWOFLON[®] ET was mainly reached by the “Eden Project” as the biggest greenhouse of the world, which is completely covered with pneumatic cushions of NOWOFLON[®] ET-film. The self-supporting domes with a height of up to 55m, and a covered ground flat of 40.000m² have been opened in Spring 2001 and received a considerable national and international attention.

Relevant Filmproperties:

Tensile Strength

Beneath the high tensile strength, also the extraordinary tear- and impact strength of NOWOFLON[®] ET is the basic property of an ideal membrane material.

Weight

Actually there is no transparent material known, which could be compared with NOWOFLON[®] ET regarding the extremely light weight of pneumatic cushionelements. Only with this material, unique, self-supporting roof constructions like Eden Project became technically feasible.

The flat weight of NOWOFLON[®] ET-film 200 µm is 350 g/m²!

Weatherstability

The a.m. tensile properties had proofed a high stability of NOWOFLON[®] ET against hailstones, storms, snow loads over the time period of more than 15 years. A 10 year outdoor weathering under extreme UV-radiation in Arizona / USA had shown no property changing of NOWOFLON[®] ET!

Live span

NOWOFLON[®] ET is due to its molecular structure extremely stabile against UV-radiation. The oldest actually operating roof constructions show, that after more than 15 years no loss of either mechanical or optical properties could be recognized. Self evidently, that long time stability is a material immanent property, that means no additives are necessary.

NOWOFLON[®] ET

- Technical information – - Applications -

Light transmittance

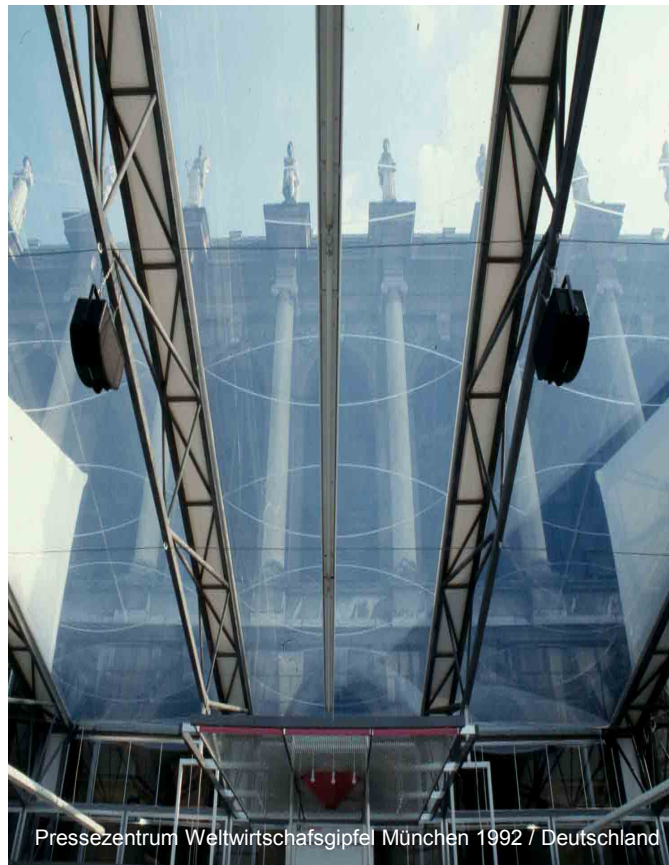
A main issue for the remarkable success in roofing systems for deerhouses (Zoo), „event greenhouses“ (jungle halls, butterfly houses) etc. is the excellent transparency of the visible light and especially the high level of UV-light transmittance. The last-mentioned has proved as a vital property for animals and plants. In leisure projects like event- or wellness indoor swimming pools, but also public projects like atrium roofing's, market places, football stadiums etc. the nearly natural daylight guaranties the human feeling of well being and makes the browning of human skin possible. Additionally the grass growing (lawns in football or tennis arenas) will be hereby actively supported.

Self cleaning

The material immanent low surface tension ensures that NOWOFLON[®] ET will not lose its high transparency over its live span. Dust or most other environmental dirt will be washed away by rain and wind.

Flame adversity

NOWOFLON[®] ET 6235 meets the demands of DIN 4102 – B1 on a flame retardant building material.



NOWOFLON[®] ET

- Technical information - - Applications -

B Translucent roofings

Beneath the before mentioned film properties, the following additional optical variants are available:

Colour White

The white pigmentation is standardized to a total-light transmittance of 50-55%, but also different colour concentrations are possible. The transmitted light becomes nearly completely scattered, which leads to an absolutely even and nonreflective lighting (indoor tennis centres). Additionally the white pigment is absorbing the total UV-light, so that under white pigmented NOWOFLON[®] ET also UV-sensitive goods could be stored for long times.

Metallizing

Metal vaporizing (e.g. Aluminium) on NOWOFLON[®] ET-surface allows an exact regulated light transmission by keeping the visible transparency. If vaporizing intensity becomes increased, a total sunlight reflection (like a mirror) could be achieved, which is used mainly in solar technology, or for decorative effects! Further details on request.

Printing

NOWOFLON[®] ET can become printed either total or partly with all RAL-colours. Printing is used either for decorating or for shadowing against sunlight.

C Roofings with flexible shadowing

A NOWOFLON[®] ET –cushion element, combined with a specific printing design can be so manufactured, that an infinite variability of light transmission can be regulated (from daylight to complete darkening). Further details on request!



NOWOFLON[®] ET

- Technical information - - Applications -

2. Solar technology

Photovoltaic – Modules

NOWOFLON[®] ET is used as front side covering and can be laminated in unpeelable quality with the underneath laying EVA-film by a one side primer coated surface. The bonding with EVA will be carried out in one production step together with the curing process of EVA-film. The advantages of NOWOFLON[®] ET compared to glass are significant reduction of weight, optimizing the robustness during transportation, achieving a certain flexibility of the modules and increasing of module productivity by transmitting the total sunlight spectrum (from UV to IR) to the solar cells.

Solarabsorbers

NOWOFLON[®] ET is used inside of solar absorbers as a barrier against heat convection at high temperatures or as a confectionated container or tube for generating or storing of warm water.

Solar reflectors (-mirrors)

With one side aluminium vaporized film surface, NOWOFLON[®] ET is used as a high reflecting membrane for light concentration and its energetic utilization. Beneath the before mentioned high weather- and UV-stability for this application particularly the high temperature stability and the tensile strength at high temperatures are to be emphasized.

3. Bonding technology

One- or double side coated with high quality adhesive systems, NOWOFLON[®] ET is processed to technical speciality-tapes with the remarkable features of excellent high temperature- and chemical stability, combined with equal life span of NOWOFLON[®] ET and adhesive!

These tapes are used for

- Repairing tape for little damages in roofing elements
- Repairing tape for glass- or plastic windows in automotive industry (cabriolets)
- Covering tape in sport article industry as a rock fall protection of e.g. mountain-bike frames.

4. Chemical industry

NOWOFLON[®] ET is used due to its excellent chemical stability as

- windows in chemical pipe systems
- inside layer of chemical hoses
- printed labels in chemical industry

NOWOFLON[®] ET

- Technical information - - Applications -

5. Separating film

As a typical fluoropolymer property, the antiadhesivity of NOWOFLON[®] ET is based on the extreme low surface tension, and creates no problems relating period of effectiveness, migration, depositions etc. These are relevant criterions for successful application as:

- Separating film for epoxycarbon elements in aerospace industry
- Print transfer film for high temperatures
- Wrapping film for stabilizing in thermal curing processes

Relevant properties:

Antiadhesivity:

Even at high temperatures and pressures, NOWOFLON[®] ET guarantees an absolute neutral behaviour to other materials.

Temperature resistance:

The maximum permanent service temperature of NOWOFLON[®] ET is 150°C, for short times (6-8h) max. 230°C.

Tensile strength for high temperatures:

Based on the high melting temperatures of 270°C, NOWOFLON[®] ET has a considerable strength up to 150°C.

Perforating:

The high tear strength is the precondition, that also a perforated NOWOFLON[®] ET can be peeled off from the cured parts, even when epoxy has penetrated through the perforation wholes.

Film thickness:

An optimised production- and quality control system ensures, that the complete range of am properties is given for NOWOFLON[®] ET also at a minimum thickness of 12 µm!

Colours:

In the international aerospace industry, colour blue is the standard colour to identify NOWOFLON[®] ET separating film.

Other colours on request!

NOWOFLON[®] ET

- Technical information –
- Film properties / physical data sheet –

<u>Properties</u>	<u>Unit</u>	<u>Test method</u>	<u>Typical values</u>		
Film typ			6235	6235 J	200
Thickness	µm	DIN 53370	25-250	25-250	12-50
Tolerance	µm	DIN 53370	≤ 50µm: ±3µm; >50µm: ±5% vom Sollwert		
Tenile strength					
longitudinal	N/mm ²	DIN EN ISO	> 40	> 40	> 40
transversal	N/mm ²	527-1	> 40	> 40	> 40
Elongation at break					
longitudinal	%	DIN EN ISO	> 300	> 300	> 300
transversal	%	527-1	> 300	> 300	> 300
Tensile at 10% elong.					
longitudinal	N/mm ²	DIN EN ISO	> 20	> 18	> 20
transversal	N/mm ²	527-1	> 20	> 18	> 20
Modulus in tension					
longitudinal	N/mm ²	DIN 53457	1000	800	1000
transversal	N/mm ²	DIN 53457 0,5% Sekante	1000	800	1000
Tear strength					
longitudinal	N/mm ²	DIN 53363	> 300	> 300	> 300
transversal	N/mm ²	on trapezium	> 300	> 300	> 300
Shrinkage					
longitudinal	%	150°C/10 min.	0-5	0-5	0-5
transversal	%	150°C/10 min.	0-5	0-5	0-5
Density	g/cm ³	DIN 53479	1,75	1,75	1,75
Melt range	°C	DSC 16°K/min.	270 ± 10	260 ± 10	270 ± 10
Light transmission (total)	%	DIN 5036–Ulbricht sphere	> 90 % ⁽¹⁾		
Shore-D-hardness		DIN 53565	70	66	67
Oxygenindex	%	ASTM D 2863-70	> 30	> 30	> 30
Flame retardance		UL 94	V-0	V-0	V-0
		DIN 4102	B1 ⁽²⁾	-	-
Weather stability		DSET- Laboratories Phoenix / Arizona	10 years outdoor weathering without changing of properties	-	-
Thermal service range	°C	ASTM-D-2863	- 200°C bis + 150°C		
		DIN 53207			
⁽¹⁾ Measured on 200 µm film					
⁽²⁾ Awarded with „Allgemeines bauaufsichtliches Prüfzeugnis“ as a flame retardant building material form Ott-Graf- Institut, Universität Stuttgart					

NOWOFLO[®]N ET

- Technical information –
- Delivery range –

Typ	6235	6235 J	200
Thickness range (µm)	25 – 250	25 – 250	12 – 50
Standard width (mm)	1300 / 1550 max	1300 / 1550 max.	1300 / 1550 max. < 20 µm: max. 1500!
Min. width for slitting (mm)	10	On request!	
Standard-Reel length (lfm)			
Thickness 12 µm	/	/	3000
Thickness 15 µm	/	/	3000
Thickness 20 µm	/	/	1500/3000
Thickness 25 µm	1000	1000	1000
Thickness 50 µm	750	750	750
Thickness 100 µm	500	500	/
Thickness 150 µm	250	250	/
Thickness 200 µm	200	200	/
Thickness 250 µm	200	200	/
Core inside diameter Ø	152	152	152
Standard colours	natural, white, blue or on request	natural or on request	natural, blue or on request
Oneside primer coated			
<i>- Standard reels on stock -</i>			
Thickness (µm)	150		
Width (mm)	775		
Reel length (lfm)	250		
Primer coating	film inside of reel		