5M

SMART TECHNOLOGIES
IN THE WORLD OF COMPOSITES

SMART TECHNOLOGIES IN THE WORLD OF COMPOSITES

THE COMPANY POLICY

- Satisfied customer is a crucial criterion for ensuring competitiveness and a long-term perspective. That's why we do our best to meet or exceed our customer's requirements and expectations.
- We will enforce and implement the job strategy without mistakes, our goal is to achieve a zero number of discrepancies and complaints. We prefer the principle of prevention before solving non-conformities in implementation processes.
- We do not allow the stagnation of the quality and technical level of our products. Continuous improvement and innovation are our everyday activities. We are initially looking for opportunities for improvement.
- We continuously develop and refine the management system, according to the needs of the company, with a line of the new management knowledge, as a tool for continuous improvement of quality, efficiency and competitiveness.
- We want only reliable and quality suppliers. We will evaluate and select them and work closely with them to meet our expectations.
- We recognize our competitors and we are ready to compete and cooperate with them.

ABOUT THE COMPANY

WHO WE ARE

The 5M Company operates in the area of the development and manufacturing of composite and sandwich materials such as epoxy resins and adhesives, composite pultruded profiles and sandwich panel constructions. We specialise in demanding applications and special products, for which the application of these types of materials is excellent (brings lower weight, great mechanical properties or better corrosion or chemical resistance). Over the years we have brought to the market a number of new products and key innovations.

HISTORY/PRESENT

The 5M Company was founded in the year 1992. Its founders followed up on their earlier activities in the area of adhesives, composites and sandwich materials and the company thereby achieved rapid development. Currently the company has its own research & development centre with a laboratory, a modern manufacturing facility for pultrusion lines and a total production area of over 5 000 m^2, with 250 employees.

TRADEMARKS

Our trademark LETOXIT® covers wide product range of epoxy resins and epoxy adhesives, which stand for high quality materials in composite industry or for the application in other industries. The new technology in sandwich panel construction represents our PUROXIT® boards.

DISTRIBUTION

In the domestic market, the 5M Company, due to the exclusiveness and quality of its products, was quickly accepted in the top rank in this field and commenced cooperation with established foreign entities. In the year 1998, the Company became the exclusive representative in the CZ for the Dutch company SABA. Due to the strong position on adhesive market, the 5M Company made agreement with the Swiss company Kisling and became sales representative of ERGO products on CZ market.

CERTIFICATED STANDARDS

ISO 9001 : 2015
AS 9100 (copyright Lloyd´s Register LRQA)
IATF 16949 (automotive)
DIN 6701 A1 (railway industry)
POA PAR 21.G EASA 748/2012 (aviation)
IRIS (railway industry)

IMPLEMENTED STANDARDS

CSN EN ISO 14001 (environmental protection)
CSN EN ISO 18001 (safety management)
Approved supplier ACR (NATO 49926)
Approved supplier for ČD

COMPOSITE PROFILES

Composite profiles are known under a variety of different names, such as GRP, FRP, FRPC, CRP, fibreglass or carbon fibre profiles. Profiles made in 5M are manufactured from various types of resin, using the conventional pultrusion or pull winding technique, according to the customer's requirements.

Due to their excellent characteristics, composite profiles are becoming a widely-used material for many applications, when low weight, excellent mechanical properties (high tensile and impact strength), corrosion resistance, water resistance, outstanding electro-insulating characteristics, low heat-conductivity and low heat-expansion, a long service-life and minimum maintenance are requisite.

In accordance with the customer's needs, for reinforcement we can use glass (the most common option), carbon or aramid fibres in the form of rovings (straight fibres), a variety of types of mats or a combination of these. As the matrix, most frequently polyester resin is applied, however our technology also permits the use of epoxy, vinyl ester, acrylates or other resins.

The properties of the profile can be optimised for specific applications, not only by the selection of the section size and the shape of the profile, but also by the type of reinforcement chosen and its structure, the reinforcement/resin ratio and the type of resin. Due to this variation of raw materials, our profiles could fulfil lots of required standards (FAR 23, FAR 25, EN 45545, EN 13501, EN 13706).

In our production range you can find standard pultruded composite profiles (rods, tubes), but due to having our own R&D department we are mainly focused on the development and production of difficult shapes and profiles, tailored to the customers' requirements.

NEVERENDING STRENGTH **AND** QUALITY

ADVANTAGES

- low weight
- corrosion resistance
- high tensile strength
- high impact strength
- feature dimensional accuracy of the profile
- outstanding electro insulation characteristics
- low heat conductivity and heat expansion
- long service life with minimum maintenance

APPLICATION

- automotive, rail vehicles, buses (cover panels, corners at lorry body)
- building and constructions (reinforcement of structures, window frames, ladders)
- aviation (construction elements)
- chemical industry (corrosive resistant materials)
- heavy-current electrical industry (insulator supporting poles, systems for trolleys, transformers)
- sport (hockey sticks, arrows, bows, tents)
- other (print machines, textile machines, accumulators, advertising panels, anti-flood walls)

POLYURETHANE COMPOSITE PROFILE

As the leader in the field of composites, we were the first in Europe introduced a composite pultrusion profile made from polyurethane. In comparison to common resins used in pultrusion, this composition has several unrivalled advantages:

- excellent impact resistance
- great structural strength
- exceptional mechanical properties (e.g. excellent resistance against extraction of a screwed in screw)
- easy to machine (less dust formation, edges do not fray)
- option of a non-flammable variant
- low absorbability
- highly resistant to salt water

In comparison with standard matrix (polyester, vinylester), parts made from pultruded polyurethane are stronger and lighter in weight, they can be made larger and with thinner walls. It allows for a more economical manufacturing process as well, because roving can be used instead of costly mats, and high line speeds can be achieved. The polyurethane pultrusion process is environmentally friendly, since it consumes less energy during production and contains no styrene.

SERVICES

Part of our production is a specialized CNC machine tool for machining of composite (fibreglass) materials that allow us to produce and deliver a composite profile including an additional final machining (milling holes, apertures, shapes, etc.)

	Glass profile	Carbon profile	Steel	Aluminium	PVC	Wood
Density (kg/m^3)	2 100	1650	7900	2700	1380	520
Flexural strength (MPa)	1 000 – 1 400	1 400 – 2 500	400 – 1 200	180	44	150
Flexural modulus (GPa)	45 – 56	120 – 300	196	70	2,4	10
Tensile strength (MPa)	1 000 – 1 400	1 400	400 – 1 200	180	70	100
Tensile modulus (GPa)	45	140	196	70	2,4	9
Thermal conductivity (W/m.K)	1	1,4	47	209	0,24	0,47
Coefficient of linear thermal expansion (1/K)	10^{-5}	$-0{,}2.10^{-6}$	10^{-5}	$2{,}3.10^{-5}$	$3{,}7.10^{-5}$	02.10^{-5}
Specific heat capacity (J/kg.K)	1 880	950	461	921	1 100	1 700

EPOXY RESINS

5M develops and produces epoxy systems for laminate production. The product range of LETOXIT® epoxy resins includes liquid systems with varying properties and viscosity, from extremely liquid to highly viscous and thixotropic.

The optimal combination of epoxy resins and hardeners can be chosen for each application and for different production factors, such as mixture, pot life, curing method, technology and the properties of the final laminate part. Our wide product range permits the choice of the right resin for every application, starting with resins certified for aviation and concluding with water-resistant resins for the boat industry.

As a speciality items, 5M also produces several epoxy foaming systems (the resin foams immediately after application, thereby expanding its volume and filling up any empty space, after that it hardens) or casting resins for the electrical engineering industry.

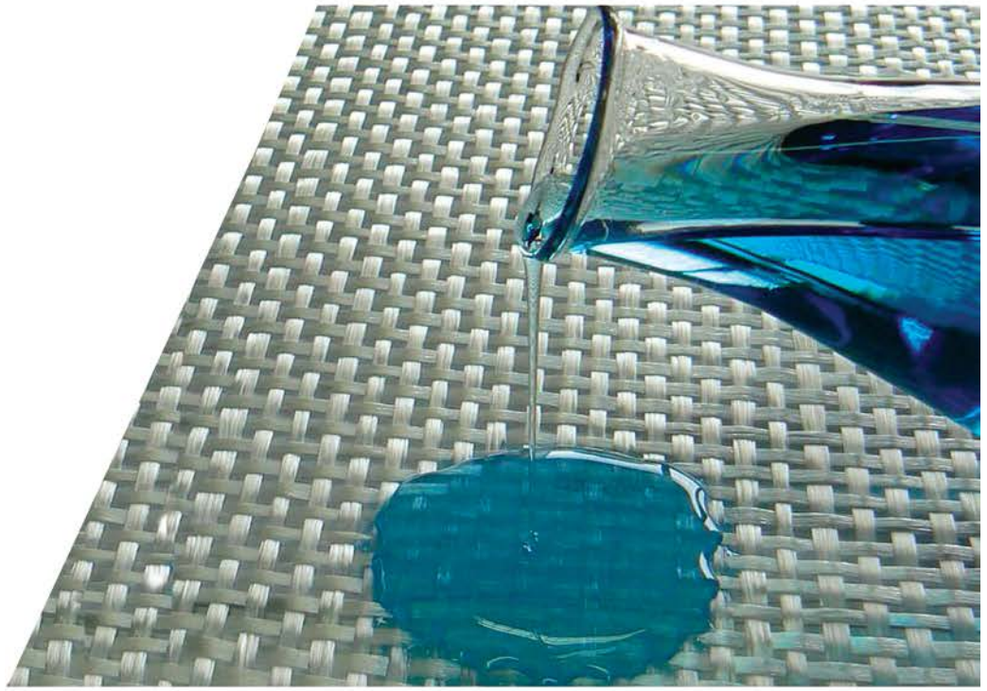
EPOXY RESINS – WATER OF
LIFE FOR **YOUR**
COMPOSITE **PARTS**

ADVANTAGES

- certified epoxy systems for aviation
- nonylphenol free hardeners
- great impregnation ability
- wide product range
- self extinguishing variant

APPLICATION

- sport equipment
- aviation
- automotive
- transportation
- models
- electricity industry
- shipbuilding
- wind power plants
- engineering



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Letoxit®

Resin LETOXIT	Hardener LETOXIT	Weight ratio	Pot life (min. at 25°C)		Viscosity (mPa.s)	Room temp. curing	Recommended curing cycle		Tg Max. (°C)	Technology	Characteristics
							Time and temperature	Tg (°C)			
PR 227	EM 315	100:38	200g	50 - 60	200 - 500	yes	24h 20°C + 15h 50°C	73 - 82	104	HL, RTM	economical in use, all-purpose application
	EM 316			70 - 90		yes	24h 20°C + 15h 50°C	76 - 89	112	HL, P, W/B	
	EM 317			100 - 120		no	24h 20°C + 15h 50°C	86 - 91	119	HL, P, W	
PR 220	EM 315	100:40	100g	50 - 60	300 - 700	yes	24h 20°C + 15h 50°C	75 - 80	115	HL, RTM	certificated for aviation, all-purpose application, nonylphenol free hardeners
	EM 316			120 - 150		yes	24h 20°C + 15h 50°C	80 - 90	123	HL, RTM	
	EM 317			200 - 250		no	24h 20°C + 15h 50°C	85 - 90	124	HL, P, W	
PR 217	EM 315	100:37	200g	50 - 60	500 - 900	yes	24h 20°C + 15h 50°C	80 - 85	113	HL, RTM	certificated for aviation, 20% improved impact strength, nonylpehnol free hardeners
	EM 316			90 - 100		yes	24h 20°C + 15h 50°C	85 - 90	131	HL, RTM	
	EM 317			230 - 250		no	24h 20°C + 15h 50°C	90 - 95	135	HL, P, W/B	
PR 223	EM 315	100:30	100 g	50 - 60	500 -800	yes	24h 20°C + 15h 50°C	55 - 60	85	HL	self extinguishing (FAR 23), nonylphenol free
	EM 316			60 - 70		yes	24h 20°C + 15h 50°C	65 - 70	90	HL	
	EM 317			80 - 100		no	24h 20°C + 15h 50°C	70 - 75	100	HL	
PR 102	EM 100	100:37	160 - 180		200 - 500	no	24h 20°C + 10h 50°C	71	125	HL, P, W/B	model hobby, low viscosity
	EM 400	100:37	50 - 60		200 - 400	yes	24h 20°C + 10h 50°C	65 - 75	110	HL, RTM	
	EM 420	100:38	40 - 50		250 - 550	yes	24h 20°C + 10h 50°C	76	100	HL, RTM	
PR 108	EM 309	100:95	12 hours		1500 - 1800	no	2h 80°C + 5h 135°C	105	105	HL, W/B	winding, black
PR 110	EM 315	100:37	50 - 60		300 - 700	yes	24h 20°C + 10h 50°C	70 - 75	108	HL, RTM	economical in use, mould production, extra water resistance
	EM 316	100:37	70 - 90		300 - 700	yes	24h 20°C + 10h 50°C	73	117	HL, W/B, RTM	
	EM 317	100:37	100 - 120		300 - 700	no	24h 20°C + 10h 50°C	87	127	HL,P,W/B	
	EM 420	100:39	40 - 50		300 - 700	yes	24h 20°C + 10h 50°C	71	109	HL, RTM	
PR 129	EM 100	100:29	180		900 - 1800	no	24h 20°C + 2h 60°C + 2h 100°C	84 - 89	103	HL, W/B,P	UV resistance
	EM 420	100:32	40 - 50		600 - 800	yes	24h 20°C + 2h 60°C + 2h 100°C	70	90	HL	
PR 131*	EM 247 EM 300	100:80:1	10 hours		1000 - 1200	no	4h 80°C + 8h 140°C	133	134	HL, P, RTM, W/B, C	casting resin - inside
PR 164	EM 285	100:76	8 hours		250 - 400	no	1h 80°C + 4h 140°C	97	97	HL, P, RTM, W/B	winding/braiding, summer
	EM 286	100:76	8 hours		250 - 400	no	1h 80°C + 4h 140°C	91	91	HL, P, RTM, W/B	winding/braiding, winter
PR 187*	EM 295 EM 300	100:80:1	12 hours		300 - 400	no	4h 80°C + 8h 140°C	103	103	HL, P, RTM, W/B, C	casting resin - outside
PR 239	EM 328	100:39	100-120		800 - 1000	yes	24h 20°C + 15h 50°C	70-75	110	RTM	infusion (RTM)
PR 246	EM 315	100:34	50 - 60		500 - 900	yes	24h 20°C + 10h 50°C	70-75	90	HL, RTM	salt water resistance

* necessary to mix with silica sand

HL	hand lay-up
RTM	resin transfer moulding
P	pultrusion
W/B	winding/braiding
C	casting

SPECIAL HARDENERS LETOXIT

Hardener	Characteristics	Usage
EM 292	economical in use, industry application	could be used in combination with all LETOXIT PR epoxy resins
EM 263	pot life (200g) 20 - 30 min	
EM 250	pot life (20 g) 10 min	

FOAMING EPOXY RESINS LETOXIT

Resin LETOXIT	Pot life (min. at 20°C, 100 g	Foam density (g/cm³)	Foam flexural strength (N/mm²)	Temperature resistance (°C)	Curing cycle	State	Usage
SV 20	30 - 40	0,20 0,30	2,5 - 3,5 5 - 7	80 - 90	24h at 20°C (90%) 48 h at 20°C (95%) 5 days at 20°C (100%)	liquid	increase of volume by 150 - 550%. Production of surfs, boats, sport equipment, aircrafts, automotive, wind energy
SV 51	10 - 15	0,2	2,0 - 2,5	80 - 90	30 min. at 60°C	liquid	
SV 60	50 - 60	0,2 0,3	3 - 3,5 6 - 6,5	80 - 90	24h at 20°c + 1h at 60°C 2h at 60°C	liquid	

LF TECHNOLOGY
FOIL EPOXY RESINS

Patented LF Technology (Letoxit Foil Technology) provides epoxy resin in the form of a flexible foil, which softens at increased temperature and is able to impregnate previously dry reinforcement (RFI technology). An outstanding feature of the LF Technology is its ability to impregnate reinforcement and to cure in one step.

Regarding our strong innovation activities we developed OOA (out of autoclave) technology for the production of laminated parts. This technology permits the application of various types and different numbers of layers in different areas of the construction. The exact resin content – as a function of the amount of resin used and the number of layers of reinforcement – is thereby defined at the same time. The products made using the LF Technology are comparable with products made using the prepreg technology. The main benefits of LF Technology are the carrying out of the impregnation and the curing in one step, the dry manner of lamination that maintain tidiness, out of autoclave technology, no hazardous vapours during the manipulation and curing, saving storage costs (in comparison with prepreg) and the possibility of achieving a perfect ratio between reinforcement and resin (60:40).

LF Technology can impregnate fabrics (glass, carbon, aramid, basalt, hybrids), multiaxial fabrics, mats and rovings. As core material honeycombs (Nomex, aluminium, paper, PP,…) and foams (PUR, PS) could be used

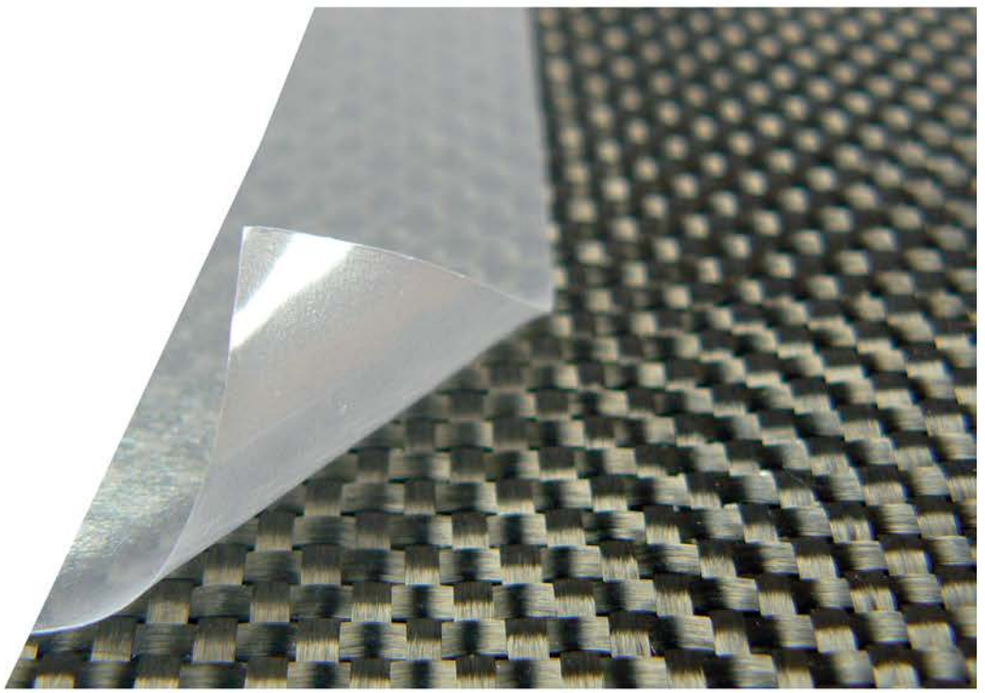
CLEAN AND FAST
COMPOSITE **PRODUCTION**

ADVANTAGES

- impregnation and curing in one step!
- out of autoclave technology
- dry way of lamination without mess around
- 3x faster production in comparison with liquid resins
- no hazard vapours during manipulation and curing
- glossy and smooth final surface
- save money for storage (in comparison with prepreg)
- great ratio reinforcement/resin (60:40)

APPLICATION

- automotive industry (car bodies, covers, hoods)
- transportation (hoods, side panels, doors, racks)
- aircraft industry (covers, doors, all types of panels)
- health care (orthoses, prosthesis)
- sport industry



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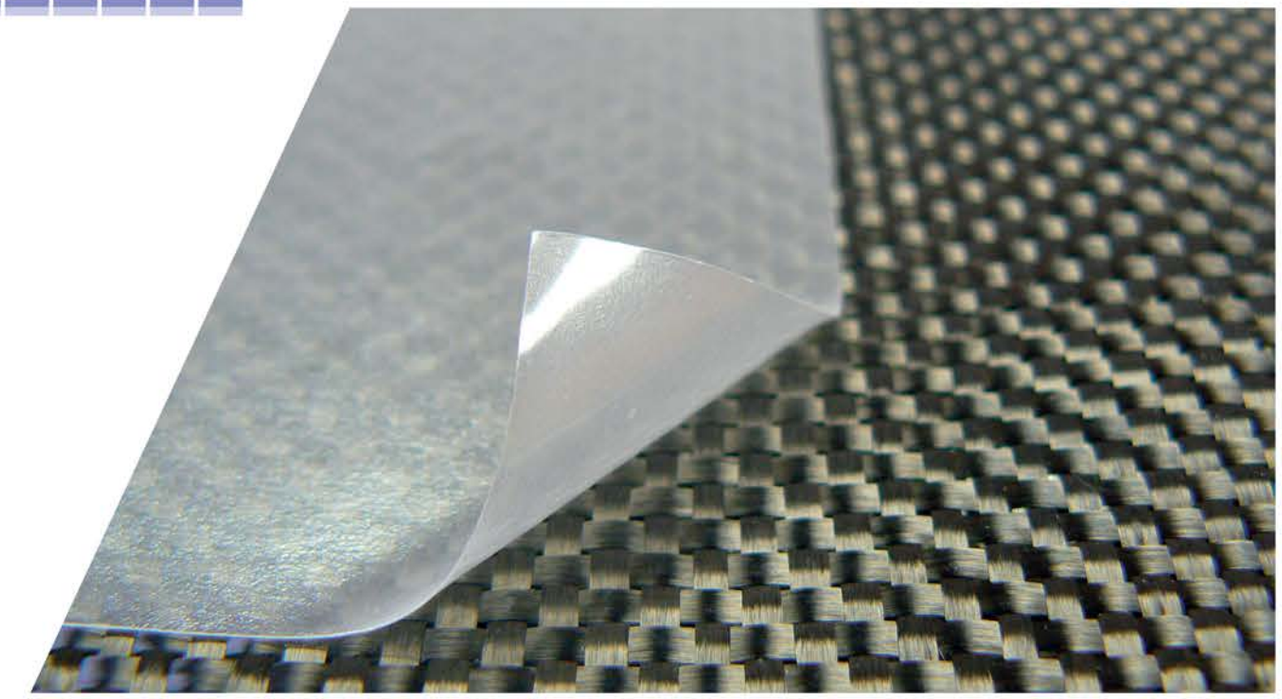
Letoxit®



EPOXY FOIL RESINS LETOXIT

Resin	Basis	Density (g/cm³)	Curing temperature (°C)	Curing time (min)	Peak (120°C, min.)	Tg (°C)	Max. Tg (°C)	Max. flexural stress (MPa)		Flexural modulus of elasticity (GPa)		Impact strength of pure resin (kJ/m²)	Characteristics
								Pure resin	Composite	Pure resin	Composite		
LFX 023	epoxy	1,19	120	60	4,65	95	100	120 - 125	540**	3 - 3,1	18,9**	45 - 50	universal type for glass fabrics
LFX 035	epoxy	1,19	120	60	5,5	122	125	120 - 125	580**	3,2 - 3,3	17,1**	30 - 35	universal type for carbon fabrics
LFX 038	halogenated epoxy	1,39	120	60	10,5	127	135	100	610**	3,2 - 3,3	19,5**	12	self extinguishing (FAR 23)
LFX 056	epoxy	1,35	120	60	6	120	125	110	480***	3,3 - 3,4	15***	22	self extinguishing (FAR 25)
LFX 060	epoxy	1,19	120 (80)	20 (240)	4	120	125	145	487***	3,2	14***	24,7	fast curing, for carbon fabrics
LFX 062	phenolic	1,19	120	45	9,4	80	103	-	-	-	-	-	self extinguishing (EN 45545, FAR 25)
LFX 162	epoxy	1,28	120 (80)	20 (240)	3,7	95	100	-	540**	-	18,9**	-	fast curing, for glass fabrics

** 12 layers glass fabric 163 g/m² twill + 5 layers Letoxit LFX 300 g/m². Resin content 44%
*** 12 layers glass fabric 163 g/m² twill + 8 layers Letoxit LFX 200 g/m². Resin content 50%

TECHNICAL SPECIFICATION OF LFX FOILS:

- area weight 240 g/m², 360 g/m² and 480 g/m² (other upon request)
- roll width 1000 mm
- suitable for glass, carbon, aramid and hybrid fabrics
- great adhesion to core materials as honeycombs (aluminium, Nomex, PP, …) and foams (PUR, PS,…)

www.5M.cz

SEMIPREGS

New alternative to prepreg technology - fabric impregnated on one side with the epoxy or phenolic foil resin. Semipregs could be used out of autoclave

In the world of composites, pre-impregnated fabrics generally referred to as prepregs, have been in use for a long time. In regard to the increase in demand for this manner of dry production of laminated parts, we have developed our own alternative, which retains all the advantages of prepregs and adds new ones. We call our product semipreg, because we are speaking about a fabric impregnated on one side with the epoxy foil resin from LF Technology. The polymer foil matrix is a combination of thermosetting resins with a hardening system and it is latent at room temperature. The reinforcement content is optional, according to the type of semipreg. The semipreg is cured at an increased temperature under pressure (a vacuum) in a mould.

There are many advantages to be gained in your laminated parts production through the utilisation of our semipreg, such as solvent-free technology, faster production (in comparison with liquid resins), out of autoclave technology and great flexibility in the composition of the structure. Our production equipment permits the production of semipreg using glass or carbon fabric with different epoxy resins, which can meet all your requirements for mechanical and other properties.

With semipregs you can easy produce composite sandwich panels, sports equipment, health-equipment tools or laminated aviation or automotive parts.

ADVANCED COMPOSITE
PRODUCTION

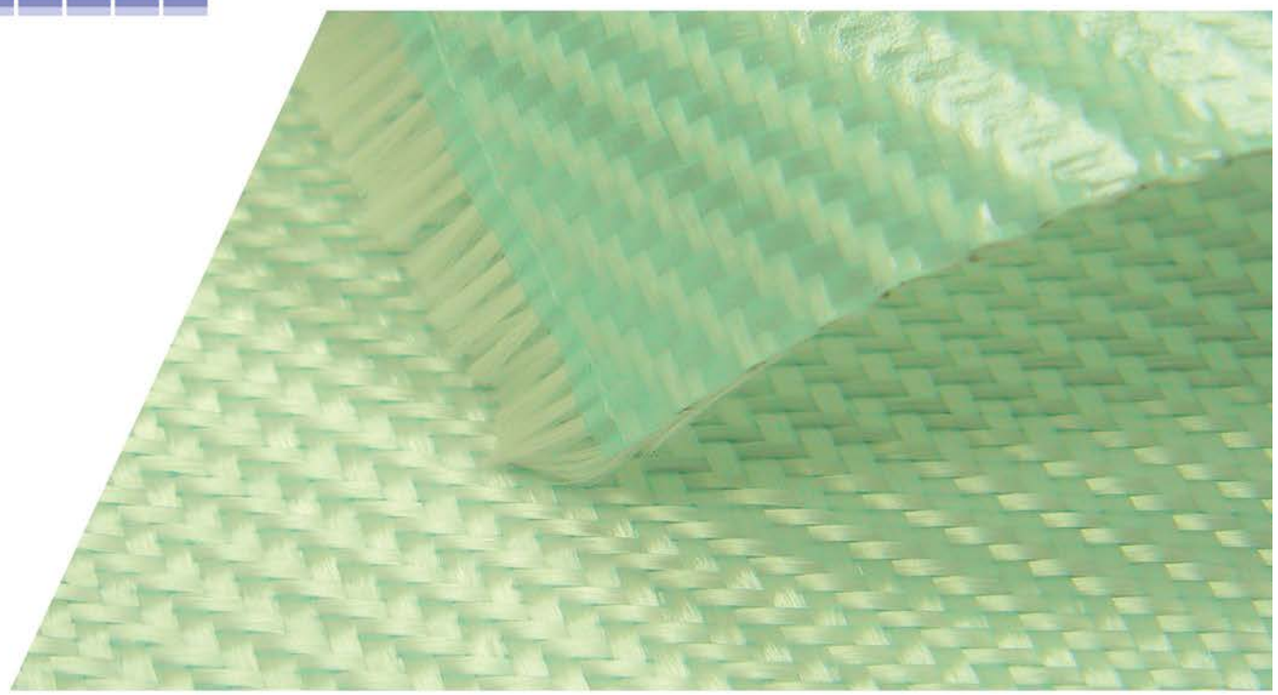
ADVANTAGES

- possible out of autoclave technology
- possible modification of parameters (resin, fabric, ratio) regarding customers needs
- solvent free
- speed up your composite production
- suitable for production of composite sandwich panels

APPLICATION

- aviation
- automotive
- shipbuilding
- sandwich panel production
- health care
- sport equipment

SEMIPREGS



Semipreg LETOXIT	Fabric	Resin	Area weight (g/sqm)	Ratio Reinforcement (%)	Ratio Resin (%)	Curing	Temperature resistance (°C)	Characteristics
SGG 0101	glass 216 g/sqm, satin	epoxy, 240 g/sqm	456	47	53	60 min. at 120 °C	100	waves permeable (RF), aviation, satellites, radomes
SGG 0301	glass 200 g/sqm, plain	epoxy, 200 g/sqm	400	50	50	60 min. at 120 °C	135	self extinguishing (FAR 23)
SGG 0601	glass 300 g/sqm, twill	phenolic, 300 g/sqm	600	50	50	45 min. at 120 °C	103	non-flammable (DIN 5510-2)
SGG 5001	glass 390 g/sqm, twill	epoxy, 260 g/sqm	650	60	40	30 min. at 120°C	100	fast curing
SGG 0105	glass 200 g/sqm, plain	epoxy, 200 g/sqm	400	50	50	60 min. at 120 °C	100	all-purpose application (glass)
SGC 0206	carbon 200 g/sqm, plain	epoxy, 200 g/sqm	400	50	50	60 min. at 120°C	125	all-purpose application (carbon)
SGC 0506	carbon 200 g/sqm, plain	epoxy, 240 g/sqm	440	45	55	30 min. at 120°C	125	fast curing, higher ratio of resin, nice surface

If you have another requirements for semipreg composition, do not hesitate to contact us and ask!

EPOXY ADHESIVES
HIGH **STRENGTH**

5M concentrates to a considerable extent on the development and production of adhesives, mainly those that are epoxy based. This range of glues is the most suitable for making joints with excellent mechanical properties and they are used in the construction of aircraft, transport vehicles or sports equipment.

Our product range includes unitary, binary and multi-component adhesives, paste-style or thixotropic adhesives and adhesives in the form of a flexible foil. We are specialists in the development of new types of adhesives in accordance with customers' requirements.

Special adhesives for high-strength construction bonding are developed in our own laboratory, where our specialists have at their disposal all of the equipment needed for the development and testing of adhesives. Some types of adhesives are approved by the ESA.

STRONG JOINT IN
ANY **CONSTRUCTION**

ADVANTAGES

FOIL EPOXY ADHESIVES

- one-component epoxy foil (film) adhesives
- excellent mechanical properties (possible usage in primary aircraft constructions)
- any hazard vapours
- guaranties equal distribution and optimum thickness of adhesive layer

LIQUID EPOXY ADHESIVE

- curing at room temperature
- high shear and peel strengths, high toughness
- contains corrosion inhibitor and spacer filler

APPLICATION

- aviation
- astronautics
- automotive
- engineering
- rail vehicles
- busses

5M

Letoxit®

FOIL EPOXY ADHESIVES

Adhesive LETOXIT	Shear strength (20°C, MPa)	Peel strength (20°C, N/mm)	Tg (°C)	Max. temperature resistance (°C)	Typical curing		Colour	Description/Advantages
					Temperature	Time		
KFL 120	36 - 41	4 - 7	102	160	120°C	60 min.	grey	extra high strength joints in aviation
KFL 125	29 - 34	3,5 - 6	102	160	120°C	60 min.	grey	net carrier
KFL 130	36 - 41	4 - 7	105	160	120°C (100°C)	20 (60) min.	grey	universal type, fast curing
KFL 131	29 - 34	2 - 4	105	160	120°C (100°C)	20 (60) min.	grey	fast curing, net carrier
KFL 156	29 - 34	2 - 4	100	160	120°C (100°C)	20 (60) min.	grey	gluing of stainless steel
KFL 162	30 - 34	2,5- 4,5	102	160	120°C (100°C)	20 (60) min.	grey	extra light adhesive (thin layer)

LIQUID EPOXY ADHESIVE

Adhesive LETOXIT	Viscosity (Pa.s)	Shear strength (MPa)	Peel strength (N/mm)	Tg (°C)	Max. temperature resistance (°C)	Mix ratio (volume)	Mix ratio (weight)	Pot life (min) 100 g at 25°C	Curing temperature	Manipulation strength (25°C)	Final strength (25°C)	Colour	Description
PL 20	pastelike	34 -40	2 - 4	50	-	100:47	100:40	60 min.	20°C	24 hours	4 - 5 days*	blue	structural adhesive, aviation grade
PL 51	pastelike	34 - 40	2 - 7	50	160	100:47	100:37	60 - 90 min.	20°C	24 hours	4 - 5 days*	blue	structural adhesive for extra strong gluing of metals, composites, wood and glass
PL 61	pastelike	30 - 35	3 - 6	60	-	100:47	100:41	60 - 90 min.	20°C	24 hours	7 days*	blue	structural adhesive for extra strong gluing of metals, composites, wood and glass. Improved temperature resistance
PL 81	15-20	27 - 33	2 - 4	80**	-	100:45	100:45	120 - 240 min.	20°C	24 hours	4 hours/80 °C	blue	structural adhesive for extra strong gluing of metals, composites, wood and glass. High temperature resistance

* could be speed up by heating (at 50°C final strength in 4 hours, at 120°C final strength in 1 hour)
** cured at 80°C

MATERIALS

Adhesive	aluminium	iron	steel	copper	stainless steel	composites	ABS	PMMA	PVC	PC	PA	PE	PP	wood	ceramics	stone
KFL 120	●●●	●●●	●●●	-	●●●	●●●	-	-	-	-	-	-	-	-	●●●	●●●
KFL 125	●●●	●●●	●●●	-	●●●	●●●	-	-	-	-	-	-	-	-	●●●	●●●
KFL 130	●●●	●●●	●●●	-	●●●	●●●	-	-	-	-	-	-	-	-	●●●	●●●
KFL 131	●●●	●●●	●●●	-	●●●	●●●	-	-	-	-	-	-	-	-	●●●	●●●
KFL 156	●●●	●●●	●●●	-	●●●	●●●	-	-	-	-	-	-	-	-	●●●	●●●
KFL 162	●●●	●●●	●●●	-	●●●	●●●	-	-	-	-	-	-	-	-	●●●	●●●
PL20	●●●	●●●	●●●	-	●●●	●●●	●●●	-	●●	-	●●●	●●●	●●●	●●●	●●●	●●●
PL51	●●●	●●●	●●●	-	●●●	●●●	●●●	-	●●	-	●●●	●●●	●●●	●●●	●●●	●●●
PL61	●●●	●●●	●●●	-	●●●	●●●	●●●	-	●●	-	●●●	●●●	●●●	●●●	●●●	●●●
PL81	●●●	●●●	●●●	-	●●●	●●●	●●●	-	●●	-	●●●	●●●	●●●	●●●	●●●	●●●

surface treated by corona, laser, plasma, oxidation flame — perfect ●●●
surface treated by laser, plasma — good ●●
surface treated by catodic protection — not tested -

EPOXY ADHESIVES

Epoxy adhesives LETOXIT® covers complete adhesive range suitable for bonding of all possible materials. Individual types are different in pot life, curing time, shear strengths or temperature resistance. Epoxy adhesives generally dominate in excellent mechanical characteristics, moisture resistance and low/high temperature resistance.

Epoxy adhesives LETOXIT® covers whole product range for qluing of all possible materials such as wood, glassfiber, metals, glass or plastics (ABS, PE, PS).

Nowadays our epoxy adhesives LETOXIT® are mostly used for production of sport equipment (skies, icehockey sticks, bike wheels, snowboards), boats, automotive or in (mechanical) engineering. If you are looking for high strength joints (structural adhesives), we produce epoxy adhesives LETOXIT KFL and LETOXIT PL.

GLUING CANNOT
BE EASIER...

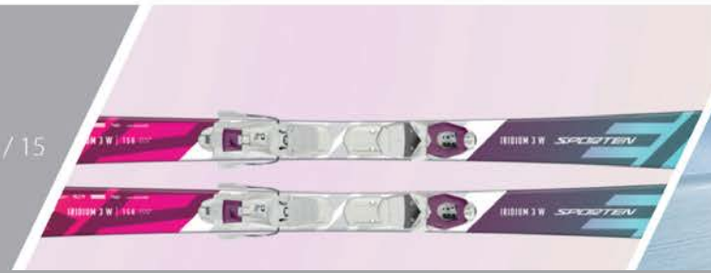
ADVANTAGES

- great mechanical properties
- curing at room temperature
- various types for many applications
- chemical resistance
- longterm durability

APPLICATION

- sport equipment
- engineering
- aviation
- transportation
- shipbuilding
- electrical industry

5M



Type	Viscosity (Pa.s)	Shear strength (MPa)	Peel strength (N/mm)	Tg (°C)	Max. tempe-rature resis-tance (°C)	Mix ratio (volume)	Mix ratio (weight)	Pot life at 25°C		Manipulati-on strength (25°C)	Final strength (25°C)	Colour	Description
LH 21	1,5-3	25	-	65	160	2:1	2:1	200 g	60 min.	24 hours	48 hours	natural	all-purpose epoxy adhesive
LH 87	pastelike	14	-	56	-	100:14	100:5,5	100 g	30 min.	24 hours	48 hours	grey	heat conductive, electric non-conductiove
LH 92	2-2,5	20-25	-	62	160	100:48	100:40	500 g	60-70 min.	24 hours	48 hours	natural	low viscosity, impregnation and gluing in one step
LH 103	0,8-1,3	20-25	-	70	160	100:54	100:46	500 g	50-60 min.	24 hours	48 hours	natural	low viscosity, impregnation and gluing in one step (thixotropic)
LH 145	pastelike	10	-	63	-	2:1	2:1	20 g	60 min.	24 hours	48 hours	white	gluing of concrete, wood, ceramics
LH 149	pastelike	40	4	95	-	100:48	100:40	100 g	60 - 90 min.	24 hours	7 days	yellow	gluing of sandwich panels, extra strong, spatula usage
LH 167	1,5-2	16	-	82	-	2:1	100:47	100 g	40 min.	3 - 4 h	48 hours	transparent	transparent, glass gluing
LH 190	pastelike	16	-	200	200	2:1	100:52	100 g	40 min.	24 hours	7 days	natural	high temperature resistance
LH 193	pastelike	23	3	35	-	1:1	1:1	20 g	30 min.	60 min.	3 hours	natural	30 minutes thixotropic
LH 195	0,4-0,8	20	-	95	-	100:41	100:33	100 g	25-35 min.	24 hours	48 hours	natural	low viscosity, impregnation and gluing in one step (stone)
LH 214	pastelike	20	-	95	-	2:1	100:48	100 g	50 min.	3 hours	3 days	dark grey	all-purpose application in engineering, contains corrosi-on inhibitor, suitable for stainless steel
LH 229	pastelike	-	-	72	-	2:1	2:1	100 g	60 min.	6 hours	24 hours	dark red	epoxy paste (production of models), density 0,7 g/m^3
LH 232	pastelike	20	4	77	160	1:1	100:94	100 g	30 - 40 min.	4 hours	48 hours	natural	all-purpose sealant/adhesive
LH 274	12 - 15	17	2	35	-	1:1	1:1	10 g	3 min	30 min	24 hours	transparent	5 minutes transparent
LH 292	pastelike	32	5	60	-	2:1	100:48	100 g	30 min.	5 - 6 h	3 days	grey	structural adhesives constains corosion inhibitor

1 COMPONENT ADHESIVES LETOXIT

Type	Viscosity (Pa.s)	Shear strength (MPa)	Tg (°C)	Max. temperature resistance (°C)	Curing temperature	Curing time	Description	Colour
LH 161	160	10	100	-	120°C	60 min	very light non-flammable filler (density 695 kg/m^3) for aviation, FAR 25	white
LA 007	1,8 - 2,2	-	-	100°C	20°C	3 - 5 minutes*	transparent, UV cured	transparent

* UVA lamp 315 - 400 nm

MATERIALS

Adhesive	aluminium	iron	steel	copper	stainless steel	composites	ABS	PMMA	PVC	PC	PA	PE	PP	wood	ceramics	stone
LH 21	●●	●●	●●	-	●●	●●	●●●	-	-	-	●●●	●●●	●●●	●●●	●●●	●●●
LH 87	casting, no specification															
LH 92	-	●●	●●	-	-	-	●●●	-	-	-	●●●	●●●	●●●	●●●	●●●	●●●
LH 103	-	●●	●●	-	-	-	●●●	-	-	-	●●●	●●●	●●●	●●●	●●●	●●●
LH 145	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	●●●
LH 149	●●●	●●●	●●●	-	●●●	●●●	●●●	-	●●	-	●●●	●●●	●●●	●●●	●●●	●●●
LH 167	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●●●	●●●
LH 190	●●●	●●●	●●●	-	-	-	-	-	-	-	-	-	-	-	●●●	●●●
LH 193	●●	●●	●●	-	●●	●●	●●	-	-	-	●●	●●	●●	●●	●●	●●
LH 195	X	X	X	X	X	X	X	X	X	X	X	X	X	X	●●●	●●●
LH 214	●●	●●	●●●	-	●●●	●●	●●●	-	-	-	●●●	●●●	●●●	●●●	●●●	●●●
LH 229	epoxy paste for moulding, no specification															
LH 232	●●●	●●●	●●●	-	●●●	●●●	●●●	-	-	-	●●●	●●●	●●●	●●●	●●●	●●●
LH 274	●●	●●	●●	-	●●	●●	●●	-	-	-	●●	●●	●●	●●	●●	●●
LH 161	●	●	●	-	-	·	-	-	-	-	-	-	-	-	-	-
LA 007	contact us for specification															

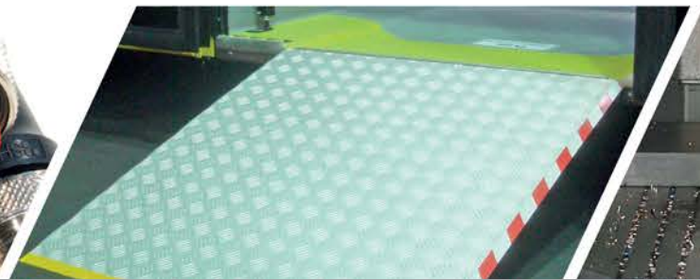
surface treated by corona, laser, plasma, oxidation flame

surface treated by laser, plasma

surface treated by catodic protection

perfect ●●●
good ●●
not tested -
not suitable X

Please contact us for the recommendation of the best possible surface treatment.



SANDWICH PANELS

The sandwich construction panels are characterised by their high strength, rigidity and, at the same time, their very low weight. When a very light panel with great mechanical properties is required, sandwich construction is the right solution for you!

The technology of sandwich constructions comes from the aviation industry, but due to its useful characteristics it is used nowadays in common items for daily use. 5M produces honeycomb sandwiches in the form of flat or three-dimensionally shaped panels with various types of end, with pasted elements for further assembly and many other types, including complicated custom-designed constructions. We are able to offer you panels in dimensions, cell sizes or plate quality that meet your requirements. We have long-term experience with the production of panels with complicated shapes, with inserts inside (for threads for example), with borders or with internal reinforcement.

Our technology of the production allows to use aluminium, steel, nickel, glassfiber, carbonfiber as cover plates (skins) and aluminium, Nomex honeycombs or foam core.

LIGHTNESS FOR YOUR
FLAT **CONSTRUCTIONS**

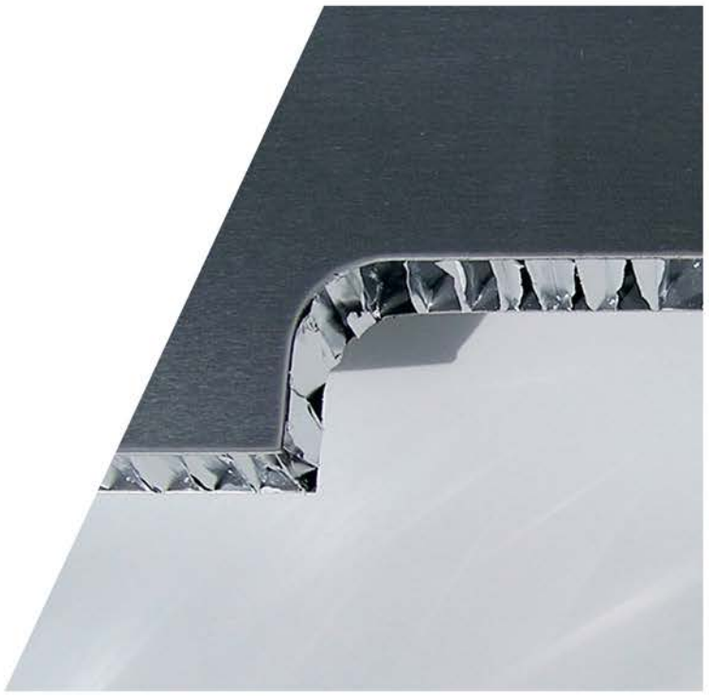
ADVANTAGES

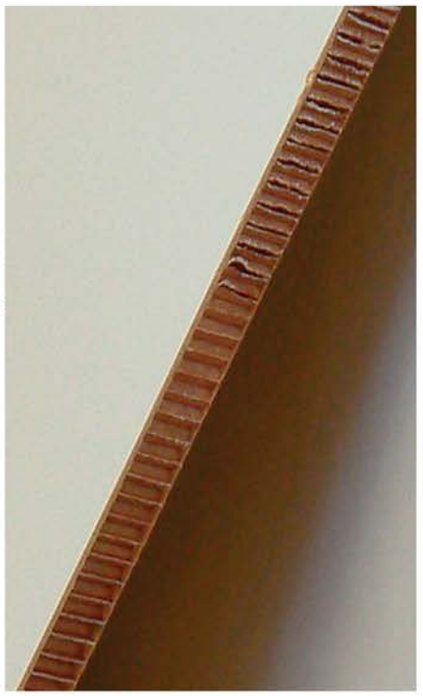
- high strength
- high stiffness
- very low weight (light structure)
- safety elements

APPLICATION

- aviation (seats, side panels, floor, doors, elevators, covers, wing flaps, radome, bulkhead, seat energy absorbers)
- transportation (doors, floors, spoilers, window panels, bulkheads, covers and lids, interior equipment, stiffeners, ramp for handicapped persons, energy absorbers)
- engineering (jigs, suction tables)

5M





ALUMINIUM SANDWICH PANELS

Most of the bonded sandwich constructions are with aluminium honeycomb core with aluminium cover sheets. These sandwiches are characterized by high strength, stiffness and very low weight at the same time. 5M produces honeycomb sandwiches in the form of flat or spatially shaped panels with various types of ending, with inserts for further assembling and many other types.

APPLICATION

- Seats
- Side panels
- Floor
- Doors
- Elevators
- Covers
- Landing gear doors
- Wing flaps
- Radome
- Bulkhead
- Seat energy absorbers
- Ramp for handicapped person in busses

COMPOSITE SANDWICH PANELS

Very interesting alternative to classic aluminium sandwich panels represent very light weight composite sandwich panels. In this material is combined glassfiber (carbonfiber) as cover sheet and Nomex honeycomb as core.

APPLICATION

- aviation
  (side panels, covers, satellite radome)
- transportation
  (interior wall panels, covers)
- shipbuilding

PUROXIT

Composite sandwich PUROXIT® panels represent a revolutionary construction element that will enable significant mass reduction in any of your projects while keeping excellent mechanical properties. Our long-term experience with composite materials has helped us develop sandwich composite boards comprising special light-weight core materials coated by laminate on both sides.

ADVANTAGES

- very light material (40% lighter than plywood)
- high strength
- great thermal insulation
- acoustic insulation
- non-flammable
- easy to glue
- can be joined into large units, whereas the joints would not concentrate tension
- waterproof (even in salt water)
- possible 3D shapes
- resistance against point load (heel test)

PUROXIT TECHNICAL SPECIFICATION

CHARACTERISTICS	VALUE
Skin (cover sheets)	PUR fibreglass
Skin thickness (mm)	2 x 1,5
Thickness	15 mm
Core	foam
Area weight (kg/m^2, thickness 15 mm)	6,5 ± 0,5
Compressive strength (MPa)	1,5
Compression modulus (MPa)	70
Stiffness (E*I) (kN*mm^2)	2,1.10^6
Flexural modulus (MPa)	6000*
Flexural modulus (MPa)	10000**
Flexural strength (MPa)	100***
Shear strength (MPa)	0,8
Shear modulus (MPa)	25
Fire resistens	EN 45 545-2
Thermal conductivity (W/mK)	0,0459
Temperature resistance (°C)	-75 to +80
Heat transfer coefficient (W/m^{2}K)	1,9
Acoustic insulation Rw(dB)	25

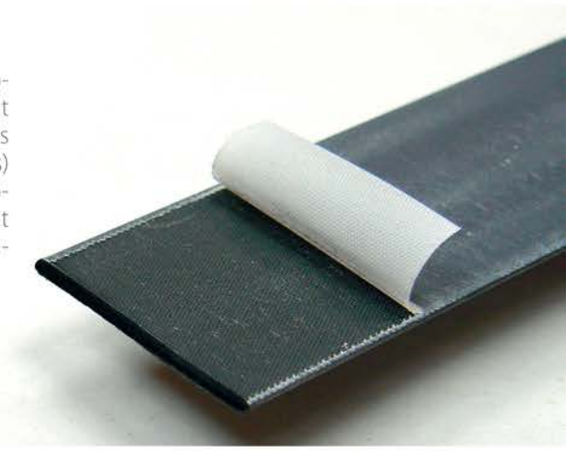
* calculated on the full thickness homogeneous material
** calculated on the supporting cover-layers only
*** span between supports edges 500 mm, width of the sample 100 mm

www.5M.cz

SILOSYST

The SILOSYST system is used for additional reinforcement of concrete structures, metal or wooden structures in cases of increased load, damage to the structure and is used to improve the qualities of the existing structure.

Our company has developed an exceptional system for additional reinforcement of structures - LETOXIT SILOSYST. This system consists of carbon lamellas (bands) impregnated with epoxy resin and two-component thixotropic adhesive Letoxit LH 145, which harden under normal temperatures.



REINFORCE YOURS
STRUCTURES!

AVIATION

The LETOXIT SILOSYST system has been successfully used in the aviation sector as well, where its exceptional mechanical qualities are used for example in reinforcement of the wing main spar or reinforcement of the primary aircraft structure.

Specification
- peel ply on both sides of the stripe
- ready to glue without extra surface treatment (after tearing of peel ply)
- structure joints by LETOXIT PL 61 and PL 81.

ADVANTAGES

- minimum intervention in the original structure
- chemical resistance
- resistance to corrosion
- high tensile strength
- no interference with computer or mobile networks
- low weight
- thermal non-conductivity
- easy manipulation

TECHNICAL DATA

Characteristics	Value
Tensile strength	2 600 MPa
Modulus of elasticity in tension	170 GPa
Density	1 600 kg/m^3
Elongation at break	1,1 - 1,2 %
Colour	black
Fiber content	70%
Standard stripe dimensions (strip width x thickness)	15 x 1,4 mm
	30 x 1,4 mm
	50 x 1,4 mm
	100 x 1,4 mm
	100 x 1,2 mm
	110 x 1,7 mm
	120 x 1,4 mm

BUILDING AND CONSTRUCTION

Thanks to exceptional mechanical qualities of the carbon fibres, it is possible to use these carbon bands to reinforce concrete or other building structures, or increase the capacity load of building structures (e.g. increase the capacity load of floors for the installation of new production machines, increase the bearing capacity of ceilings in underground garages, balcony renovations) or to refurbish older concrete objects such as bridges or buildings.

5M

SMART TECHNOLOGIES
IN THE WORLD OF COMPOSITES

www.5M.cz

5M

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