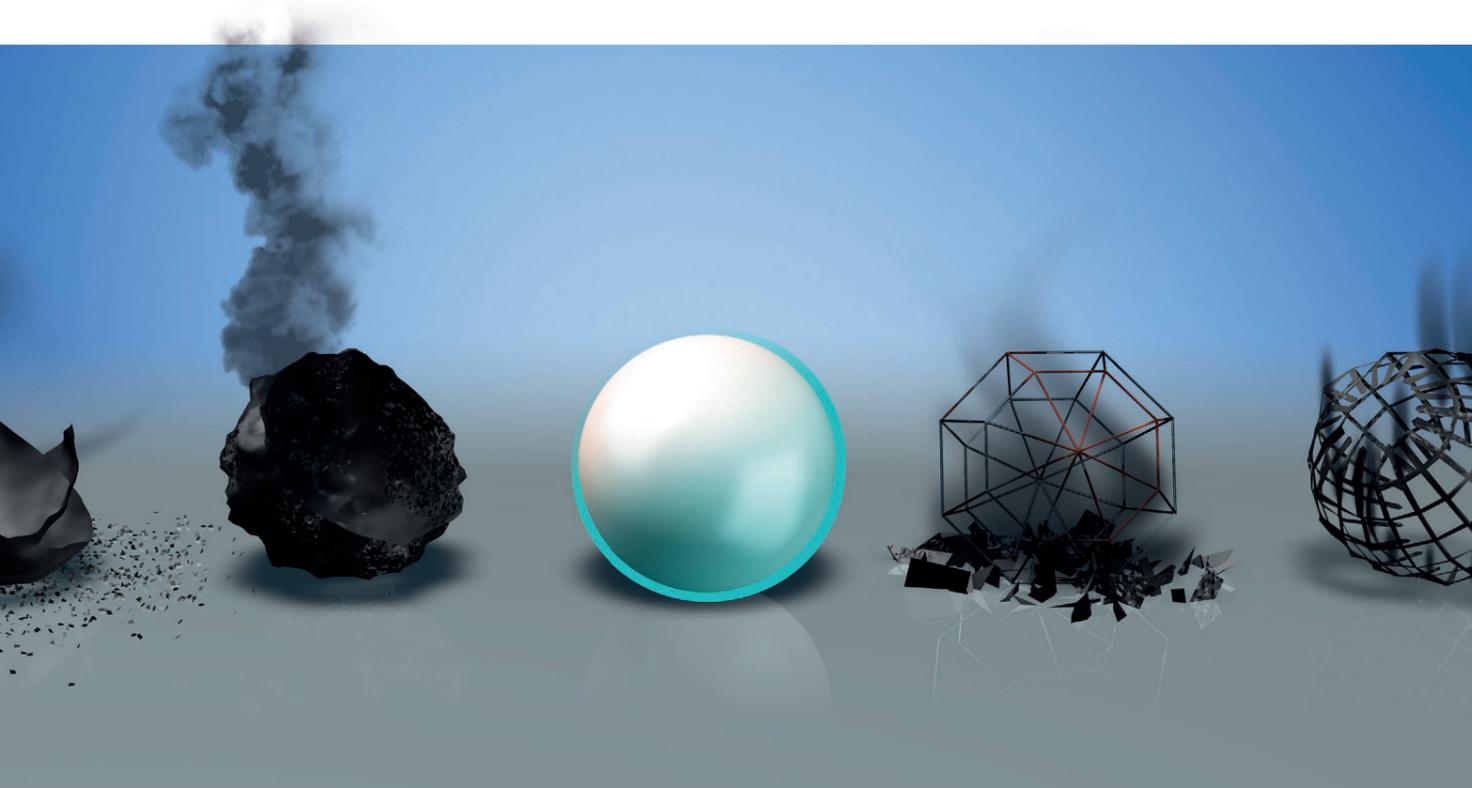




OPTIMAL SAFETY

Fire Retardant systems



Fire Retardant Systems

BÜFA®-Firestop – Fire protection with a system

In all systems in which glass fibre reinforced plastics are used, BÜFA®-Firestop makes GRP composites a flame retarding material and the GRP cladding turns into a fire protection wall.

Bottom line: BÜFA®-Firestop protects itself. This extraordinary effect is achieved by:

1. Carbonization

When exposed to heat, the integrated flame retardant converts to phosphoric acid. This causes the surface to carbonize which in turn acts as a protective layer.

2. Elimination of water

At temperatures above 200 °C, aluminium hydroxide is split into aluminium oxide and water. The water cools the source of fire and thins the resulting fumes. Aluminium oxide forms a ceramic protective layer.

3. Intumescence

Higher temperatures cause the surface of the component to swell. During the swelling process, the surface sets a carbon based protective foam free.

4. Effect in the gas phase

Through efficient suppression of the source of fire, starting in the gas phase, further spread of the fire is prevented.

The products in the BÜFA®-Firestop line can make optimum use of their qualities, either individually or combined with each other, in all imaginable applications.

All of the BÜFA®-Firestop products are strictly tested according to German as well as international standards. They can be applied quickly without any problems and no special requirements are placed on the production process.

BÜFA Fire Retardant systems give GRP components the necessary protection against fire and therefore give you optimum safety. Innovative solutions for all applications!

Why BÜFA Fire Retardant Systems?

In-house research and development

In-house production

In-house test centre where the following test methods are used:

- ISO 5660 (Cone Calorimeter)
- DIN 5510-2
- LOI (Limited Oxygen Index) ISO 4589-2
- UIC 564-2

The result:
Maximum safety and maximum efficiency at minimum cost.



Cone Calorimeter

Halogenfree resins

Resin name	BÜFA®-Firestop S 425	BÜFA®-Firestop S 430	BÜFA®-Firestop S 520	BÜFA®-Firestop S 555	BÜFA®-Firestop S 570	BÜFA®-Firestop S 900 Foaming Resin
Art. No.	716-0425	716-0430	716-0520	716-0555	716-0570	716-0900
Resin base	DCPD	DCPD	DCPD	DCPD	OP	OP
Non-volatile matter [%]	56	78	74	69	84	70
Viscosity [mPa.s]	230 (20s/1)	720 (20s/1)	800	750	900	1250
Elongation at break [%]	not tested	not tested	2.8	not tested	2	1.8
Tensile strength [MPa]	not tested	not tested	82	not tested	82	58
HDT [°C] calculated	110	110	100	100	88	78
Comments	Slightly filled, halogen-free, pre-accelerated, for structural components in vacuum injection processes	Halogen-free, filled system, HLU, ideal for spray up application, preaccelerated	ATH filled injection resin for structural components, preaccelerated	ATH filled injection resin, preaccelerated	ATH-filled, thixotropic resin for structural components, preaccelerated	Filled foaming resin with good fire retardant properties

Resin name	BÜFA®-Firestop 5001-W-2	BÜFA®-Firestop 5001-T-1	BÜFA®-Firestop 8175-W-1
Art. No.	716-5002	716-5003	716-8175
Resin base	DCPD	DCPD	DCPD
Non-volatile matter [%]	80	not tested	76
Viscosity [mPa.s]	1100 (20s/1)	100	750 (20s/1)
Elongation at break [%]	2.2	0.45 (filled)	3
Tensile strength [MPa]	87	51 (filled)	80
HDT [°C]	90	not tested	> 100
Comments	Highly ATH-filled resin for higher standards, preaccelerated	Prepared to be highly filled, little smoke development (+ 300 parts of ATH), not preaccelerated	ATH-filled, thixotropic resin for structural components, preaccelerated



* LEO-System

Halogenated resins

Resin name	BÜFA®-Firestop S 810	BÜFA®-Firestop 2754-P-2	BÜFA®-Firestop 2777-P-1	BÜFA®-Firestop 6806-N-5	BÜFA®-Firestop 6815-N-4	BÜFA®-Firestop S 840
Art. No.	716-0810	716-2754	716-2777	788-0806	788-0816	788-0840
Resin base	DCPD	OP	DCPD	OP	DCPD	ISO
Non-volatile matter [%]	82	65	68	60	65	60
Viscosity [mPa.s]	500 (250s/1)	230 (20s/1)	420 (20s/1)	200	210	not tested
Elongation at break [%]	not tested	1.8	1.2	0.6	1.9	>100
Tensile strength [MPa]	not tested	49	25	96	75	5
HDT [°C]	not tested	65	50	63	54	35
Comments	ATH-filled and halogenated white resin for the highest fire protection requirements, not preaccelerated, also available as a nature version (716-0811)	Halogenated unfilled resin for HLU- and RTM applications, preaccelerated, also available as a filled version (716-2755)	Halogenated unfilled resin for HLU applications, preaccelerated, for IMO 1006 life boats	Halogenated resin for translucent applications, not pre-accelerated	Halogenated resin for translucent applications, designed for higher standards, not pre-accelerated	Halogenated highly flexible resin (e.g. for roofing applications), not preaccelerated, also available as a styrene free version (788-0842)

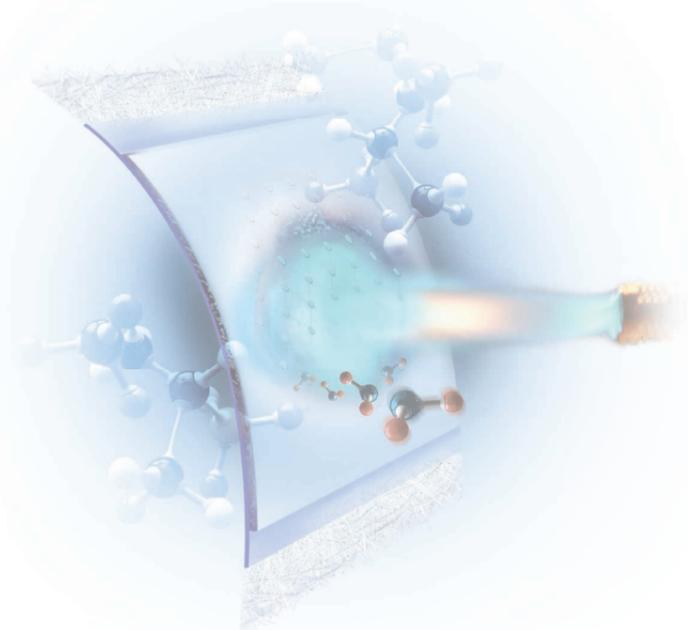
Fire Retardant Systems



Gelcoats

Gelcoat name	BÜFA®-Firestop GC S 230	BÜFA®-Firestop GC S 250	BÜFA®-Firestop GC S 260	BÜFA®-Firestop GC S 270	BÜFA®-Firestop GC S 285	BÜFA®-Firestop GC S 300
Art. No	714-2300	708-colour (spraying quality) / 728-colour (brushing quality)	714-2600	714-2702	714-2852	714-3000
Resin base	IP	IP	OP / NPG	VE / DCPD	IP	VE / DCPD
Non-volatile matter [%]	82	Colour 708 = 77 Colour 728 = 84	76	84	80	85
Viscosity [mPa.s]	30,000	Colour 708 = 7,500 Colour 728 = 30,000	11,500	28,000	14,000	25,000
Elongation at break [%]	5	8.2	3.4	3	4.5	2.5
Tensile strength [MPa]	50	52	56	45	48	45
HDT [°C]	59	41	39	60	36	85
Comments	Gelcoat in a spraying quality with increased fire protection properties	Gelcoat in a spraying quality with good fire protection properties	Gelcoat in a spraying quality with increased fire protection properties	Gelcoat in a hand and spraying quality with highest fire protection properties	Gelcoat in a hand and spraying quality with highest fire protection properties	Gelcoat in a spraying quality with highest fire protection properties

Chemical properties	DCPD: dicyclopentadiene	OP: orthophthalic acid	IP: isophthalic acid	VE: vinyl ester	NPG: neopentyl glycol
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FR-Additives

Product name	BÜFA®-Accelerator Complex 9003	BÜFA®-Accelerator Complex 9004	BÜFA®-Additive Viscoreducer	BÜFA®-Repair Additive	BÜFA®-Accelerator Foaming Agent
Art. No.	715-9003	715-9004	742-0018	742-0030	020-0880
Chemical composition	Accelerator complex for curing of highly filled fire retardant systems	Accelerator complex for curing of highly filled fire retardant systems based on polymeric cobalt	Viscosity reducer for filled HLU- and Infusion systems	Repair solution for the repair of gelcoat surfaces in spray up technics	Foaming agent for BÜFA®-Foaming resins

Fire Retardant Systems



Bonding Pastes and further additives

Product name	BÜFA®-Firestop Liquid mat	BÜFA®-Firestop Adhesive 0255	BÜFA®-Firestop Barriercoat 9002	BÜFA®-Firestop Surfacer	BÜFA®-Firestop Bonding Paste LEO 5200
Art. No.	715-0245	715-0255	715-0709	715-0250	715-5200
Resin base	OP	VE	IP	IP	VE
Non-volatile matter [%]	87	85	83	72	86
Viscosity [mPa.s]	300,000	400,000	29,000	10,000	550,000
Elongation at break [%]	2.5	4.5	8	6	5
Tensile strength [MPa]	6.5	12.5	not tested	not tested	13
HDT [°C]	70	85	not tested	not tested	80
Comments	Liquid fire protection mat: Levels sharp edges and corners, fire protection adhesive	Adhesive for structural applications with increased fire protection properties	Fire protection barriercoat to achieve optimum surface quality	Spray spatula with fire retardant properties S	Adhesive for structural applications according DIN Spek 91326, build for the LEO system with increased fire protection properties

Fire Retardant Systems



Fire protected composite components with outstanding mechanical properties.

Innovative Fire Protection for:

- Wind energy
- Offshore / Oil & Gas
- Boat & Shipbuilding
- Railway
- Civil engineering & Construction



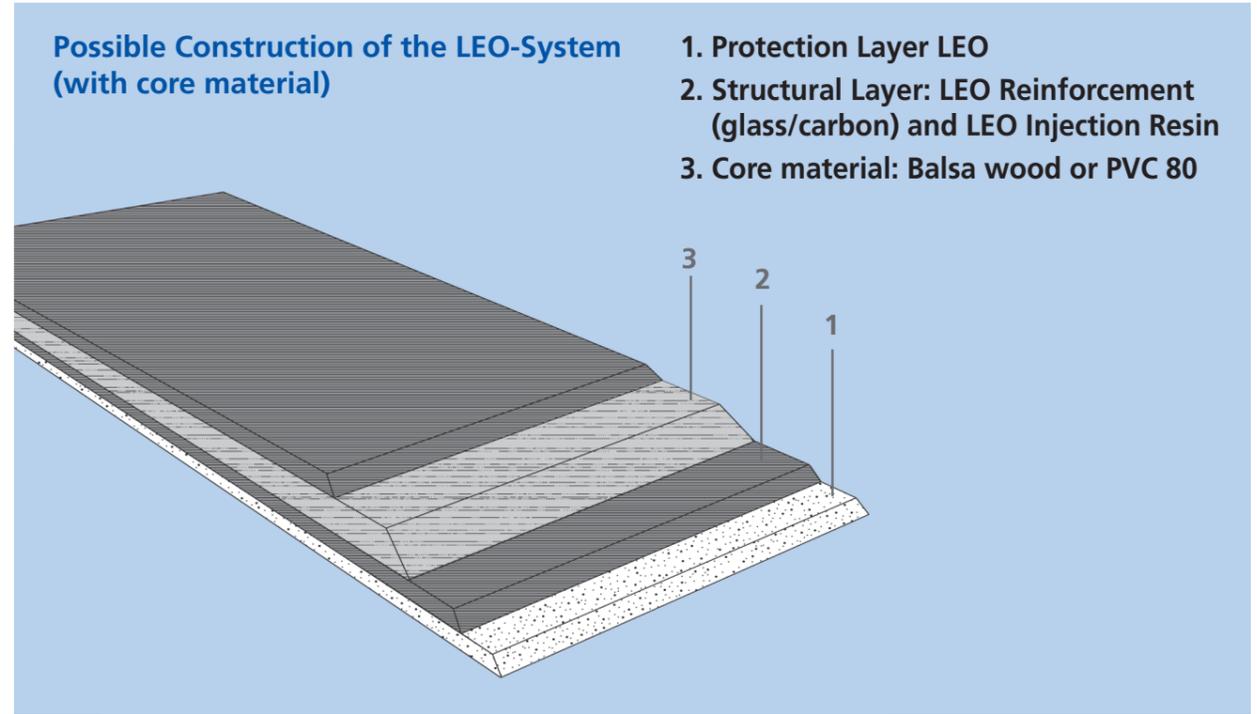
Practically unlimited use in new application areas

LEO is a novel composite material which, when processed into moulded parts, meets the strictest European and international fire protection standards and, at the same time, also has the highest mechanical properties which allows practically unlimited use in new application areas.

LEO – invented in Germany

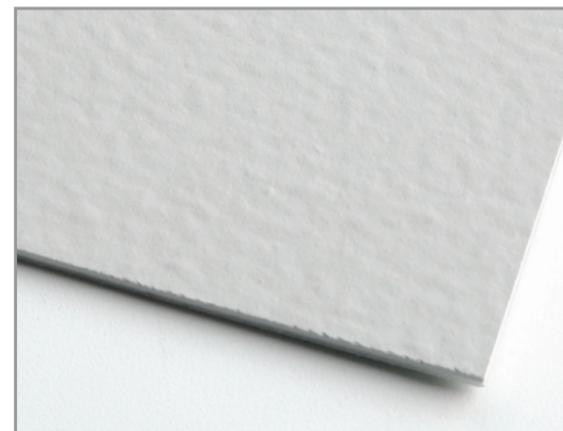
To make LEO available as a ready-to-use system with approved properties, the companies SAERTEX® (manufacturer of reinforcement materials) and BÜFA Composite Systems have joined forces. We have pooled our knowledge so that we can offer our customers in the composite industry the best solutions and support. The result of joining our competence and experience for developing customer specific solutions is the **LEO-System (LIGHTWEIGHT WITH EXTREME OPPORTUNITIES)**.



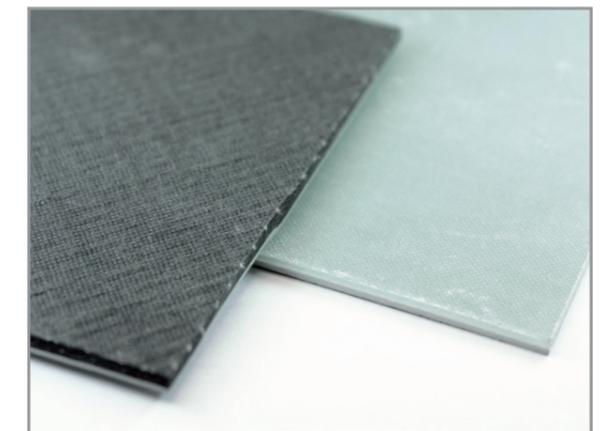


Depending on the customer's specific requirements and the intended use of the components, different core materials, optimised NCF layers and resins can be used. In most cases, LEO Protection Layer is applied as a final layer.

LEO's individual components are physically and chemically coordinated to each other so that they best meet the specific requirements of the moulded part with the application method used.



LEO Protection Layer



LEO reinforcement (Carbon or glass)



HLU with standard UP

LEO



1.850 °C
3.362 °F

3 min

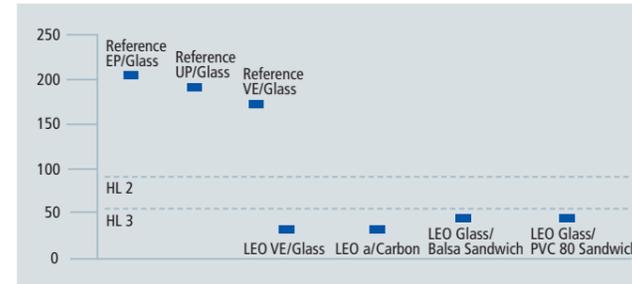


Convincing in various ways

LEO is tested in accordance with international FTP codes, and provides low-weight material with high fire retardancy and mechanical performance.

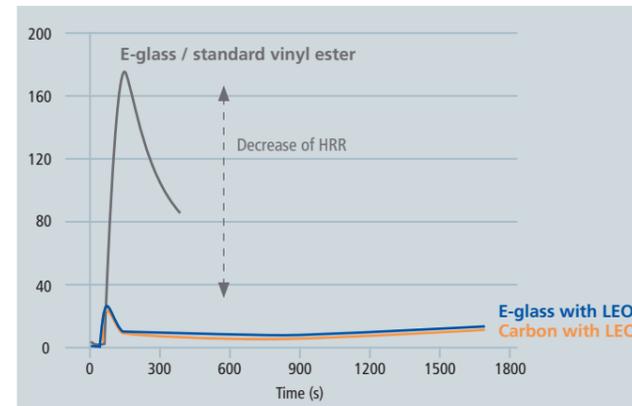
Less toxicity in the event of fire

The system components do not contain any toxic ingredients such as halogens or antimony trioxide. All of the raw materials used are completely compliant with REACH.



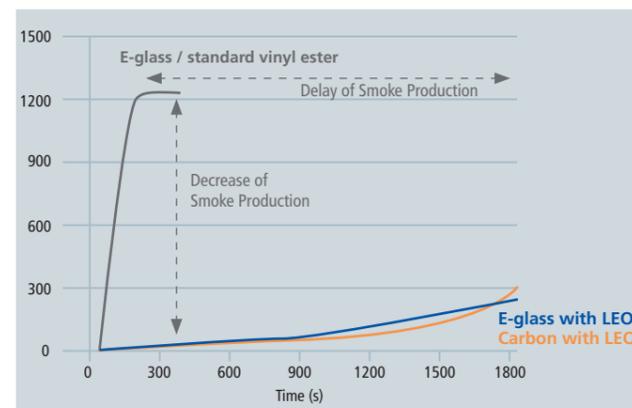
Maximum Average Heat Release Rate acc. ISO 5660-2

**Highest FR-Rating:
HL3 according EN 45545**



Average Heat Release Rate acc. to ISO 5660 (kW/m²)

**Considerable low
heat release**



Average Smoke Release Rate acc. to ISO 5660 (m²/m²)

**Delay and decrease of
smoke production**

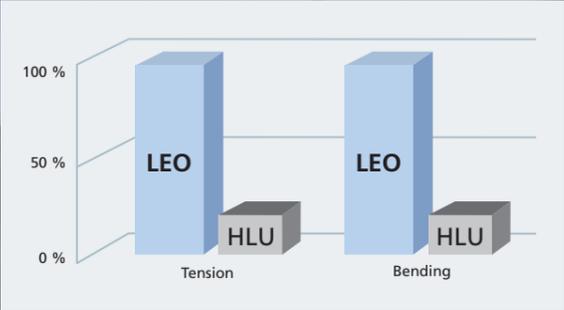
	IMO		EU			GER			FR		UK			US				EU	ES		
	HSC 200	IMO RES. A 653 (16) FTP	IMO RES. A 653 (16) FTP	EN 45545-2:2013							NFPA 130:2007										
		Code MSC 61 (67)	Code MSC 61 (67)																		
	ISO 9705	Annex 1 Part 2	Annex 1 Part 5	ISO 5658-2 2006	EN ISO 5659-2 2007	ISO 5660-1 2002	DIN 4102	DIN 5510		NFF 16-101	BS 476-6	BS 476-7	BS 6853, Annex B	ASTM E 662	ASTM E 162	ASTM E 1354	ASTM E 84	BSS 7239	EN ISO 13501	UNE 23721: 1990	
LEO Marine	*	fulfilled	fulfilled																		
LEO Rail				HL 3	HL 3	HL 3		S4/SR2/ST2 +Tox., according to 5659		M 1/F 1	class 0	class 1	Rail cat 1b exterior cat 2 interior	Max. Ds: non-flaming 83 Max. Ds: flaming 110	FSI=12	HRR _{peak} = 90 kW/m²		fulfilled			M 1/F 1
LEO Building							B1			M 1/F 1	class 0	class 1		Max. Ds: non-flaming 83 Max. Ds: flaming 110	FSI=12	HRR _{peak} = 90 kW/m²	class A		b/s2/d0		M 1/F 1

*in process

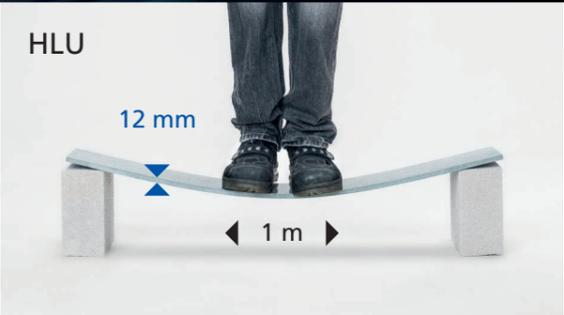
Impressive Lightweight



Thanks to its low weight, LEO is vastly superior to conventionally produced mouldings in regard to cost efficiency. Its excellent mechanical properties are just as impressive: Much better rigidity as well as tensile and flexural properties – and that in spite of less weight and a thinner layer of material.

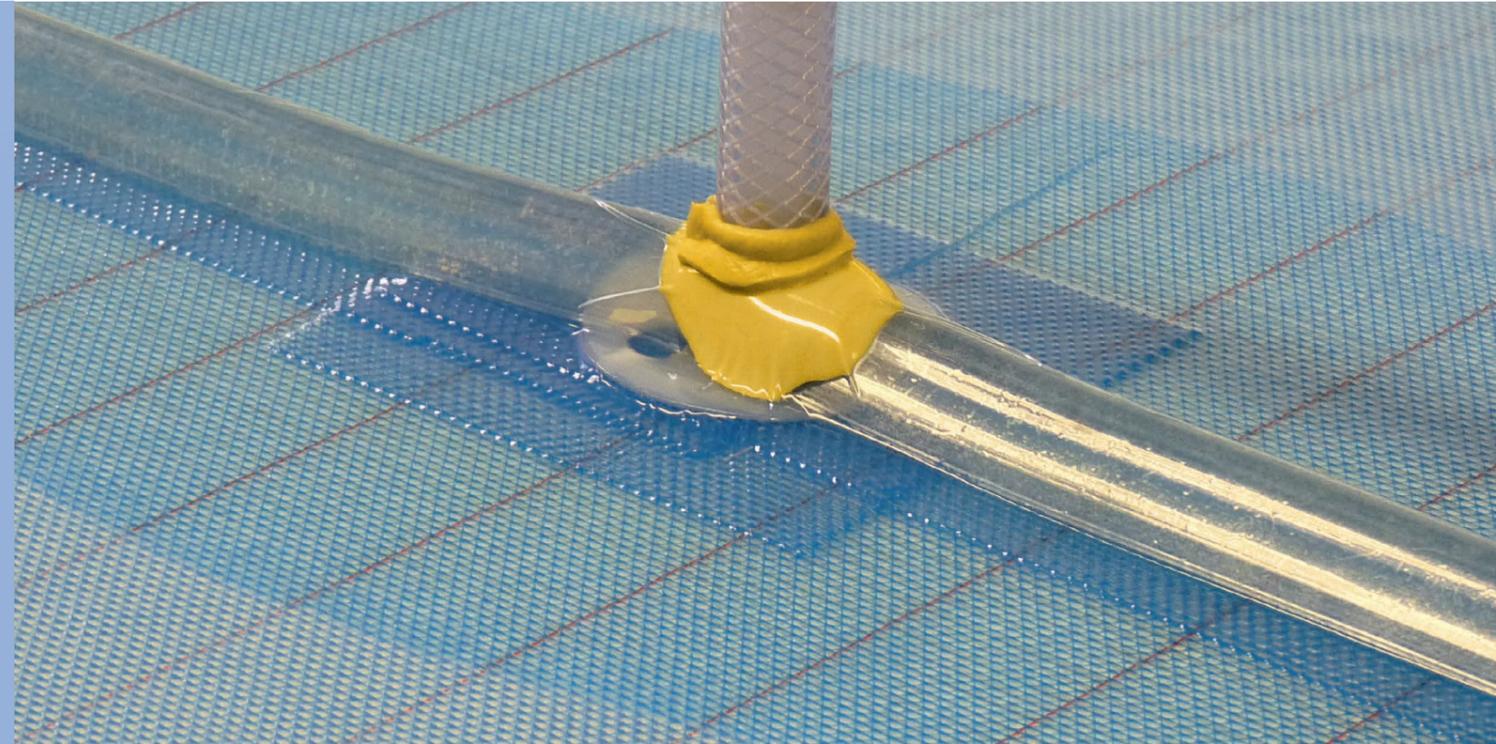


Mechanical properties



12 x
12 x higher tensile strength compared to hand lay-up laminate

5 x
5 x higher part stiffness with same weight



Cost effective

LEO provides high cost effectiveness through low material usage, efficient labor-cost production technologies (infusion) and part production without time intensive intermediate curing. LEO can be processed at room temperature.

40%

40 % lighter parts with same stiffness compared to HLU

30-35%

30 - 35 % faster production of parts compared to HLU

High quality

Standardized processes (infusion technology) ensure highly reproducible part quality. The uncompromised quality of LEO's ingredients is maintained by recorded testing performed during production.

Competent

The entire techno-commercial collaboration is done via a single point of contact. BÜFA will be your competent contact during all project phases and has the required know-how and staff to realize your wishes and goals.