ENG

Labara

MACHINING OF ELECTROINSULATING MATERIALS AND PLASTICS

www.labara.cz

Labara

LABARA Company Ltd. was founded in 1995 as a commercial organization. The main activity was buy and sell of laminated electro-insulation materials. Motivated by the needs of its customers, Labara gradually created an in-house production department, focusing on the cutting and machining for electro-technical industry field.
So already in year 1998, our company could start offering to our customers an operational processing of electrical insulating materials, plastics and non-ferrous metals on CNC machines according to their requirements and drawing specifications.
We offer supply of cut parts, coating parts, gluing, thermoforming plastics. We understand our customer needs - we can produce both lump product, and also we can deliver a big series. Labara also performs subsequent installation of electrical components as needed and required. We have the necessary machinery for this activity - CNC lathes, CNC milling machines, saws and water jet.
In Labara product range you can also find following electroinsulation materials - sheets, rods, tubes, slot insulations, technical tapes, adhesive tapes, insulation tubes, mica insulation materials, round and profile copper and alluminium winding wires, veiling mats for lamination, glass fabrics and yarns. We also offer wires and cables for electrical wiring distribution.
The production quality is guaranteed by the certified system ISO 9001: 2009 and UL Repackaging system.

www.labara.cz

Labara-rus

Our company has been working for many years with customers from the Russian Federation and to support these activities, we decided to establish subsidiary co. LABARA-RUS in year 2012 in Yekaterinburg.

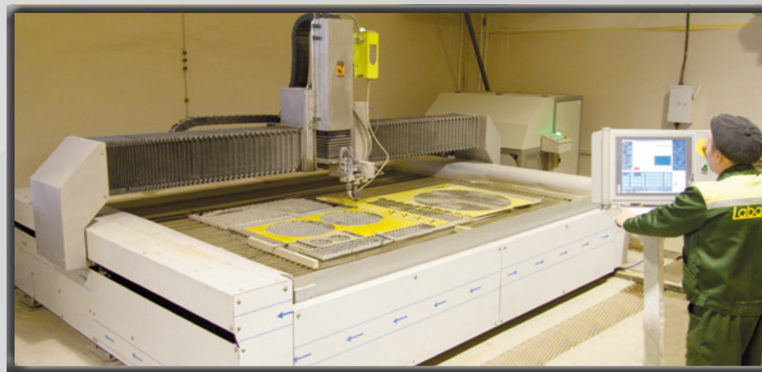
LABARA-RUS main activities are supplies of electroinsulation materials for electrotechnical and engineering industry. The important customers are manufacturers of transformers, electrical equipments, motors and generators, chokes, reactors, producers of transport equipments (trains, trams, trolleys etc.) In Russia and other former Soviet republics.

LABARA-RUS production programm is cutting and machining of electroinsulation materials. The company is using its own production technology (know-how) for production of glass epoxy tubes. The part of the production is also coating and gluing of materials, following customers specifications. We also offer slitting and machining by water jet – for customer special product applications.

The main supplied materials are sheets, rods, tubes, plastics, slot insulations, technical tapes, adhesive tapes, insulation tubes, mica insulation materials and others. These materials are supplied either in standard production format sizes, but also mainly as a offcutts and fabricated elements, according to customers technical drawings.

Electroinsulation materials are supplied according the GOST norms, or the european DIN technical norms.

LABARA-RUS has very modern technological equipment, especially CNC equipment –saws, milling machines and lathes.



www.labara.ru

BOBROVSKI INSULATION FACTORY

For further development of the company and strengthening of the business position on the Russian market, the electrical plant BIZ was acquired. BIZ – BOBROVSKI INSULATION FACTORY (Bobrovskiy Izolacionny Zavod), which is located 35 km from Yekatěrinburg, site plant covers an area of 10 hectars.

BOBROVSKI INSULATION FACTORY is one of the traditional, long-standing manufacturers of electrical insulating materials and components in Russia. The main fields of the plant is the production of laminated sheet materials (different types of reinforcement - paper, fiberglass and fabric).

Another production divisons of this company are: dielettric foils, impregnated materials, insulators, phenolic cotton electroinsulation rods, glass epoxy profiles of different shapes, dogbones, laminated cardboard, paper tubes and electrical rods, fiberglass tubes.

The strategic customers of BOBROVSKI INSULATION FACTORY LLC are companies from following industrial sectors:

- Electrical engineering (high and low voltage transformers, power cables production)
- Power industry (electric motors, turbogenerators, vacuum switches, insulators)
- Electronics industry (microelectronics, printed circuit boards, measuring instruments)
- Metallurgy
- Building industry

BOBROVSKI INSULATION FACTORY is a company with years of experience in the production of electrical insulating materials. In conjunction with traditional methods of production and the current modern technologies, the new production techniques and modern equipment are used. Our staff is highly qualified and trained, so that our products always meet the high quality requirements and satisfy all customer needs.

www.biz-ural.ru

Quality Management System BIZ is certified according to ISO 9001-2011.

CNC CUTTING

Our company is specialised for cutting of insulating materials and plastics, using specific formatting.

We slit upto a thickness of 100 mm according to customer requirements. Maximum length cut is 3100 mm with an accuracy of +/- 0.1 mm.

CNC MACHINING

We are equipped with modern high speed CNC machines, guaranteeing to achieve high dimensional and geometric accuracy of the desired surface quality. Beside the three-axis vertical milling CNC machines with an additional fourth axis,our fleet include also 2 pallets table horizontal machining center Makino CNC. Maximum workpiece dimensions for this machine are 750 mm in diameter and a height of 950 mm, with a weight parts upto about 400 kg.

For the machining of rotating parts is available CNC turning center OKUMA Genos with the possibility of clamping a workpiece diameter up to 340 mm. This machine also allows machining in axes C and Y. To ensure treatment of complicated components, company LABARA has 5 axes machining center HERMLE C400 U with swiveling rotary table of a diameter 650 mm.

WATER JET

To increase the efficiency of production of plate shape parts the company's fleet Labara extended to the manufacturing technology of waterjet cutting. Machine has the size of working place 2x3 meters and is equipped with two heads - cutting and threading. This head allows to make threads upto size M12 (depending on type of material).

LASER INSCRIPTION AND FINAL PARTS ADJUSTMENT

All required machined parts we are able to mark by laser marker device, using text or graphic descriptions (logos, pictures, etc.)

We also provide surface finish of machined parts, such as painting, staining, nickel plating, zinc plating, silver plating and anodizing.

QUALITY

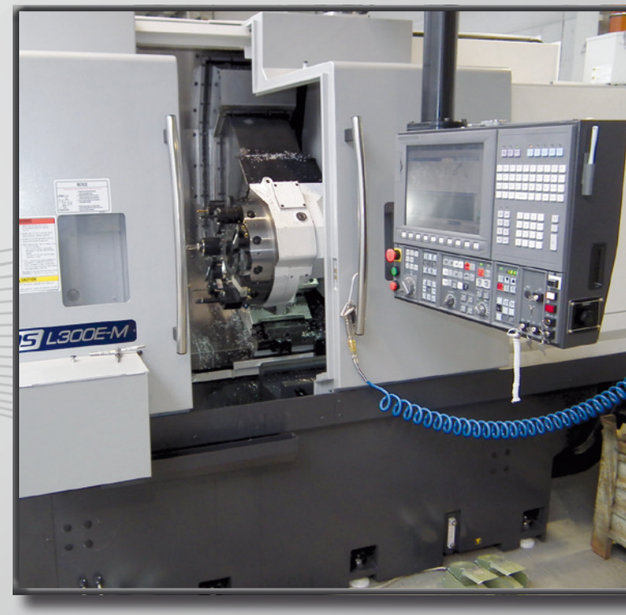
To ensure product quality in accordance with current standards, our products and processes are constantly monitored. We are equipped with all modern measuring devices, including 3D measurement system. Besides of regular audits, the company LABARA is audited and regularry evaluated by you, our customers. Based on your ideas we are constantly improving our processes.

TRACEABILITY OF PRODUCTION BATCHES

Thanks to our internal system orders monitoring from its receipt to delivery to the customer, we also can do perfect traceability of production batches.

TECHNICAL ADVICE

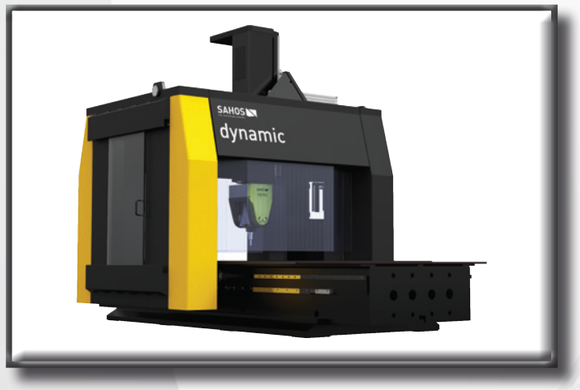
Our staff will help you choose the right material, recommending appropriate tolerance or quality functional surfaces, and to manufacture of prototypes and samples as well. In every moment, fully as possible we always do our best to meet your needs, and the emphasis is always placed on an individual approach to every customer.



MACHINE COMPANY FLEET

5-axis machine SAHOS – Dynamik:
(electroinsulation machining)

Dimensions of elements are max.:
1250x2750x650 mm



Long turning Manurhin K´MX 432 (CNC lathe with feeder)
(machining of non-ferrous metals and plastics)

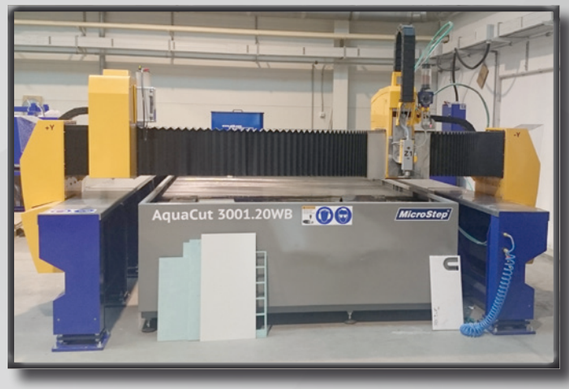
Maximum rod diam.: Ø 32 mm
Drilling of the main spindle: Ø 37 mm
Max. length of machining per stroke: 400 mm
Max. length of rod for feeder: 4 000 mm

MACHINING CENTER HERMLE C 400 U
5-axis machining center

Swivel rotary table: ø 650 mm
Taxiway X-Y-Z: 850 - 700 - 500 mm

Water jet AQUACUT 3001.20 WB
(cutting of all types of materals)

Working table area: 3000x2000 mm
Max thickness of material: 100-150 mm based on the type of material
Machine is equipped by 2 heads – cutting and drilling and threading, with possible max thread M12



Vertical 3 axis CNC milling and drilling centers MCV 1016 QUICK = option 4th turning axis (machining of insulating materials, non-ferrous metals and plastics)

Table travel in axis X: 1016 mm
Table travel in axis Y: 610 mm
Headstock travel in axis Z: 710 mm
Clamping table surface: 1300 x 600 mm
The maximum table load: 700 kg

Vertical 3 axis CNC milling and drilling center MAKINO PS 95
(machining of non-ferrous metals and plastics)

Table travel in axis X: 920 mm
Table travel in axis Y: 510 mm
Headstock travel in axis Z: 460 mm
Clamping table surface: 1170 x 510 mm
The maximum table load: 800 kg

Vertical highspeed CNC milling center with 2-pallets exchanger BROTHER SPEEDIO R450X1
(machining of non-ferous metals and plastics)

Pallet size: 300 x 350 mm,
Max. weight of machined element: 120 kg

Horizontal 2-pallets CNC machining center MAKINO a61nx
(machining of non-ferrous metals and plastics)

X axis move (stand lengthwise): 730 mm
Y axis move (vertical spindle): 730 mm
Z axis move (crosswise table): 800 mm
Table:
Size of pallet: 500 × 500 mm
Machined element size (diam./height): 800 / 1 000 mm
Max. weight of element: 500 kg
Spindle: turns 15 000 min-1

CNC turning center OKUMA Genos L300E-MY
(machining of non-ferrous metals and plastics)

Max. circulating: Ø 520 mm
Spindle drilling: Ø 80 mm
Machined: Ø max. 340 mm
Dist. spindle-revolver: 1020 mm

Spindle:
Turns: 25 - 3000 turn/min
Power: 11,0 kW
Driven tools for milling

CNC Cevenini E450
(slitting of electroinsulation tapes)

Maximum length of cutted roll: 1650 mm
Maximum diam. of cutted roll: 430 mm
Width tape tolerance: +/- 0,2 mm

EASYLINE R-320
(feathering of slot insulation foils)

Max. thickness of material.: 0,50mm
Max. width of material: 320 mm;
Minimum width of feathered materials: 18 mm

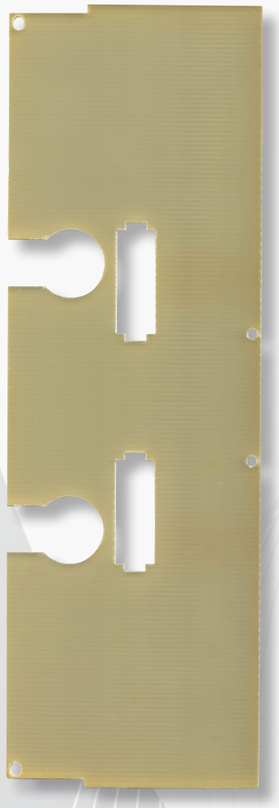
PUNCHING

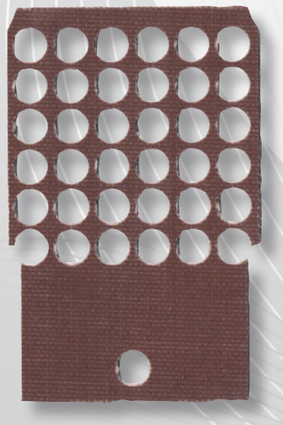
Based on customers request we extended production about other processing facility by punching technology of electroinsulation materials, plastics, rubber, banding and slot insulation. This process leads to outstanding production capacity increase, material utilisation and cost reduction by parts production in higher volumes.

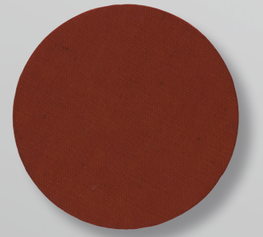
According to product complexity, material request and series volume, there is individually recommended a usage of the most suitable punching tool. Construction and provening of complicated tool design takes about 2 - 3 months. A simple tool production takes several weeks – whose design requires only current tool modification. Common tool life depends on material kind – about 500 000 hoistings.

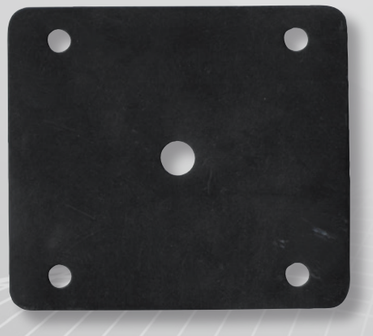
Moulded parts thickness is standardly to 3 mm, eventually to 5 mm. Dimensional length and hole diameter tolerances can be achieved according to material kind and its thickness from ± 0,1 mm.

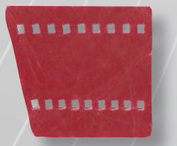
We will have a pleasure to give you a response for all requests and make complete price offer.











RODS

Laminated moulded tubes and rods are manufactured in moulds by rolling epoxide or phenolic impregnated layers of material on mandrel and curing at high temperature and under preassure.

ROD TYPES		Reinforcement	Resin	Thermal class °C
DIN 7735-2/NEMA	IEC			
Hp 2068	PF CP 41	paper	phenolic	120
Hgw 2088	PF CC 42	cotton cloth	phenolic	120
	EP GC 41	glass cloth	epoxide	130
	EP GC 42	glass cloth	epoxide	155
		glass cloth	epoxide	180; 200; 220
SG 200				200

RODS				
Type	Diameter	Weight	Material	Length
	d (mm)	(g/pc)		(mm)
6020125	3,2	16	SG-200 (200 °C)	2750
6020003	5,8	50		
6020004	6,4	59		
6020005	8	105		
6020006	9,5	155		
6020008	12,7	234		
6020010	15,9	375		
6020012	19	542		
6020014	22,2	789		
6020016	25,4	988		

APPLICATION:

laminated moulded tubes and rods are generally applied as electroinsulating and mechanical material.

*** The above mentioned values are for illustrate purposes only. We will make an offer based on your specific material inquiry demand.**

ROUND ROLLED TUBES

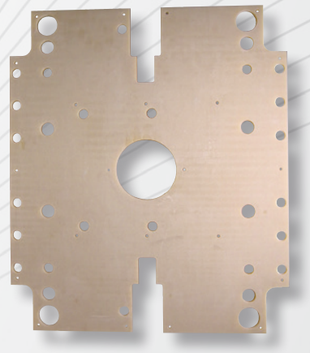
Tubes are manufactured by rolling resin impregnated material layers on steel mandrel and curing at temperature.

Type	Resin	Reinforcement	Thermal class °C	DIN 7735-2/ NEMA	Application
PF CP 21 PF CP 22	phenolic	celulose paper	120	Hp 2065	Mechanical and low voltage electrical applications. Good electrical properties in normal relative humidity.
				Hp 2067	Electrical high voltage applications at mains frequency. High electrical strength in oil.
PF CC 21 PF CC 22	phenolic	cotton cloth	120	Hgw 2086 Hgw 2085	Mechanical and low voltage applications in normal relative humidity.
EP GC 21	epoxide	glass cloth	130	Hgw 2375	Mechanical and high voltage electrical applications. High mechanical and electrical strength in thermal endurance to 130 °C. Stable dielectric properties under conditions of normal humidity.
EP GC 22	epoxide	glass cloth	155	Hgw 2375.4	High mechanical and electrical strength in thermal endurance to 155 °C.
EP GC 23 FR4, V0	epoxide	glass cloth	130	FR-4	Flammability class FV0
CLASS H	epoxide	glass cloth	180	---	High mechanical and electrical strength in thermal endurance to 180 °C.
SI GC 21	silicone	glass cloth	180	Hgw 2575	Mechanical, electric and electronic applications under conditions of high humidity. Thermal endurance 180 °C, flammability class FVO.

PRODUCT DIMENSION							
Inside diameter	PF CP 21, 22	PF CC 21, 22	EP GC 21	EP GC 22	FR-4 cat. FV0	Class H	SI GC 21
Wall thickness – minimum / maximum (mm)							
4-12 mm	1,5-8	-	1,5-8	1,5-8	1,5-8	1,5-8	1,5-8
13-16 mm	1,5-8	2-15	2-15	2-15	2-15	2-15	2-15
17-80 mm	2-35	2-35	2-35	2-35	-	2-35	2-35
81-150 mm	2-35	2-35	2-35	2-35	2-35	2-35	2-35
150-360 mm	2-15	2-15	2-15	2-15	-	2-15	2-15
361-600 mm	3-15	5-15	5-15	5-15	-	5-15	5-15
601-800 mm	4-15	5-15	5-15	5-15	-	5-15	5-15
801-1240 mm	5-15	5-15	5-15	5-15	-	5-15	5-15
Max. length mm	1000 1350	1300	1000	1000	1000	1000	1000

PF CC 21, 22 tubes up to inside diameter 18 mm are manufactured in length 650 +/- 50 mm. Tubes diameter 4-12 mm are manufactured in length max. 800 mm.

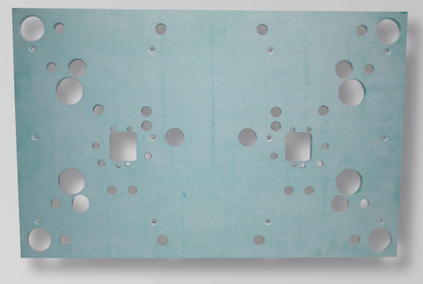
GLASTHERM

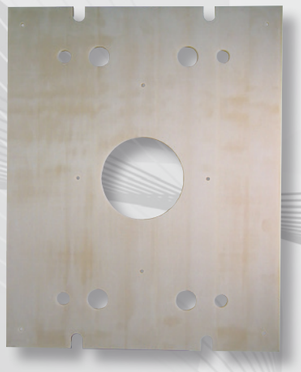


High-strength, temperature resistant insulation made from glass fibre reinforced composite materials play a very important role in accurate temperature controls and energy conservation. They are employed wherever thermal separation is required for operational and/or economic reasons between components in installations.

THESE ALL OFFER THE FOLLOWING SPECIAL CHARACTERISTICS:

- **high strength characteristics ensure against bending and compression. Continuous longterm use.**
- **low thermal conductivity**
- **outstanding size and dimensional stability**
- **excellent workability, available in a wide range**
- **oil and monture resistant**
- **insulation with excelent dielectric characteristics**





WE CAN OFFER FOLLOWING:

- **we have on stock GLASTHERM HT200 – which is most often used in thicknesses 5, 6, 8, 10, 12, 15, 20, 25 mm, sheet size 1220x2440 mm**
- **GLASTHERM HT220 - thicknesses 6, 8, 10, 15, 20, 25 mm, sheet size 1220x2440 mm**
- **GLASTHERM HT250 - thicknesses 6, 8, 10, 12, 15, 20 mm, sheet size 1040x2000 mm**
- **GLASTHERM THERMALITE 500, is produced in thicknesses 4 – 50 mm, sheet size 1000x1200 mm**
- **Different sizes, types and material delivery dates are specified after consultation with manufacturer**
- **We mainly supply precision-machined parts and cutoff s according to drawings**
- **Our company has technological device to which we are able to work with maximum format 1220 x 2440mm**

We will prepare price offer base on customer specific requirements.

Technical data	Testing method	Unit	Glastherm HT 200	Glastherm HT 220	Glastherm HT 250 M	Glastherm HT 250 HQ	Glastherm HT 500
Standard colour	-	-	green/ orange	yellow	brown	green	silver
Specific weight	ISO 1183	g/cm³	2	1,9	2	2	2,15
Operating temperature	-	°C	200	220	250	250	500
Compressive strength 23 °C	ISO 604	Mpa	330	500	600	600	400
Compressive strength 200 °C			120	280	450	500	350 °C/250
Bending strength 23 °C	ISO 178	MPa	210	360	300	600	230
Transverse thermal conductivity		W m.k	0,27	0,25	0,23	0,23	0,25
Water absorption	ISO 62	%	<0,2	<0,2	<0,15	<0,1	<0,5
Coefficient of linear expansion	Mettler TMA	10^{-6} K	10-15	10-20	10-20	10-20	10-60
Size	-	mm	2440x1220 1830x915	2440x1220	2000x1040	2000x1040	1000x1200
Thickness	-	4 - 50 mm					
Thickness tolerance	-	mm	+/- 0,05	+/- 0,1			**+/- 0,3**

DUROSTONE® GLASTIC

Flameretardant and tracking resistant
Length 3050 mm
Similar to UTR
In electrical, industrial and construction applications.

ANGLE PROFILE			
Type	Width	Height	Thickness
	b (mm)	a (mm)	s (mm)
2889	31,8	31,8	3,2
2879	31,8	31,8	4,8
2880	38,1	38,1	3,2
2881	38,1	38,1	4,8
2882	38,1	38,1	6,4
2883	50,8	50,8	4,8
2884	50,8	50,8	6,4
2885	76,2	76,2	6,4
2886	76,2	76,2	9,5
2876	38,1	57,2	4,8
1133	31,8	63,5	4,8
2877	50,8	69,9	6,4
2890	76,2	152,4	12,7

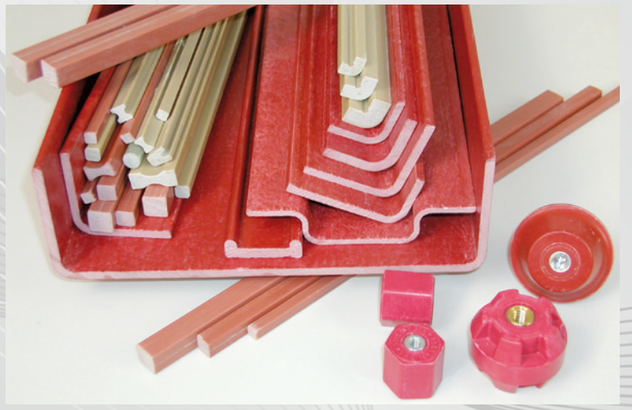
U-PROFILE			
Type	Width	Height	Thickness
	b (mm)	h (mm)	s (mm)
2875	50,8	14,3	3,2
2617	50,8	20,6	3,2
1144	50,8	25,4	6,4
2261	55,6	19,1	1,6
2212	58,7	19,1	3,2
1177	65,1	31	3,2
1166	76,2	22,2	6,4
2888	76,2	38,1	6,4
1939	90,5	65,1	4,8
1791	91,3	28,6	3,2
1155	101,6	28,6	6,4
2242	101,6	34,9	4,8
2874	114,3	63,5	6,4
1940	115,9	65,1	7,1
1788	120,7	41,3	4,8
2825	139,7	31,8	4
2288	161,9	50,8	7,1
1844	215,9	68,3	4,8
1936	245,3	41,3	3,2
2250	286,5	41,3	9,5
2120	292,1	36,5	4

HOLLOW PROFILES			
Type	Width	Height	Hollow diameter
	b (mm)	h (mm)	d (mm)
F822024	38,1	38,1	3,2
F822432	50,8	50,8	6,4

*** The above mentioned values are for illustrate purposes only. We will make an offer based on your specific material inquiry demand.**

PROFILES

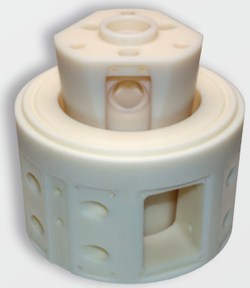
CORNER PROFILES				
Type	Thickness	Thickness	Material	Length
	a (mm)	b (mm)		(mm)
	6	6	glass fiber epoxy class F/H (155 / 180 °C)	2500
	7	7		
	8	8		
	10	10		
	12	12		
6820606	6	6	SG-200 (200 °C)	2750
6820808	8	8		
6821010	10	10		
6821212	12	12		



Temperature class: 155 °C; 180 °C and 200 °C
In electrical, industrial and construction applications.

DOGBONES				
Type	Width	Height	Material	Length
	b (mm)	h (mm)		(mm)
	8	10	glass fiber epoxy class F/H (155 / 180 °C)	2500
	10	12		
	10	14		
	10	15		
	12	16		
	14	18		
	16	20		
	20	22		
	16	24		
6720608	6	8	SG-200 (200 °C)	2750
6120406	6,4	9,5		
6120606	9,5	9,5		
6120608	9,5	12,7		
6120612	9,5	19,1		
6120616	9,5	25,4		
6721012	10	12		
6721014	10	14		
6721015	10	15		
6721216	12	16		
6120808	12,7	12,7		
6120810	12,7	15,9		
6120812	12,7	19,1		
6721417	14	17		
6121012	15,9	19,1		

Chip removing machining parts made of engineering plastics, including installation and mounting



	Amorphous	Semi-crystalline	
		SUSTAPPS	
	SUSTAPEI	SUSTAPEEK	
	SUSTAPPSU	SUSTAECTFE	
	SUSTAPES	SUSTAPVDF	
High Performance Plastics	SUSTAPSU	Polystone PVDF®	150 °C
	SUSTAPPE	PBT/PET	
	SUSTANAT PC	PA	
		POM	
		UHMW-PE	
Engineering Plastics			100 °C
	SUSTAABS	Polystone M®	
	PS	Polystone D®	
	Trovidur®	Polystone G®	
	Trovicel®	Polystone E®	
	Formaterm®	Polystone P®	
	Rimito®	Matrox®	
Industrial Plastics	PMMA	Robadur®	

KEY FEATURES OF PLASTICS:

- excellent sliding properties
- high resistance to abrasion
- high degree of resistance to aggressive chemicals
- high flexibility and mechanical strength
- a high degree of impact resistance
- fireproof or flame-retardant
- electrostatically conductive, dissipative or insulative
- high potential for innovation
- UV resistant
- Suitable for direct contact with food

KEY PROPERTIES FOR THE PLASTICS APPLICATION, INSTEAD OF STEEL:

- low weight
- corrosion resistant
- excellent sliding properties - self-lubricatings
- thermal and electrical insulator

SUSTAMID 6 FR (EN 45545)

SUSTAMID 6 FR is with 40 percent characterized by a very high oxygen content index (LOI - Limiting Oxygen Index) containing no phosphorus and no halogen. The fire behavior is classified according to UL94 class V0. Very low density of material SUSTAMID 6 FF (1.17 g / cm^3) offers - compare to conventional materials such as e.g. steel (7.85 g / cm^3) significant weight and that means design advantages. At the same time the material has high strength, stiffness, wear resistance, good sliding properties and also offers excellent resistance to corrosion and chemicals.

Standard	Country	Fulfilled testing
EN 45545	Europe	R22, R23, R24, R25, R26
BS 6859	UK	Table 7 / Table 8
DIN 5510	DE	S4 / SR2 / ST2
BSS 7239	USA / SEA	Toxic Gas Generation
NFPA130 - ASTM E162	USA / SEA	Surface flammability
NFPA130 - ASTM E662	USA / SEA	Smoke generation
UL 94	Worlwide	VO
FAR 25.853 /	Worlwide / AIRBUS	
Japan Railway Ignition Test	JP	(3) Flame retardant

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APPLICATION

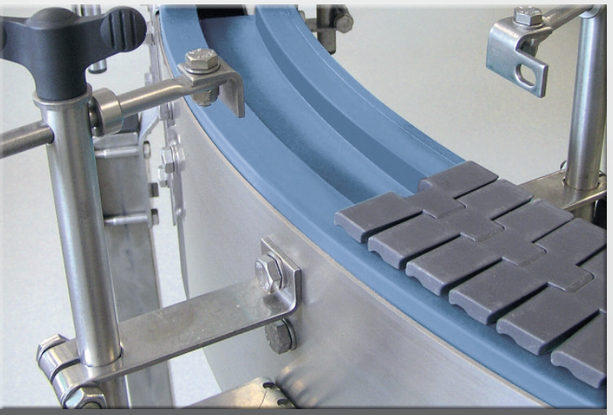
Pieces of material Sustamid 6 FR are used mainly in areas where there are especially very high requirements for good material behavior during burning. These include mainly the area of

people transportation, eg. rail transportation, aviation or shipping industries.

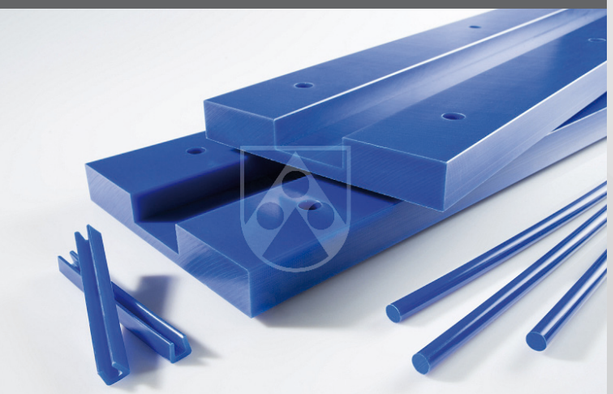
And here is a very positive contribution to low weight products from SUSTAMID 6 FR. The unique properties of the material SUSTAMID 6 FR anyway also offer an ideal opportunity to use in industries such as

mining, electrical engineering or construction.

LubX® C



HANDLING SYSTEMS AND CONVEYOR TECHNOLOGY



SPECIAL FEATURES:

- Energy saving
- Specially adapted as sliding partner with POM materials and steel
- The coefficient of friction with sliding partner POM upto 75% lower, then in PE-UHMW
- The coefficient of friction with sliding partner steel upto 75% lower, then in PE-UHMW
- Suitable for food contact (FDA/21CFR177.1520)
- Noise reduction

LubX® C / Specially adapted for sliding contact with the material POM and steel

Pieces of material LubX® CO offers a new high-performance product with excellent sliding properties. This material has been specifically developed for use in handling systems and conveyor technologies. Compared with conventional sliding materials, the conveyor systems equipped with elements of a material LubX® C require substantially less energy.

Significantly lower friction coefficient completely eliminates the slip-stick effect and that is the reason of increase the stability of the process.

SUITABLE PLASTICS FOR FOOD CONTACT

We offer components production from wide range of standard plastics to high temperature plastics intended for direct food contact. The materials meets the requirements of the new regulations EU 1935/2004/ES, 10/2011/EU a 2023/2006/ES.

THE MAXIMUM SAFETY

The parts made of plastics, intended for contact with food, comply with the requirements of the framework Regulation 1935/2004/ES. They do not negatively affect the:

- **the health of consumers**
- **composition, taste, smell and appearance of food**

This regulation distinguishes following types of food:

- **dry**
- **watery**
- **sour**
- **a fat - containing**
- **containing alcohol**

Material	Product	Colour	EU: 10/2011/EU	USA: FDA Code of Federal Regulation or FDA FCN
PE-300	Polystone® G	natural, blue, white UV	●	●
	Polystone® G	black, blue RAL 5015	●	
PE-100	Polystone® G black B 100	black	●	
PE-HMW	Polystone® D	natural, marble white, red-brown	●	●
PE-UHMW	Polystone® M	natural, green, blue, blue-grey	●	●
	Polystone® M	black	●	
	Polystone® M AST black	black	●	●
PP	Polystone® P homopolymer	natural, grey	●	●
	Polystone® P copolymer	natural, grey	●	●
	Polystone® MG	yellow, orange, red, pink, blue, green, brown, white		●
LubX®	LubX® CV	ultramarine blue	●	●
	LubX® C		●	●
	LubX® S		●	●
PVC	Trovidur® EC	white, light grey, dark grey	●	
	Trovidur® NL		●	
PA6	SUSTAMID 6	natural		●
	SUSTAMID 6 FG	natural	●	●
PA66	SUSTAMID 66	natural		●
	SUSTAMID 66 FG	natural	●	●
PA6G	SUSTAMID 6G	natural*		●
	SUSTAMID 6G PLUS	natural*		●
	SUSTAGLIDE	natural*		●
	SUSTAGLIDE PLUS	natural*		●
POM C	SUSTARIN C	natural, black, yellow, red, green, blue		●
	SUSTARIN C FG	natural, black, blue	●	●
	SUSTARIN C MG	natural, red, yellow, grey, green, blue, brown, black		●
	SUSTARIN C MDT	blue		●
	SUSTARIN C GLD 160	natural		●
	SUSTARIN C GLD 350	blue		●
POM H	SUSTARIN H	natural		●
PC	SUSTANAT PC	natural		●
PET	SUSTADUR PET	natural		●
	SUSTADUR PET FG	natural	●	●
	SUSTADUR PET GLD 130			●
PVDF	SUSTAPVDF FG	natural	●	
PSU	SUSTASON PSU	natural		●
PES	SUSTASON PES	natural		●
PPSU	SUSTASON PPSU	natural, black		●

Material	Product	Colour	EU: 10/2011/EU	USA: FDA Code of Federal Regulation or FDA FCN
	SUSTASON PPSU MG	natural, black, blue, green, red, yellow, grey, brown, rust		●
PEI	SUSTAPEI	natural		●
PPS	SUSTATRON PPS	natural		●
	SUSTATRON PPS GF 40	natural		●
PEEK	SUSTAPEEK	natural		●
	SUSTAPEEK FG	natural	●	●
	SUSTAPEEK MG	natural, black, copper, blue, green, yellow		●
	SUSTAPEEK GLD 140 FG	natural, blue	●	●

* The above mentioned values are for illustrate purposes only. We will make an offer based on your specific material inquiry demand.

PLASTICS FOR MEDICAL TECHNOLOGY

The elements, made out of materials Medical Grade series are the ideal solution for the demanding market of medical and pharmaceutical industries.

The materials match biocompatibility tests according to USP Class VI and cytotoxicity according to DIN EN ISO 10993-5, which is one of the basic requirements of the medical industry. They are FDA-compliant and free of heavy metals.

100% traceability of all raw materials used, as well as the availability of a variety of materials and colors, is for these products quaranteed. Different colors of materials are used primarily because of easy distinction between relevant dimensions in individual applications.

Components made of materials series Medical Grade have good chemical resistance to various conventional disinfectants and cleaners, They are very easily sterilizable with steam, ethylene oxide, plasma and gamma radiation. Polypropylene-based material has been modified and stabilized, to ensure its resistance against 500 cycles of hot steam sterilization.

APPLICATION

Components of materials Series Medical Grade are used in many medical applications, devices and equipments such as:

- surgery instruments
- dental technology
- diagnostic radiology
- therapeutic systems
- pharmacy
- biotechnology

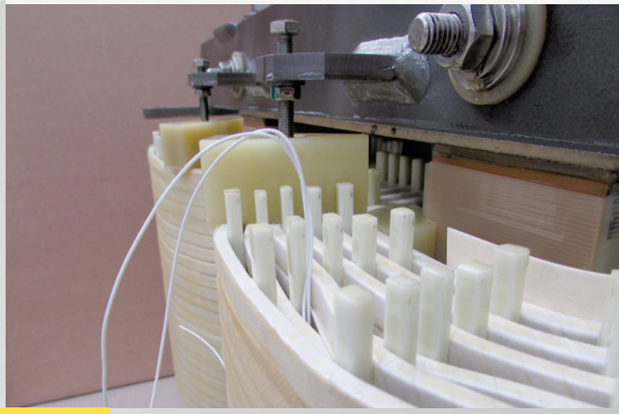
THERMAL PROTECTION

BIMETAL THERMOSTATS, TEMPERATURE LIMITERS, FUSES, THERMAL FUSES

These include reversible bimetal fuses and fusible (destructive) fuses, whose task is to maintain the temperature of the protected product of the predetermined value. It is being manufactured in a wide range of temperatures and hundreds of versions (various kinds of functions, insulations, outlets, mounting, dimensions, etc.). In addition to these fuses we also offer PTC (NTC) sensors which operate on the principle of a step change in resistance. For their connections can be used for example relays.

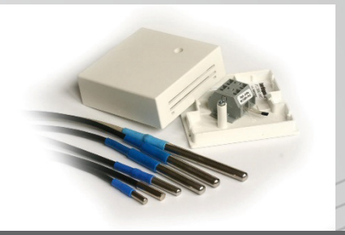
Typical examples of the use of reversible bimetallic fuses, are: electromotors, transformers, heaters, radiant heaters, ventilators, welding devices, oil radiators, heating convector, etc. Wide application is also found in household appliances, automotive industry (heated seats, el. windows, wiper systems), electronics, medical technology, etc.

Cutout fuses (destructive or one-time) are mainly used: in transformers and network resources, and also in household appliances (coffee makers, deep fryers, toasters, hair dryers, ...) lighting technology, electronics, etc.



PROTECTIVE HEAT SWITCHES

- Thermostats
- Thermistors
- Cutouts



TEMPERATURE SENSORS

- Protection of motor windings (PT100, PT500, PT1000, ...)
- Hardware engines (with metal housing, or box type)
- Other industrial applications (with metal housing, box type, with teflon housing)

ELECTROINSULATION MATERIALS

Name	Marking	Standard colour	Norm						Resin	Reinforcement	Temperature index (C°)	Comparative tracking index IEC 112 CTI	Material Characteristics		Material application
			(D) DIN 7735	EN 60893/ IEC 893	(GB) BS	(USA) NEMA L1	UL94 class	Also available EN 45545					Characteristics	Value	
Phenolic paper	Kartit	brown, black	Hp 2061.5 Hp 2064	PF CP 202		XX			Phenol	Paper	120	100	1 min. voltage test perpendicular / parallel to layers	40/40 kV	Electrical high voltage applications. High dielectric strength in oil and air (undernormal humidity levels).
Phenolic paper	Kartit	brown, black	Hp 2061	PF CP 201	5102-3	X, XP			Phenol	Paper	120	100	Water absorbtion DIN 53495	550 mg	Mechanical and low voltage electrical applications. Good mechanical properties. Good characteristics for punching production processes.
Phenolic paper	Kartit	brown, black	Hp 2062.8	PF CP 206		XXXP			Phenol	Paper	120	100	Permittivity	6 Mhz	Electrical and electronics applications. Stable dielectric properties under high humidity levels. Good characteristic for punching production processes.
Epoxy paper	Kartit	brown, black	Hp 2361.1 Hp 2361	EP CP 201		FR-3	V0		Epoxy	Paper	120	100	Compressive strength parallel to lams PN 89031	120 Mpa	Paper-epoxide laminated sheets. High voltage electrical and electronics applications. Stable dielectric properties under high humidity level.
Phenolic paper	Kartit	various	CGS-GC						Phenol	Paper melamine with glass cloth	120	600	Water absorbtion	ISO 62<200 mg	Decorative purpose.
Phenolic cotton	Textit E	brown	Hgw 2082.5	PF CC 202	2572-F4	CE			Phenol	Cotton fabric, medium weave	120	100	Electrical strength perpendicular / parallel to layers	9/20 kV	Medium voltage electrical applications. Good dielectric properties. Lowered water absorption.
Phenolic cotton	Textit special	brown		PF CC 201					Phenol	Cotton fabric, medium weave	120	100	Impact strength(Charpy) parallel to laminations	8,8 KJ/m^2	Mechanical and low voltage electrical applications. Good mechanical properties.
Phenolic cotton	Textit	brown	Hgw 2083	PF CC 203		L			Phenol	Cotton fabric, fine weave	120	100	Compressive strength parallel to lams. PN 89031	150 MPa	Fine weave texture provides good mechanical applications. Excellentmechanical properties. Particularly recommended for precision machining and for small components.
Phenolic cotton	Textit J	brown	Hgw 2082	PF CC 201	2572-F3	C			Phenol	Cotton fabric, medium weave	120	100	Impact strength (Charpy) parallel to laminations	8,8 KJ/m^2	Mechanical applications.
Cotton, melamin			Hgw 2282	MF CC 201					Melamin	Cotton fabric	130	500	Permittivity	8 Mhz	Cotton-melamine laminates. Low voltage electrical application.
Phenolic glass		brown	Hgw 2072	PF GC 201					Phenol	Glass cloth	130	100	1 min. voltage test perpendicular / parallel to layers	25/15 kV	Very good mechanical and electrical behaviour at temperatures up to 120 °C.
Epoxy glass	Sklotextit	green, yellow, brown	Hgw 2372	EP GC 201	3953 EP3	G 10			Epoxy	Glass cloth	130	200	Electrical strength perpendicular / parallel to layers	30/35 kV	Stable dielectric properties in high humidity and temperatures up to 130 °C.
Epoxy glass	Sklotextit	green, yellow, brown	Hgw 2372.4	EP GC 203	3953-EP 7	G 11			Epoxy	Glass cloth	155	180	Tensile strength	300 Mpa	Very good mechanical and dielectric properties at temperatures up to 155 °C.
Epoxy glass	Sklotextit	green, yellow, brown	Hgw 2372.4	EP GC 308		G 11		YES	Epoxy	Glass cloth	180	180	Tensile strength	300 Mpa	Very good mechanical and dielectric properties at temperatures up to 180 °C.
Epoxy glass	Sklotextit	green	Hgw 2370.4	EP GC 205		G 11	V0>3mm		Epoxy	Glass roving	180	500	Tensile strength	500 Mpa	Very goog mechanical properties at temperatures up to 180 °C.
Epoxy glass	Sklotextit	green, yellow, brown	Hgw 2372.1	EP GC 202	3953-EP 4	FR 4	V0	YES	Epoxy	Glass cloth	130	200	Electrical strength perpendicular / parallel to layers	30/35 kV	Dielectric and mechanical properties equal to G10. Flammability category FV0.
Epoxy glass	Sklotextit	green, yellow, brown	Hgw 2372.2	EP GC 204		FR 5	V0		Epoxy	Glass cloth	155	180	Electrical strength perpendicular / parallel to layers	30/35 kV	Dielectric and mechanical properties equal to G11. Flammability category FV0.
Epoxy glass	Sklotextit	green, yellow, brown							Epoxy	Glass cloth	200	200	Compressive strength	350 Mpa	
Epoxy glass	Sklotextit	green, yellow, brown							Epoxy	Glass cloth	220	200	Flexural strength	500 Mpa	
Melamine glass	Melamin	green, yellow, brown	Hgw 2272	MF GC 201	3953-MF 4	G 5	V0		Melamin	Glass cloth	130	500	Comparative tracking index IEC 112	CTI=500	Glass-melamine laminates. Medium voltage electrical and mechanical applications. Good mechanical properties.
Silicone glass	Silicone	green, yellow, brown	Hgw 2572	SI GC 202	3953-SI 5	G 7	V0		Silikon	Glass cloth	180	450	Comparative tracking index IEC 112	CTI=450	Medium voltage electrical and mechanical applications. Very good mechanical properties.
Glass cloth	Sklotextit	green, yellow, brown	Hgw 2372.4	EP GC 306		G 11			Special epoxy	Glass cloth	180	600	Modulus of elasticity in exure	21400 Mpa	Long-term endurance in mechanical, electrical and electronics applications.
Glass cloth	Sklotextit	green, yellow, brown	Hgw 2372.4	EP GC 308		G11	V0		Heat resistance epoxy	Glass cloth	180	600	Modulus of elasticity in exure	21 Gpa	Track resistance.

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ELECTROINSULATION MATERIALS

Name	Marking	Standard colour	Norm						Resin	Reinforcement	Temperature index (C°)	Comparative tracking index IEC 112 CTI	Material Characteristics		Material application
			(D) DIN 7735	EN 60893/ IEC 893	(GB) BS	(USA) NEMA L1	UL94 class	Also available EN 45545					Characteristics	Value	
Polyester glass	UTR 1491, 1494/ UPM 203/H900/ H950	white, red	Hm 2471	UP GM 203	3953-UP 3	GPO-3	V0/>2,4mm	YES	Polyester	Glass mat	155	600	Electrical strength parallel in oil	47 kV	Electrically insulating, high flame resistance.
Polyester glass	1580/ETR-FR-C	white	Hm 2471	UP GM 203	3953-UP 3	GPO-3	V0		Polyester	Glass mat	120/140	>500	Arc resistance	181 sec	Outstanding punchability, asbestos free.
Polyester glass	SG-200, 1906/ HST II	natural, tan	Hm 2471	UP GM 201	3953-UP 4	GPO-1	HB		Polyester	Glass mat	210	>500	Compressive strength perpendicular ISO 604	248 MPa	Extremely strong, ideal for high temperature applications.
Polyester glass	FHT1800/H515	natural, cream, tan					HB		Polyester	Glass mat	190/200	>500	Electrical strength at 90 °C	18/22 kV/mm	Ideal for dry-type transformers.
Polyester glass	TSF1312/ETS	brown	Hm 2471			GPO-1	HB		Polyester	Fibreglass	130		Flame resistance, oxygen index	21,8 O2	Oustanding punchability, asbestos free.
Polyester glass	UPM S2 MSEDE1020900	ivory, beige	Hm 2472	UP GM 205			V0/>5mm		Polyester	Glass mat	155	600	Bending strength ISO 178	350 MPa	High mechanical strength.
Polyester glass	UPM S1	creme white	Hm 2472	UPM72			V0>3mm		Polyester	Glass mat	155	600	High index CTI	600 M	Low flamability.
Polyester glass	UPM S 13LST	white		UPGM 203+		GPO-3 +	V0/>1mm		Polyester	Glass mat		600	Impact strength(Charpy) parallel ISO179	100 kJ/m²	Extraordinarily low flammability, smoke and toxicity performance.
Polyester glass	UPM S16/H953	white, red		UPGM 203+		GPO-3 +	V0/>5mm		Polyester	Glass mat	155	600	Tracking and erosion resistance IEC 60587	IB 2,5	High mechanical strength.
Epoxy glass	EPM 203	yellow		EPGM 203				YES	Epoxy	Glass mat	180	150	Thermal conductivity ISO 8302	0,35 W/mK	High mechanical performance.
Muscovite mica		grey silver		371-2			V0		Silicone	Mica	600-800		Mica content IEC 371-2	90%	Support for all kind of electrical, heat resistances.
Sindanyo	L 23	green	52612		BS2782				Silicate	Technical cement	230-250		Compressive strength	85 N/mm²	
Arclex M	Asbestos-free	grey			BS2782				Glass	Mica	500		Electrical strength	20 kv/mm	Transformers, sheet dimensional stability.
Arclex P	Asbestos-free	grey			BS2782				Glass	Mica	500		Electrical strength	15 kv/mm	Transformers, sheet dimensional stability.
Thermal insulator	Glastherm Thermalate	green, white, orange	HT200/ H320/H330								200		Bending strength 23 °C	210 Mpa	High compressive and bending strength, excellent dielectrical properties, low heat conductivity.
Thermal insulator	Glastherm Thermalate	yellow, orange	HT220/ H330/H340								220		Bending strength 23 °C	360 Mpa	High compressive and bending strength, excellent dielectrical properties, low heat conductivity.
Thermal insulator	Glastherm	brown	HT250 M								250		Bending strength 23 °C	300 MPa	High compressive and bending strength, excellent dielectrical properties, low heat conductivity.
Thermal insulator	Glastherm	green	HT250 HQ								250		Bending strength 23 °C	600 Mpa	High compressive and bending strength, excellent dielectrical properties, low heat conductivity.
Wave soldering mat.	CBC	grey	CBC 503						Special resin	Glass mat	260		Elasticity modules	16000 Mpa	Low heat conductivity, excellent mechanical properties, chemical resistance. Application - for solder screen production-solder pallet.
Wave soldering mat.	STANDARD	blue	CHP 760						Special resin	Glass mat	260		Elasticity modules	18000 Mpa	Low heat conductivity, excellent mechanical properties, chemical resistance. Application - for solder screen production-solder pallet.
Wave soldering mat.	Antistatic	black	CAS 761						Special resin	Glass mat	260		Elasticity modules	18000 Mpa	Low heat conductivity, excellent mechanical properties, chemical resistance. Application - for solder screen production-solder pallet.
Wave soldering mat.	Antistatic, optic	grey	CAG 762						Special resin	Glass mat	260		Elasticity modules	18000 Mpa	Low heat conductivity, excellent mechanical properties, chemical resistance. Application - for solder screen production-solder pallet.

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ELECTROTECHNICAL ADHESIVE TAPES

Adhesive tapes are produced in thermal class A-105 °C, B-130 °C, F-155 °C, H-180 °C. We deliver cut widths to customer requirements.

Rubber, silicone, acrylate adhesive, PET tapes, acetate tapes, PET fi lm, glass fibre, cellulose paper tapes, glass fabric tapes, PEI tapes for high temperature, PTFE, Kapton®, Nomex®.

Type	Colour	Backing	Backing thick-ness	Total thick-ness	Adhesive type	Peel adhesion	Elonga-tion	Tensile strength	Break-down voltage	Thermal class	Short time
			(µm)	(µm)	(N/cm)	(N/cm)	%	(N/cm)	(kV)	(°C)	(°C)
PET FILM ADHESIVE TAPES WITH RUBBER THERMOSETTING ADHESIVE											
P.31 UL		PET	23	60	R-TS	5	90	40	4,5	130	
Good adhesion and comformability. Very thin film (1mil). For outer and interlayer coils insulation.											
11.B* UL		PET	23	60	R-TS	4,5	80	35	4,5	130	
Thin film tape, multi purpose coil and small transformers insulation.											
P.315 UL		PET	50	90	R-TS	5	90	70	9	130	
Higher thickness and tensile strength. For small transformers and coils insulation.											
12.B* UL		PET	50	90	R-TS	4,5	80	65	8,5	130	
Thicker film for heavy duty coils and transformers.											
P.231		PET	23	100	R-TS	6	90	40	4,5	130	
Double sided adhesive for components bonding.											
211.B*		PET	23	90	R-TS	5	80	35	4,5	130	
Double coated tape for assembling and bonding electrical components.											
PET FILM TAPES WITH SILICONE ADHESIVE											
P.40 P.405*		PET PET	23	60	SIL	3	90	40	4,5	130	180
Very thin and comfortable, good adhesion on most materials.											
6.SL*		PET	23	55	SIL	3,5	80	35	4,5	130	180
Thin film with silicone adhesive, high temperature resistance.											
P.42		PET	23	90	SIL	2	90	40	4,5	130	180
Tape for gold plating. Very thick (3 mil) silicone adhesive.											
8.SL*		PET	23	95	SIL	1,5	80	35	4,5	130	
Gold plating tape for Printed Circuit Boards masking.											
P.43 P.435*		PET PET	36	70	SIL	5	80	55	7	130	180
Stiffer, heat stabilized PET film.											
P.450 P.4505*		PET PET	50	85	SIL	3	90	70	9	130	180
Higher thickness and tensile strength.											
12.SL*		PET	50	80	SIL	2,5	80	70	9	130	180
High temperature resistant tape.											
PET FILM TAPES LAMINATED WITH NON WOVEN MAT OR PAPER											
PT.20/20 UL		PET + fleece	95	145	ACR	7	15	25	4,8	155	
Extra thick adhesive layer, outstanding adhesion and conformability on winding.											

Type	Colour	Backing	Backing thick-ness	Total thick-ness	Adhesive type	Peel adhesion	Elonga-tion	Tensile strength	Break-down voltage	Thermal class	Short time
			(µm)	(µm)	(N/cm)	(N/cm)	%	(N/cm)	(kV)	(°C)	(°C)
40.AC*		PET + fleece	70	115	ACR	6,5	28	30	4	155	
Medium thickness transparent tape, acrylic adhesive, conformable on the copper wire winding.											
PT.25 UL		PET + fleece	95	145	R-TS	5	15	25	4,8	130	
Medium thickness, dull, the most used for small transformers.											
4.B		PET + fleece	70	110	R-TS	4,5	28	30	5	130	
White opaque tape rubber adhesive for transformers outer and intermediate insulation.											
PT.35		PET + fleece	120	175	R-TS	5	15	25	4,8	130	
Thicker and opaque tape for coils and transformers outer winding.											
41.B* UL		PET + fleece	160	180	R-TS	3,5	40	45	5	130	
Medium thickness, white opaque tape for coils and transformers.											
PT.40 UL		PET + fleece	160	210	ACR	5,5	20	45	5	155	
Very thick and strong tape, for bigger coils and transformers.											
PT.45 UL		PET + fleece	160	220	R-TS	5	20	45	5	130	
Thicker, stronger and translucent tape for bigger coils and transformers.											
R.180 UL		PET + paper	160	225	R-TS	4	20	70	5	130	
Laminated paper (outer) + PET film compatibile with impregnation. For outer coils insulation.											
ACETATE CLOTH TAPES											
CA.100		cloth	100	200	R-TS	2,5	10	55	2	105	
Tape for aesthetical outer wrapping of coils and small transformers.											
PET FILM REINFORCED TAPE WITH GLASS FIBRES OR PAPER											
PR.25 UL		Paper+glass fibre	85	130	R-TS	3,2	5	200	5	130	
Base type for dry or varnished coils.											
PR.30 UL		Paper+glass fibre	100	170	R-TS	4	5	450	5	130	
Higher tensile strength. For dry or varnished coils.											
46.AC* UL		Paper+glass fibre	75	140	Acr	5,5	5	170	5	155	
Fibre reinforced tape for heavy duty transformers.											
PS.25 UL		Paper+glass fibre	85	165	Acr	5,5	5	200	5	155	
Reinforced tape for oil filled and dry transformers, high temperature adhesive.											
PS.30 UL		Paper+glass fibre	100	180	Acr	5,5	5	450	5,6	155	
Higher tensile strength for oil and dry transformers, high adhesive temperature.											
PVX.30* UL		PET+glass cloth	110	170	Acr	6	4	380	5	155	
Cross wave reinforced tape for oil and dry transformers, high adhesive temperature .											
PG.70		Paper+glass fibre	190	155	Acr	4,5	5	200	1	130	
White coated special paper, fibre reinforced for dry of oil filled transformers.											
PG.90		Paper+glass fibre	210	185	Acr	4,5	5	200	1	130	
Cellulose paper reinforced tape for dry transformers insulation.											

Type	Colour	Backing	Backing thick-ness	Total thick-ness	Adhesive type	Peel adhesion	Elonga-tion	Tensile strength	Break-down voltage	Thermal class	Short time
			(µm)	(µm)	(N/cm)	(N/cm)	%	(N/cm)	(kV)	(°C)	(°C)
CELLULOSE PAPER TAPES											
CP.50		Semicrepe paper	110	155	R-TS	1,7	9	40	0,8	80	100
Protection and masking tape, removable.											
CS.60		Semicrepe paper	90	130	R-TX	3	9	30	0,8	80	100
Flexible and conformable tape for conductors insulation to be varnished.											
FP.48		Flat paper	110	150	R-TX	2,5	4	40	0,8	80	120
Removable, strong and thick tape, usable for sandblasting.											
GLASS CLOTH TAPES											
GL.94 UL		Glass cloth	120	170	ACR	4	5	280	2,5	155	180
Clear adhesive, good heat resistance, medium size transformers.											
GL.95 UL		Glass cloth	120	180	R-TS	4	5	280	2,5	130	
High tack adhesive, for all surface kinds, used for motors, coils etc.											
GL.96 UL		Glass cloth	120	175	SIL	3,5	5	280	2,5	180	260
Outstanding performance tackiness and usage for many surfaces.											
GL.99 UL		Glass cloth	120	170	SIL	3,5	5	280	2,5	180	210
High performance and adaptability, good adhesion.											
76.SH* UL		Glass cloth	120	175	SIL	3,5	8	200	2,5	180	210
Glass cloth tape with high thermal resistance to silicone adhesive.											
B.021		Glass cloth	125	180	ACR	5	5	240	2,5	155	
B.022		Glass cloth	125	180	SIL	3,5	5	240	3	180	
TEONEX® PEN A ULTEM® PEI TAPES FOR HIGH TEMPERATURES											
K30 UL		Teonex®	25	60	SIL	3	50	40	5,3	180	220
K.305* UL		Teonex®									
High performance tape for electronic components, traction motors, flat conductors of automotive coils.											
K.30AC UL		Teonex®	25	65	ACR	4,5	50	40	5,3	155	180
High tack and adhesion. Insulation of medium high voltage coils and electronic components.											
K.50 UL		Teonex®	50	90	SIL	3	60	90	9	180	220
Outstanding, performance tape for electronic components, traction motors, flat conductors.											
U.25		Ultem®	25	60	SIL	3	60	35	5	180	220
ULTEM® film tape flame retardant of high thermal performance for coils and transformers.											
U.50		Ultem®	50	90	SIL	3,5	60	80	7	180	220
ULTEM® thick film flame retardant for heavy duty insulation of coils and transformers.											
PTFE TAPES, ANTIADHESIVE LOW FRICTION AND HEAT RESISTANT											
TF.50 UL		PTFE	50	100	SIL	3	100	25	9	180	260
The most used PTFE tape, plastic, extensible for H.F. electrodes.											
TF.55		PTFE	50	100	SIL	3	55	25	9	180	260
Stiffer film for more stressed applications, more visible colour.											

Type	Colour	Backing	Backing thick-ness	Total thick-ness	Adhesive type	Peel adhesion	Elonga-tion	Tensile strength	Break-down voltage	Thermal class	Short time
			(µm)	(µm)	(N/cm)	(N/cm)	%	(N/cm)	(kV)	(°C)	(°C)
TFE.130		PTFE	130	185	SIL	3	320	30	11,5	180	260
Very thick for heavy duty and high attrition applications.											
POLYIMIDE, KAPTON® FILM TAPES FOR VERY HIGH TEMPERATURE											
H.20 UL		Kapton®	25	60	SIL	3	60	45	7	180	300
H.205*		Kapton®	25								
The most used high performance tape for printed circuits, electronic components, traction motors, flat conductor. Flame retardant.											
71.SL* UL		P.I. film	25	60	SIL	2,8	55	40	6	180	300
High performance polyimide film tape for PCB tin wave.											
H.20 AC		Kapton®	25	60	AC	4,5	60	45	6	155	
High tack and adhesion. Insulation of medium high voltage coils and electronic components.											
70.AC* UL		P.I. film	25	60	AC	3,5	55	40	6	155	
Polyimide film tape for flat conductors and coils insulation.											
H.20 TS		Kapton®	26	60	R-TS	4	60	45	6	130	
High tack and adhesion. Insulation for medium high voltage coils.											
H.50		Kapton®	50	90	SIL	2,8	60	75	11	180	300
The highest performance tape for printed circuits, electronic components, traction motors, flat conductor. Flame retardant.											
H.220*		Kapton®	25	100	SIL	3	60	45	7	180	
High adhesion double sided adhesive for electronic components mounting.											
560 T01-2		P.I. film	25	60	SIL	3	55	40	6	180	300
Thin polyimide tape for general purposes use in PCB and insulation.											
660		P.I. film	50	85	SIL	3	60	60	10	180	300
Thick Polyimide tape for general purposes use of flat conductor insulation.											
7170		Kapton®	25	63	SIL	5,4	85	153	7,5	180	
7270		Kapton®	50	88	SIL	5,4	60	289	8,5	180	
NOMEX® PAPER TAPES AND LAMINATED NOMEX®											
X.50 UL		Nomex®	50	100	ACR	5	5	35	0,8	155	180
The thinnest Nomex® tape for coils insulation, contacts and leads.											
5.H* UL		Nomex®	50	95	ACR	4	5	35	0,8	155	180
Nomex® thin paper tape for high endurance coils and transformers insulation.											
X.51 UL		Nomex®	50	100	R-TS	5	5	35	0,8	155	
Tapes with rubber based adhesive having higher tack.											
X.80		Nomex®	80	125	ACR	5	5	60	1,4	155	180
Higher thickness than X.50, but still flexible and comfortable.											
X.130		Nomex®	130	180	ACR	5	5	110	3	155	180
Heat shielding for leads soldering, for Nomex® dry transformer insulation.											
X.180		Nomex®	180	240	R-TS	4,5	5	200	5,5	155	180
Joining and fixing insulating sheets of power transformers, insulating spacer of breakers.											
PX.50 UL		PET+Nomex®	90	140	R-TS	6	10	65	5,5	155	
Nomex® PET laminate has higher dielectric strength and tensile, it´s used for coils and transformers.											
19.F* UL		PET+Nomex®	90	130	R-TS	5	10	65	5,5	155	
Nomex® laminated PET tape with Nomex® to improve insulation in tranformers and leads.											

Type	Colour	Backing	Backing thick-ness	Total thick-ness	Adhesive type	Peel adhesion	Elonga-tion	Tensile strength	Break-down voltage	Thermal class	Short time
			(µm)	(µm)	(N/cm)	(N/cm)	%	(N/cm)	(kV)	(°C)	(°C)
GX.50	●	Glass+Nomex®	110	150	R-TS	5	3	160	1	155	
Glass cloth Nomex® laminate to higher tensile, used for banding copper wire windings.											
RX.50 UL	●	Fibre+Nomex®	125	170	R-TS	4,5	5	80	1,2	155	
Non Woven + Laminate Nomex® reinforced in the lenght, but still flexible.											
PET FILM RANGE OF ADHESIVE TAPES WITH ACRYLIC ADHESIVE											
*P.34 UL	◐ ● ● ● ● ●	PET	23	60	ACR	3,5	90	40	4,5	130	
Good adhesion and comformabitlity. Very thin film (1 mil). For coils outer and interlayer insulation available in several colours.											
**10.B*	◐ ●	PET	23	60	ACR	4	90	40	4,5	130	
Thin film tape, for coils insluation.											
10.B* UL	● ●	PET	23	60	ACR	4	90	40	4,5	130	
Tenká páska pro izolaci cívek.											
P.34 print	●	PET	23	60	ACR	4	90	40	4,5	130	
Thin film tape, for coils insluation.											
10.B UL print	●	PET	23	60	ACR	4	90	40	4,5	130	
Thin film tape printable on the back side for capacitors and batteries wrapping.											
P.36 UL	○ ●	PET	23	60	ACR	4	90	40	4,5	130	
High adhesion, printable tape, flame retardant.											
P.355	◐ ●	PET	50	87	ACR	5	90	70	9	130	
Higher thickness and tensile strength.											
P.343	◐	PET	23	40	ACR	2,5	90	40	4,5	130	
Very thin cable insulation, flat and copper wires.											
P.345 print	●	PET	50	85	ACR	4,5	90	70	9	130	
Low adhesion, clear insulation tape for copper plates and bands.											
P.346	◐	PET	36	50	ACR	2,5	90	55	7	130	
Intermediate thickness, used also for electronics packaging.											

* The above mentioned values are for illustrate purposes only. We will make an offer based on your specific material inquiry demand.

FLEXIBLE INSULATION MATERIALS

Flexible insulation materials are available in thermal classes A-105 °C, B-130 °C, F-155 °C, H-180 °C, C-220 °C and are delivered in standard widths 450 - 914 (990) mm or cut to required widths according to customer specifi cation. We off er a bespoke pressing service of parts using all insulation types from customer - supplied drawings.
Flexible insulation applications – electromotors, transformers, chocking coils, relays etc.

THERMAL CLASS A 105 °C

Kraft insulating paper (sheets or rolls)

th. 0,10 – 1 mm, sheets 700x1000 mm
th. 1,5 – 2,50 mm, sheets 1000x1000 mm

Pressed cardboard – classic electroinsulation material used in transformer and electromotor production, used in low temperature operating conditions. Appplications – slot insulation for stators and rotors, electromotor fi ller, basic insulation, layer winding insulation and transformer banding insulation.

DM (PET fleece + PET foil) – flexible two layer insulation made from polyester foil and polyester mat (one side smooth), thickness 0,12 – 0,30 mm. DMD/DM applications – slot and protecting electromotors and generators insulation. It´s possible to use it like phase insulation owing to surface properties. DMD is used as core insulation, interlayer and top insulation for transformer consturction.

NPN 50 (NOMEX®+PET foil+NOMEX®) – flexible three layer insulation made from NOMEX® 0,05 mm and polyester foil, thickness 0,13 – 0,47 mm. NPN 50 is cheaper variant of areal insulation material and used in electromotors as slot, phase and protecting insulation. NPN 50 is processed as core insulation, between layers and top insulation for transformer construction.

NPN 80 (NOMEX®+ PET foil + NOMEX®) – flexible three layer insulation made from NOMEX® 0,08 mm and polyester foil, thickness 0,18 – 0,40 mm.

NPN 80 applications – slot, phase and protection insulation for electromotors. NPN 80 is processed as core insulation , between layers and top insulation for transformer construction.

THERMAL CLASS B 130 °C

Polyester foil – delivered with feathering, Mylar®, Hostaphan® RN/WN – thickness 0,019 – 0,50 mm in rolls or tapes. Applications – slot, phase and protecting insulation, in transformers, choking coils, relays core insulation.

Presphan H2, H3 (laminated cardboard and polyester foil, two or three layer) – thickness 0,10 – 0,50 mm. Applications – slot insulation and rebate closing in stators , rotors, specially in small motors. It´s used as layer and protecting insulation in small transformers.

THERMAL CLASS F 155 °C

DMD (PET fleece+PET foil+PET fleece) – flexible three layer insulation made from polyester foil and polyester mat (both sided rough), thickness 0,15 – 0,40 mm.

THERMAL CLASS H 180 °C

NOMEX® (aramide paper) – thickness 0,05 – 0,76 mm, type 410, 411, 414 and other special types.
High quality insulation, Nomex®, is used in known applications for antenna electrical insulation materials. Applications – AC/DC motors, large generators, liquid and dry transformers and choking coils.

NKN (NOMEX®+Kapton®+NOMEX®) – flexible, three layer insulation made from NOMEX® and polyimid foil Kapton®.
NKN applications – electromotors with wide range of usage – slot, phase and protecting insulation. Can be used in transformers and other operating electrotechnical equipment, demanding high resistance against temperature with high mechanical and electricial loads.

THERMAL CLASS C 220 °C

Kapton® (polyimid unadhesive foil) – thickness 0,025 – 0,125 mm. Delivered in cut tapes based upon customer requirements (for manual or machine turning).
Applications – pressure switches, sensors, insulation underlay, labels, motor winding fixings, capacitor production, protective tapes for soldering printed circuits, magnet winding, flexible board circuits, optical cables protection, carrier film, microphones and tweeters, computer componentory, automotive industry, chemical industry etc.

GKG (glass fabric + Kapton®+ glass fabric) – flexible, three layer insulation made from glass fabric and polyimid foil Kapton®, thickness 0,10 – 0,27 mm.
Electric motors phase insulation, used in generators and transformers which are exposed to high thermal stress.

OTHER INSULATION MATERIALS

BANDAGE MATERIALS

GLASS BANDAGE TAPE H200/F155

Used in all motor types, especially traction motors, generally for all motors working in harsh conditions - extreme temperatures and humidity.

Glass bandage tapes have other advantages compared to bandages made from steel wire:

- Does not form eddy currents; insulation materials will not overheat under bandage.
- More tear resistant than steel wire at fatigue limit.
- Electroinsulation tape, eliminates potential gapping of current between winding and steel bandage.
- Excellent inherent insulation properties – less material required, cost saving benefits.
- They are also used for banding of transformers and chokes

INSULATION TUBES

- PVC tubes 105 °C
- Silicone tubes 180 °C
- Glass fibre tubes with polyurethane varnish 155 °C
- Glass fibre tubes with acrylate varnish 155 °C
- Glass fibre tubes with silicone rubber 200 °C
- Polyurethane tubes type 300
- Glass tubes type 400

ELECTROTECHNICAL TAPES

Basic material types:

- Cotton (B)
- Polyester (PES)
- Glass (S)
- Nomex (A)

Types according to weave:

- Direct
- Twill

UL CERTIFICATION

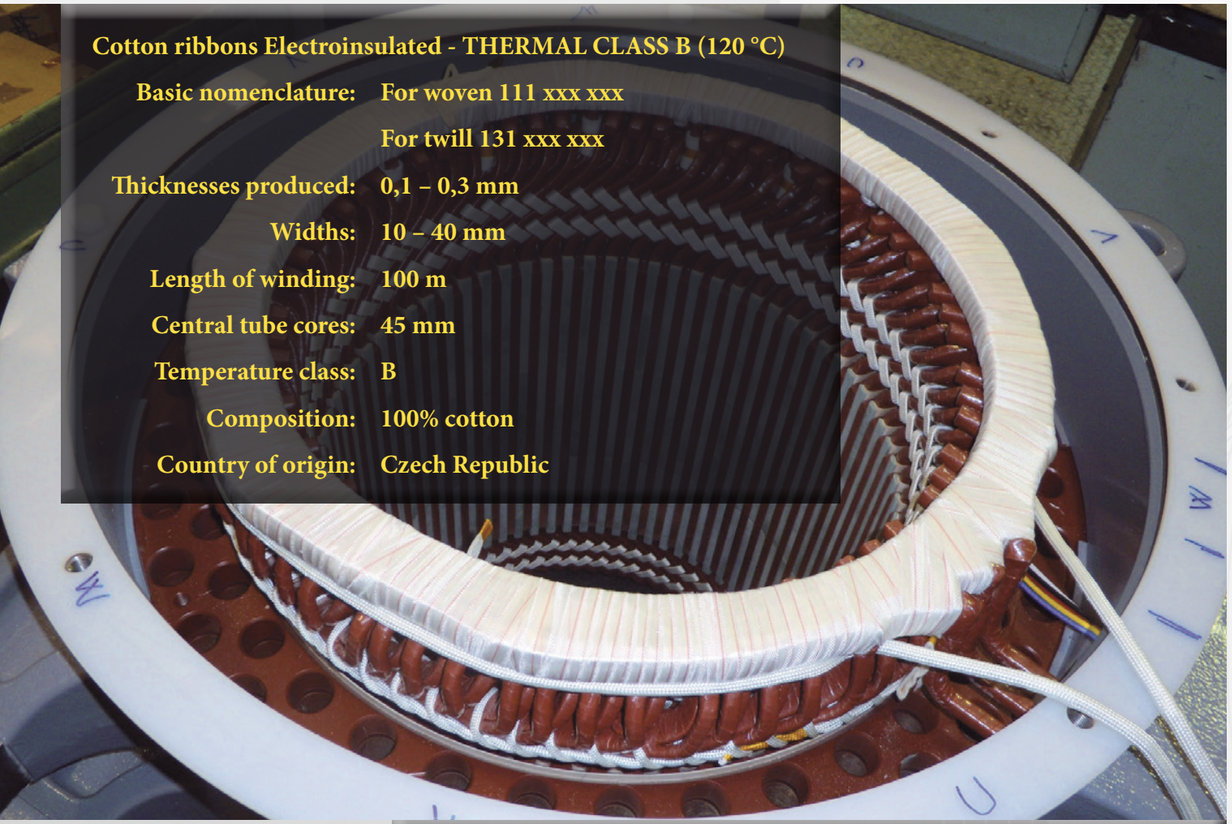
Since 2013, the company LABARA s.r.o. holds UL E360801 certification process, including packaging, cutting, punching, rewinding, bending, feathering and other operations of UL material.

WOVEN ELECTRICAL INSULATING NONADHESIVE TAPES

Produced in plain/direct and twill weave. Production in widths of 10 to 60 mm and thicknesses of from 0,08 to 0,50 mm.

Besides the thickness, the most important parameter is class of thermal resistance. This is due to the material used. Insulating ribbons are made from cotton fibers (thermal resistance class B), of a polyester fiber (thermal resistance class F) and glass fibers (class H thermal resistance). Newly applied also special basalt fibers and also aramid fibers.

Insulating ribbons designed for electrical and thermal insulation purposes.



Cotton ribbons Electroinsulated - THERMAL CLASS B (120 °C)

Basic nomenclature:	For woven 111 xxx xxx
	For twill 131 xxx xxx
Thicknesses produced:	0,1 – 0,3 mm
Widths:	10 – 40 mm
Length of winding:	100 m
Central tube cores:	45 mm
Temperature class:	B
Composition:	100% cotton
Country of origin:	Czech Republic

Electrical insulating polyester ribbons - THERMAL CLASS F (155 °C)

POLYESTER RIBBONS

Basic nomenclature:	For woven 117 xxx xxx
	For twill 137 xxx xxx
Thicknesses produced:	0,1 – 0,25 mm
Widths:	10 – 60 mm
Length of winding:	100 m, or 50 m
Central tube cores:	30 mm, or 55 mm
Temperature class:	F, for resin impregnation for class H, resistance for temperature class H
Composition:	100% PES
Country of origin:	Czech Republic

POLYESTER TUBES

Nomenclature:	421 138 000. 421 137 000, 421 178 000, 421 141 000
Dimension produced:	diameter 13 mm, 10 mm, 8 mm, 6 mm
Temperature class:	F, for resin impregnation for class H, resistence for temperature class H
Country of origin:	Czech Republic

Electrical insulating glass ribbons - THERMAL CLASS H (180 °C)

Basic nomenclature:	119 xxx xxx
Thicknesses produced:	0,08 – 0,50 mm
Widths:	10 – 60 mm
Length of winding:	100 m, or. 50 m
Central tube cores:	30 mm, or 55 mm
Temperature class:	H
Composition:	99% glass, 1% PES
Country of origin:	Czech Republic

Also being produced and fiberglass piping with stronger edge in widths 20 mm (159106200) and 32 mm (159102320)

* The above mentioned values are for illustrate purposes only. We will make an offer based on your specific material inquiry demand.

PRODUCTS FOR THE PRODUCTION OF COMPOSITES

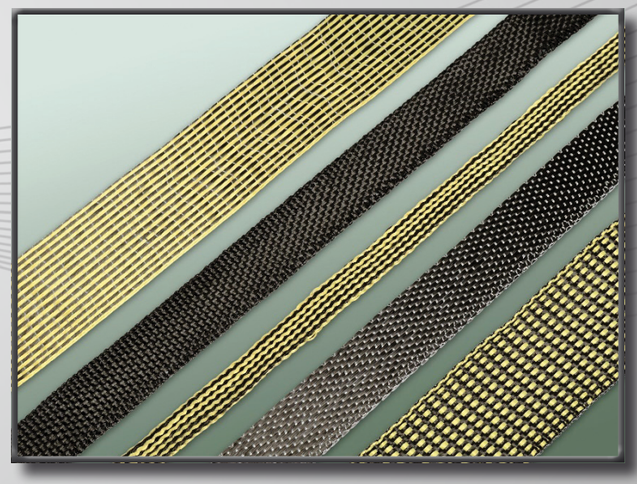
These include products of glass fibers, carbon fibers and the aramid fibers (Twaron ®, a Trevira®) and their combinations, from which is being produced extremely light and strong parts

for aircraft and rocket construction,

but they have great use in the automotive industry,

the armed forces (bulletproof vests),

sport (bicycles, hockey sticks, helmets, canoes ...)



GLASS FABRICS

Our major supplier of glass fabrics and other glass products is OAO Polotsk – Steklovolokno. The company is one of the largest producers of these materials in Belarus.

ELECTRIC INSULATION GLASS MATERIALS

Glass fabrics for production of laminates - electric insulation glass fabrics, from 49 to 230 g/m². Thanks to the unique properties of electric insulation fabrics, these materials have high mechanical and electrical insulation properties. The fabric is suitable for production of printed circuit boards, domestic and industrial equipment.

BUILDING MATERIALS

Fabrics – roofing material. The material is suitable for the construction of new roofing and old roofing repairs, hydrochannels, bridges, water pipe-lines, drain sewerage systems, foundations and underground structures in a wide range of temperatures and climatic conditions. The material is manufactured with densities 120, 190 and 210 g/m² with specified treatments.

THE MOST USED MATERIALS							
Name	Surface density g/m²	Tensile strength		Density of yard 10 cm		Width cm	Hole mm
		in warp	in welt	in warp	in welt		
FABRICS - BASIS OF ROOFING MATERIALS							
RATL-190	190+15/-20	882	980	60+1	21+/-1	100, 110	
RATL-120	120+20/-10	882	980	60+1	25+/-1	100	
RATL-210	210+20/-10	882	980	60+1	26+/-1	100	
AGRIS-200	200+15/-0	1000	1000	60+1	21+/-1	100 (108)	
BUILDING GLASS MESHES							
SSŠ-160	160-/+10	1500	1500	50+/-2	22,5+/-0,5	100+/-1	5x5

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GLASS YARNS

Glass yarns are used in the production of fabrics, tapes and meshes in a variety of applications, such as electrical insulation winding of wires and cables, stators and trasformers. The type of emulsion, tex, yarn structure (number of plies, twist value) can be specified according to the customer´s requirements.

Yarn structure	Diameter of elementary yarn	Nominal linear density	Tex tolerance	Number of twists per 1 m	Tolerance twists	Relative tensile strength	L.O.L	Emulsion type
	(mkm)	(tex)	(%)		(%)	(mN/tex) min.	(%)	
Typ – E								
EC9 68 Z40	9	68,0	+5, -7	40	+/-20	410(42)	1,1-1,4 0,7-1,3	starch, silan
EC9 68x2 S 100	9	136,0	+5, -7	100	+/-15	410 (42)	1,1-1,4 0,7-1,3	starch, silan
EC7 22 S 40	7	22,0	+5, -7	40	+/-20	470 (48)	1,1-1,9 1,1-1,4	wax emulsion, starch
EC7 22x2 Z 100	7	44,0	+5, -7	100	+/-15	470 (48)	1,1-1,9	wax emulsion
EC5 5,5 S 70	5	5,5	+5, -7	70	+/-15	610 (62) 570 (58)	1,1-1,9 1,1-1,4	wax emulsion, starch

* The above mentioned values are for illustrate purposes only. We will make an offer based on your specific material inquiry demand.

- EC9 68 Z40-30A
- EC7 22 Z40-30A
- EC7 22x2 S100-30A
- EC9 68x2 S110-30A
- EC9 68x3 S110-30A
- EC5 5,5x2 Z100-30A

VEILING MATS

VILEDON – Core material consists of a PES carrier non-woven in which expanded microspheres are spread homogeneously to achieve the desired volume. For over 40 years, surfacing veils have been used in the fibre reinforced plastics industry. The applications are diverse from the construction of anti-corrosion tanks and pipes, UV resistant surfaces on facade panel and often in special applications such as gluing aids for skis and snowboards.

Core material was developed specifically for the production of lightweight fibre reinforced plastics parts such as boat hulls, machine housings, car body part or cladding materials in the building industry. With core material, the required wall thickness can be constructed quickly and easily.

VILEDON
– NON-WOVEN TEXTILE FABRICS

Non-wovens are textile fabrics made of aligned or randomly arranged fibres. Fibre reinforced plastics are found in many day to day applications.

These products are then coated marked as VP, GFK, GRP in order to meet the requirements for:

- **abrasion resistance**
- **corrosion resistance**
- **optical quality smoothness**
- **mechanical resistance**

NOTE

The resin-rich surface layer required for fibre reinforced plastic products is created using gel-coats or surfacing non-wovens. The use of non-wovens provides the additional advantages of a wet-on-wet process. Depending on the requirements, you can choose between surfacing veils made from:

- **textile glass fibres**
  - C-glass
  - E-glass
  - ECR-glass
- **synthetic fibres**
  - polyacrylonitrile (PAN)
  - polyester (PES)

Surfacing veils are available with styrene-soluble or styrene-insoluble binder systems. Fibre reinforced plastics products finished with surfacing veils conform to international standrards.

SURFACING VEILS FOR FIBER REINFORCED PLASTICS									
	Fibre	Weight g/m³ EN 29073-T1	Lamination injection method	Pressing	Winding method (dry)	Winding method (wet)	Pultrusion	Injection	Continuous processing
T1702	Polyester	24				x	x	x	
T1772	Polyacryl-nitril	21		x	x	x		x	
T1773		22	x		x				
T1775	E-Glass	30							x
T1785		14							x
T1776	C-Glass	26		x	x	x		x	
T1777		26	x		x				
T1790 C	ECR-Glass	30	x		x				
T1790 C	C-Glass	30	x		x				
T1791 C		30		x	x	x		x	
T1792 C		50			x	x			
T1798	ECR-Glass	32	x		x				
T1799		30		x	x	x		x	
T1711	ZS/CV	40						x	

* The above mentioned values are for illustrate purposes only. We will make an offer based on your specific material inquiry demand.

Advantages in comparison to laminates made purely from resin and glass:

- **weight reduction due to less resin and glass consumption (with same thickness)**
- **higher rigidity (with same weight)**
- **improved surface, no show- through of the glass structure**
- **cost savings in production time, resin and glass usage**

Core material is easily impregnated with all commercially available resins. Core material is also easy to work with, using the hand lay-up and fibre spraying process. Core material is available in several thicknesses, according to the specified application and requirement. Bulk mat performs in a large extent your requirements in the area of three-dimensional formability in a laden condition - without cut and translations. In its production is ensured comprehensive quality control according to international standards. Material we supplied according to your requirements with a binder soluble or insoluble in styrene and in the thickness of 2-5 mm.

VILEDON - DATA SHEET				
	Thickness	Weight	Length	Width
T 1721	1 mm	40 g/m²	185	1000 m
T 1722 HC	2 mm	50 g/m²	110	1000 m
T 1723 HC	3 mm	75 g/m²	80	1000 m
T 1724 HC	4 mm	95 g/m²	60	1000 m
T 1725 HC	5 mm	110 g/m²	50	1000 m

* The above mentioned values are for illustrate purposes only. We will make an offer based on your specific material inquiry demand.

Packaging: each roll is packed separately in PE foil on pallets 1200x1200 mm – 8 rolls packed in PE foil.

WIRES FOR WINDING

ENAMELLED ROUND COPPER WIRES

Produced according to standards:	Produced diameters:
IEC 60317-13 GR1, GR2	0,16 mm - 5,00 mm
IEC 60317-38 GR1 ,GR2	0,20 mm - 1,50 mm
IEC 60317-51 GR1, GR2	0,20 mm - 2,00 mm

ENAMELLED ROUND ALUMINIUM WIRES

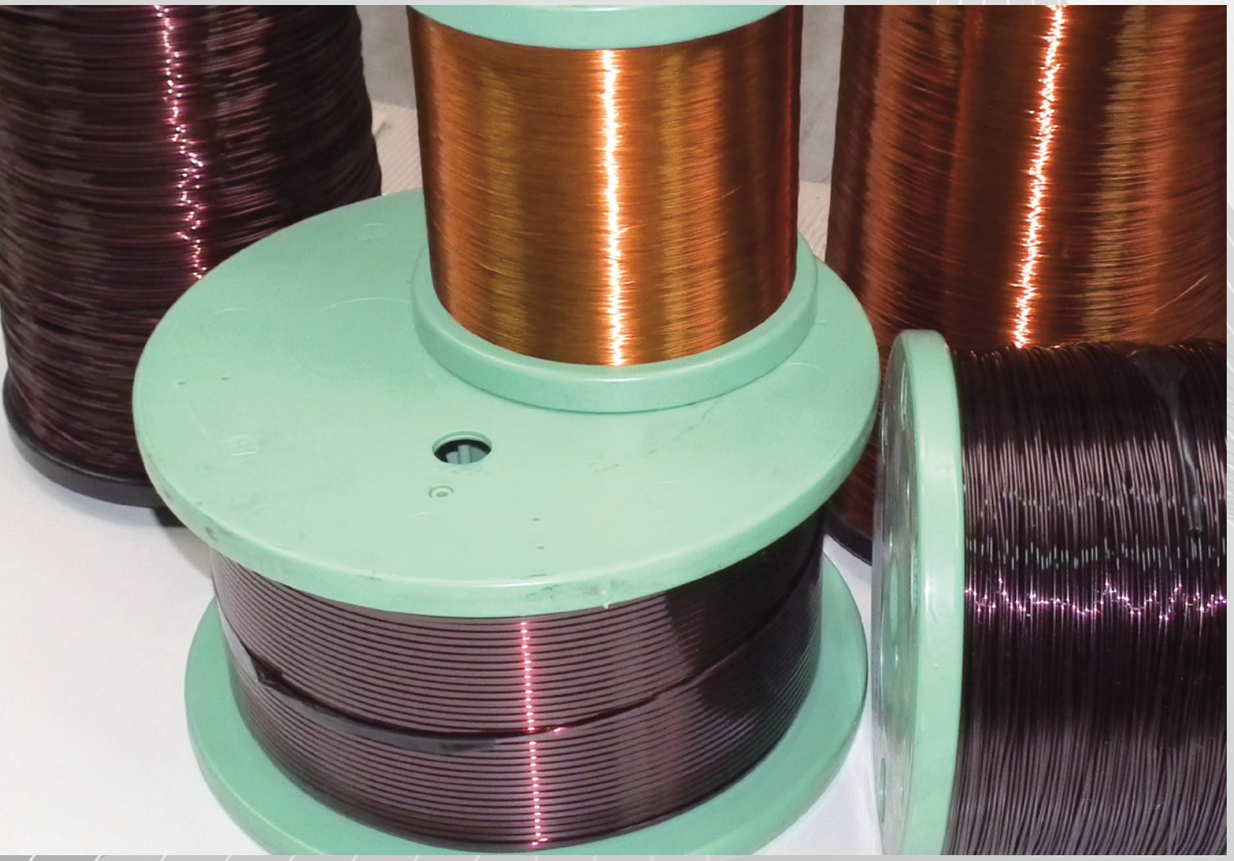
Produced according to standards:	Produced diameters:
IEC 60317-25 GR2	1,18 mm - 4,25 mm

RECTANGULAR COPPER WIRES

We offer rectangular wires overlapped by glass, Nomex®, Kapton®, mica and enamelled.

Products marking:

- DAMID 2
  rectangular copper wire 2x enamelled according to norm IEC 60317-29, thermal class 200 °C
- DAMIDFIBRE
  rectangular copper insulated wire – enamel +1-3x overlapped by glass and enamelled, thermal class 155 °C and 180 °C
- DAMIDOGLAS
  rectangular copper insulated wire: enamel + 2x overlapped glass with polyester, thermal class 155 °C
- DAFIBRE
  rectangular copper insulated wire: 1-3x overlapped glass + enamel, thermal class 155 °C and 180 °C



- DAMEX
  insulated by Nomex® 410
- DAMIDOMEX
  insulated by Nomex® 410 and enamel
- DAKAP
  insulated by Kapton®
- DAKAP CR
  insulated by Kapton® CR
- DAMIC
  insulated by mica
- DAFIBRE EPOXY
  insulated by glass fibre
- DAROGLAS
  insulated by glass fibre and polyester

We offer bare rectangular Cu wires, aluminium and copper wires insulated by paper.

RECTANGULAR ALUMINIUM WIRES

Products marking:

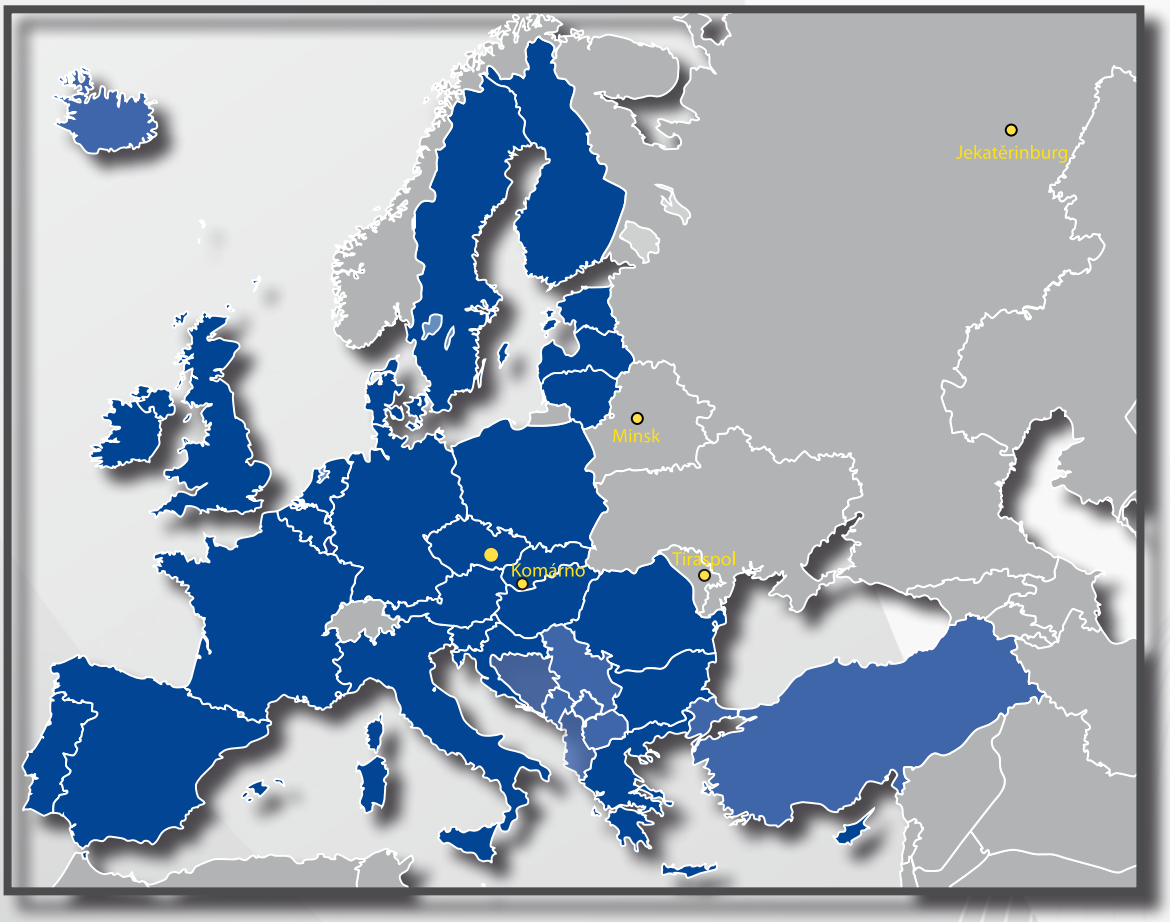
- DAMID AL
  rectangular insulated aluminium wire: 2x enamelled according to norm IEC 60317-29, thermal class 155 °C and 200 °C
- DAFIBRE AL
  rectangular insulated aluminium wire: 1-3x overlapped by glass fibre and enamelled, thermal class 155 °C and 180 °C
- DAMIDFIBRE AL
  rectangular insulated aluminium wire: enamel + 1-3x overlapped by glass fibre + enamel, thermal class 155 °C and 180 °C

BARE RECTANGULAR COPPER WIRES

Coils with thickness from 0,8 to 8 mm (DIN 40500/4, DIN 46433) and widths from 3 to 50 mm. Conductors are produced in hardening states – soft, hard or semi-hard.

Bars produced in thickness from 1,20 to 12 mm (DIN 40500/3) and widths from 4 to 160 mm. Conductors are produced in hardening states – soft, semi-hard and hard. Cu bars alloyed by CuAg and comutators bars according to DIN 42963. Shaped Cu trolley wires according to DIN 43141/2, DIN 43140.

Conductors with radius on edges or with sharp edges according to IEC norm. We deliver non-insulated rectangular Cu wires with shaped cross section based on customer requirement (comutators, rotors bars). Rectangular wires deliveries are in coils, 6 meter bars and drums.



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