Impregnating Resins and Varnishes

Dolph's

VONROLL

We Enable Energy

As one of the oldest industrial companies, founded 1803 in Switzerland, we focus on products and systems for power generation, transmission and distribution, rotating machines and mechanical engineering. Von Roll is the global market leader for insulation products and the only company to offer the complete range of insulation products, composites, consulting, tests and services for the electro-technical industry.

For more than 100 years, we have been making outstanding contributions to this market, developing a number of highly innovative products that have enabled higher operating temperatures, improved processing and a lower impact on the environment.

Customers enjoy the following benefits:

- One single source for all insulating materials
- Thorough expertise from power generation and transmission to its efficient utilization
- Proven compatibility for system components
- Testing at Von Roll of both materials and systems
- Consulting for applications and technologies
- Training in insulation materials and systems

Von Roll varnishes and resins have been integral components for insulation systems in all classes of rotating equipment, motors and generators for decades. They provide environmental protection, vibration reduction and, in some cases, additional dielectric strength. The choice of materials depends on the end use application as well as manufacturing concerns such as ease of use and environmental impact.

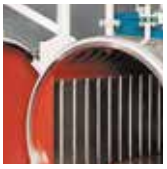
With the integration of Dolph® products in 2007, this new synergy significantly contributes to the successful performance of our whole varnish and resin product range.
Our experience in the field and in the laboratory has allowed us to develop an array of “green” waterborne and solventless resins that are UL recognized.

The products shown in this brochure exhibit the most desirable characteristics, through exacting formulation and selection. We have continuously worked with our customers to obtain superior results.

Our quality control standards are the toughest in the industry. Distribution is another strength. We have more than 30 subsidiaries worldwide. In addition a carefully selected network with partners is renowned for its good service and technical support.
Continous improvement is our philosophy.



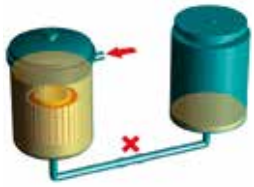
VPI Impregnating Resins



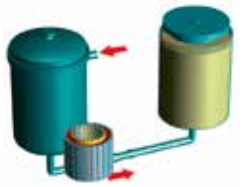
Vacuum Pressure Impregnation (VPI) is the leading process for the resin treatment of traction motors, high voltage motors and generators. Whether your company is running a single bar or a global impregnation process, we assist you in selecting the best resin based on equipment, application and expected performance. Thanks to our expertise in VPI equipment, system components and high voltage testing, we are able to provide some unrivalled guidance in testing and assessing your insulation system.
Please ask for our technical support for the first impregnation trials: we will help you fine-tune your processes in order to get the best out of our impregnation resin.

1. » Transfer preheated equipment to vacuum vessel
   » Pull vacuum

2. » Transfer resin under vacuum (the vacuum pump must be closed)
   » Allow time to soak



3. » Release vacuum
   » Apply positive pressure



4. » Transfer resin back to storage tank
   » Put equipment back in oven and cure

Below is a selection of our best resin choices in either epoxy, polyester, polyesterimide or silicone chemistries. All these resins have been tested and proven in our own laboratories and are successfully processed by our valuable customers.

Product name	Chemistry	Diluents	Flash point °F	Viscosity at 25°C (cps)	Gel time	Cure time at temperature	UL 1446 system max. rating	Main characteristics
HV motors and generators to 15kV								
Permafil® 707 N	Polyester	775	132	600	19 min at 118°C	> 2 h at 150°C	220°C	Low viscosity version of Permafil® 707 for HV motors to 15kV
Damisol® 3309	Polyesterimide	775	132	225	2 min at 118°C	> 2 h at 150°C	240°C	Premium Samicabond® system resin for applications up to 18kV
Damisol® 3407	Epoxy	–	–	400	10 h at 171°C	–	–	Epoxy anhydride formulation for use with accelerated mica tapes
Permafil® 74038	Epoxy	–	>200	900	45 min at 171°C	8 h at 150°C	–	Very stable, low viscosity resin for applications up to 15kV
Permafil® 74050	Epoxy	775	132	500	15 min at 171°C	8 h at 150°C	–	New technology, RT stable, low VOC resin for applications up to 15kV
Permafil® 74051	Epoxy	775	132	150	8 min at 171°C	8 h at 150°C	–	New technology, RT stable, very low viscosity resin up to 18kV
Traction and DC motors								
Permafil® 707	Polyester	775	132	900	19 min at 118°C	> 2 h at 150°C	220°C	Premium resin for traction and general purpose motors and generators
Permafil® 711	Polyester	775	132	14,000/ 5,000	22 min at 118°C	> 2 h at 150°C	220°C	Thixotropic version of Permafil® 707 for DC fields and other very high build requirements

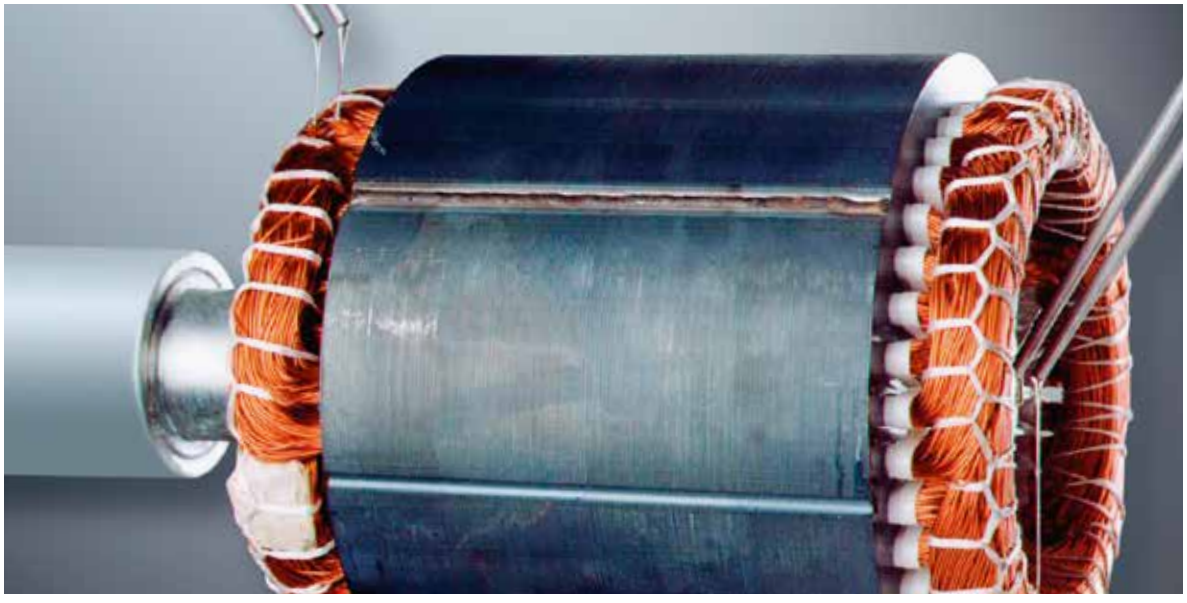
Product name	Chemistry	Diluents	Flash point °F	Viscosity at 25°C (cps)	Gel time	Cure time at temperature	UL 1446 system max. rating	Main characteristics
Traction and DC motors								
Permafil® 747	Polyesterimide	775	132	800	6 min at 118°C	> 2 h at 150°C	220°C	New technology premium resin for traction and general purpose motor applications
Permafil® 777	Polyester	775	132	5,000/ 2,000	15 min at 118°C	> 2 h at 150°C	220°C	Thixotropic version of Permafil® 707 with improved build and chemical resistance
Damisol® 3551	Silicone	–	–	1300	–	8 h at 180°C	–	100% silicone resin for high temperature resistant motors. Normally processed at 40–50°C
Dolphon® CC-1105	Polyester	VSR-3016	>200	400/ 1,200	40 min at 110°C	> 2 h at 150°C	220°C	Low viscosity, high bond, minimum clean-up
Dolphon® CC-1118LV	Epoxy	–	>200	7,500/ 3,000	18 min at 140°C	> 2 h at 150°C	155°C	Thixotropic, semi-rigid, superior moisture and chemical resistance
Form coil and random wound motors to 7kV								
Permafil® 707	Polyester	775	132	900	19 min at 118°C	> 2 h at 150°C	220°C	Premium resin for traction and general purpose motors and generators
Permafil® 709	Polyester	780	168	900	22 min at 118°C	> 2 h at 150°C	220°C	Stable, high performance general purpose resin for motor, transformer and coil applications
Permafil® 716	Polyester	784	132	900	20 min at 118°C	> 2 h at 150°C	220°C	Low cost, RT stable resin for motor and transformer dip, VI or VPI applications
Permafil® 723	Polyester	780	168	5,000/ 2,000	15 min at 118°C	> 2 h at 150°C	220°C	Thixotropic version of Permafil® 709 for VPI applications
Permafil® 724	Polyester	775	132	900	9 min at 118°C	> 2 h at 150°C	220°C	Fast curing, general purpose resin for VPI or chilled dip tanks
Permafil® 747	Polyesterimide	775	132	800	6 min at 118°C	> 2 h at 150°C	220°C	New technology premium resin for traction and general purpose motor applications
Permafil® 777	Polyester	775	132	5,000/ 2,000	15 min at 118°C	> 2 h at 150°C	220°C	Thixotropic version of Permafil® 707 with improved build and chemical resistance
Permafil® 74035	Epoxy	–	>200	8,000/ 3,000	10 min at 150°C	4 h at 150°C	180°C	High performance resin for general purpose industrial motor and generator applications
Permafil® 74041	Epoxy	–	>200	8,000/ 3,000	10 min at 150°C	4 h at 150°C	180°C	Commercial grade resin for general purpose industrial motor and generator applications
Dolphon® CC-1118LV	Epoxy	–	>200	7,500/ 3,000	18 min at 140°C	2 h at 150°C	155°C	Thixotropic, semi-rigid superior, moisture and chemical resistance
Dolphon® CC-1105	Polyester	VSR-3016	>200	400/ 1,200	40 min at 110°C	2 h at 150°C	220°C	Low viscosity, high bond, minimum clean-up

Trickle and Roll Through Resins



Popular for many low voltage, automotive and consumer product machines, these single and two component resins are especially designed for rapid processing and outstanding performance.

Product name	Chemistry	Diluents	Flash point °F	Viscosity at 25°C (cps)	Gel time	Cure time at temperature	UL 1446 system max. rating	Main characteristics
Permafil® 724 F	Polyester	775	132	300	4 min at 100°C	7 min at 100°C	220°C	Fast cure polyester resin with good pot life for high speed tools, automotive and DC applications
Permafil® 724 F2	Polyester	775	132	200	10 min at 80°C	15 min at 85°C	220°C	Very fast cure polyester resin for high speed tools, automotive and DC applications
Gelcoat® 3007-2	Polyesterimide	788	88	20,000	2 min at 110°C	15 min at 120°C	180°C	Gel coat for trickle applications; color changes upon cure; compatible with Damisol 3032 trickle resin
Damisol® 3032	Polyesterimide	788	88	300	2 min at 120°C	15 min at 130°C	220°C	Single component, RT stable resin very fast gel and cure times
Dolphon® CC-1096	Polyester	788	88	100/400	8–13 min at 100°C	5 min at 124°C	200°C	Low viscosity, high bond, excellent penetration, fast cure at low temperature
Dolphon® CC-1105 OPT	Polyester	VSR-3016	>200	400/700	12–19 min at 100°C	10–20 min at 150°C	200°C	One part nothing to mix, high bond, high flash, fast cure
XL® 2101	Polyester	M-2102	>200	200/400	8–13 min at 100°C	20–40 min at 127°C	220°C	High flash, very low VOC
Dolphon® CC-1105	Polyester	VSR-3016	>200	400/200	40 min at 100°C	1 h at 150°C	220°C	High bond, high flash, roll thru
Dolphon® CC-1099	Polyester	788	88	400/700	10-15 min at 100°C	30 min at 150°C	155°C	Low viscosity, low build, roll thru
Dolphon® CC-1139	Polyester	788	88	10,000/ 16,000	8–17 min at 100°C	5–10 min at 127°C	180°C	Staking compound to reinforce wire connections, apply behind commutator tangs



Process of trickling the resin over a stator.

Dipping Varnishes and Resins

The following range of resins and varnishes is designed for the impregnation of low voltage rotating machines and transformers.

Product name	Chemistry	Diluents	Flash point °F	Viscosity at 25°C (cps)	Gel time	Cure time at temperature	UL 1446 system max. rating	Main characteristics
Permafil® 712	Polyester	781	>200	600	20 min at 120°C	> 2 h at 150°C	240°C	Low build, RT stable resin for motor and transformer applications
Permafil® 716	Polyester	784	>132	900	20 min at 118°C	> 2 h at 150°C	220°C	Low cost, RT stable resin for motor and transformer dip, VI or VPI applications
Permafil® 724 CT	Polyester	775	>132	900	15 min at 118°C	> 2 h at 150°C	220°C	Fast curing, general purpose resin for dip or VPI, modified to eliminate greening on bare copper
Permafil® 1217	Polyester	6710	88	1000	–	30 min at 25°C	180°C	Fast RT curing polyester varnish for general purpose applications. Available in clear, red or yellow
Permafil® 9637	Polyester	6710	88	250	–	2–4 h at 150°C	220°C	General purpose polyester varnish for motor and transformer dip tank applications
Permafil® 9637LS	Polyester	6710	88	125	–	2–4 h at 150°C	220°C	Low solids version of 9637 for faster impregnation and thinner build
Permafil® 74040	Epoxy	–	>200	900	60 min at 118°C	> 2 h at 125°C	220°C	Low viscosity resin for transformer applications up to 220°C
Permafil® 74043	Epoxy	1520	88	650	–	2–4 h at 165°C	155°C	Solvent borne epoxy for general purpose and hermetic motor dip tank applications
Dolphon® CC-1105	Polyester	VRS-3016	>200	400/ 1,200	40 min at 110°C	2 h at 150°C	220°C	High flash, high bond, fast cure, minimum clean-up
Dolphon® CC-1305	Polyester	VRS-3016	>200	1,000/ 2,500	70 min at 110°C	2 h at 150°C	220°C	Semi rigid, high flash, polyester
Hi-Therm® BC-346A	Polyester	T-200-X	88	150/320	–	2 h at 170°C	220°C	High temperature, tough, flexible, meets mil-I-24092D
Hi-Therm® BC-352	Epoxy	T-352	88	120/180	–	2–6 h at 175°C	200°C	Class H epoxy varnish, excellent for hermetic high bond, moisture and chemical resistance
Hi-Therm® BC-359	Polyurethane	T-100	88	180/340	–	2 h at 165°C	200°C	Fast cure, low temperature, flexible with superior moisture, chemical resistance
XL® -2102	Polyester	-	>200	350/650	9 min at 124°C	2 h at 150°C	220°C	Excellent tank stability, high flash, low VOC
XL® -2103	Polyester	-	>200	1500/ 2000	9 min at 124°C	2 h at 150°C	220°C	Excellent tank stability, high flash, low VOC, thixotropic version (of XL2102)
Synthite® AC-43	Polyester	T-200-X	54	20/70	–	30 min at 25°C	155°C	Good conformal coating, air dry or bake applications, solderable
Synthite® AC-41	Polyurethane	T-200-X	81	150/200	–	30 min at 25°C	155°C	Flexible fast dry: moisture, salt spray and chemical resistance

Compounds and Coatings



This range of varnishes and resins includes air drying and elevated curing solutions for various over-coating, gap filling, potting and wet winding applications. They can be easily applied by spray, brush, flood or dip processes.

Product name	Chemistry	Diluents	Flash point °F	Viscosity at 25°C (cps)	Gel time	Cure time at temperature	UL 1446 system max. rating	Main characteristics
Permafil® 704	Polyester	–	132	1,400	15 min at 40°C or 3-4 h at 25°C	2–3 h at 40°C or 8-10 h at 25°C	200°C	Two component pour through polyester resin for general purpose motor applications
Permafil® 1217	Polyester	6710	81	1,000	15 min at 25°C (dust free)	30 min at 25°C (tack free)	180C	Fast RT curing polyester varnish for general purpose applications. Available in clear, red or yellow
Permafil® 3285	Polyester	–	>200	Putty	–	1 h at 125°C	–	Two component polyester putty for commutator and general purpose gap filling applications
Permafil® 74010A/ 74010	Epoxy	–	>200	300	2-4 h at 25°C	> 4 h at 25°C	–	High performance two component clear epoxy coating for spray or flooding applications
Permafil® 74036	Epoxy	–	>200	300	15 min at 40°C	> 15 min at 60°C	–	Two component pour through epoxy resin for general purpose motor applications; 5 to 1 mix ratio
Permafil® 74100/74101	Epoxy	–	>200	Putty	–	24 h at 23°C	–	Two component epoxy RT cure putty for commutator and general purpose gap filling applications
Permafil® 74115	Epoxy	–	>200	200,000	Single part	8–16 h at 150°C	200°C	Thixotropic wet winding compound for DC pole wound coils
Dolphon® CB-1128	Polybutadiene	T-200-X	>200	Thixotropic	Two parts	2–4 h at 21°C	155°C	Black-filled compound for brushing, dippping and spraying where high build is required
Dolphon® CB-1057	Epoxy	–	>200	Paste	Two parts	2–4 h at 21°C	–	Thixotropic epoxy paste for stators, armatures coil ends, marginal ends for transformers
Dolphon® CC-1089	Epoxy	–	>200	Low	Two parts	15 min at 135°C	–	Low viscosity, flexible, for impregnating and sealing stators, coils and armatures
Dolphon® CC-1094	Polyester	–	88	180/200	Two parts	2–4 h at 21°C	–	Pour-on low viscosity polyester
Dolphon® CC-1095	Epoxy	–	>200	3,800	Two parts	2–4 h at 21°C	–	Pour-on low viscosity epoxy
Dolphon® CO-1060	Epoxy	–	>200	Thixotropic	Two parts	2–4 h at 21°C	–	Thixotropic epoxy, semi rigid, for brush-on applications on stators and coils
Dolphon® CR-1034H	Epoxy	–	>200	Paste	Two parts	2–4 h at 21°C	–	Semi-rigid, red thixotropic paste for daubing buttering or insulating components

Product name	Chemistry	Diluents	Flash point °F	Viscosity at 25°C (cps)	Gel time	Cure time at temperature	UL 1446 system max. rating	Main characteristics
Dolphon® CW-1081	Epoxy	–	>200	Thixo-tropic	Two parts	1 h at 65°C	–	Thixptropic epoxy, flexible, for “spray-on” protection of motors
Permafil 277	Dupont Krytox	IPA	55	Thixo-tropic	–	Air dry	–	Masking compound for use on surfaces where adhesion of a cured resin is not desired
Synthite® AC-46	Polyurethane	T-200-X	81	150/200	–	30 min at 25°C	–	Fast drying, fungicidal, has UV tracer, available in spray
Synthite® ER-41	Polyurethane	T-200-X	81	200–400	–	30 min at 25°C	–	Class F red insulator: tough, flexible and fast drying; abrasion-, chemical-, moisture-resistant
Synthite® EB-41	Polyurethane	T-200-X	81	200–400	–	30 min at 25°C	–	Same as ER-41 with satin black finish, available in spray
Synthite® EB-43FB	Polyester	T-200-X	54	150–200	–	1 h at 25°C	180°C	Same capabilities as AC-43 with flat black finish, applications for transformers and coils
Synthite® ER-44	Polyurethane	T-200-X	54	250–400	–	30 min at 25°C	–	Red, tough, flexible, low cost, fast drying chemical and moisture resistant film

Potting Compounds

Our expertise in formulating and producing resins have enabled us to develop innovative potting compounds that simplify processing and save manufacturing time. These compounds have low shrinkage, low sensitivity to moisture and low outgassing during cure.

These resins are specially designed to fulfill the most demanding conditions of the electrical insulation and electronic components and protection markets.

Product name	Chemistry	Flash point °F	Viscosity at 25°C (cps)	Gel time	Cure time at temperature	Main characteristics
Potting compounds						
Dolphon® CB 1043	Epoxy	>200	1,500/ 2,000	R/T cure	Per reactor used	Black flame retardant for casting/potting
Dolphon® CB-1044	Epoxy	>200	900/ 1,275	R/T cure	Per reactor used	Black, unfilled for casting/potting
Dolphon® CB-1054	Epoxy	>200	8,000	R/T cure	Per reactor used	UL 94VO, 1:1 mix, Class F with CB 1054B
Dolphon® CB-1069	Epoxy	>200	5,500	R/T cure	Per reactor used	Soft filler, good for automatic dispensing equipment



Product name	Chemistry	Flash point °F	Viscosity at 25°C (cps)	Gel time	Cure time at temperature	Main characteristics
Potting compounds						
Dolphon® CB-1077	Epoxy	>200	50,000	R/T cure	Per reactor used	Black, highly filled for casting and potting, excellent thermal conductivity
Dolphon® CB-1078	Epoxy	>200	8,000	R/T cure	Per reactor used	Black, filled good thermal conductivity, low shrinkage
Dolphon® CB-1109	PBD	>200	2,500/ 3,000	R/T cure	24 h at 70°F	Black, potting for low stress applications
Dolphon® CB-1130	PBD	>200	11,000/ 14,000	R/T cure	1 week at 70°F	Potting with UL94V0 recognition
Dolphon® CB-1130FC	PBD	>200	11,000/ 14,000	R/T cure	10 min at R/T	Potting with UL94V0 recognition, fast cure
Dolphon® CB-1145	PBD	>200	2,300/ 2,700	–	2–3 h at 325°F	One component heat cure required
Dolphon® CC-1154	Epoxy	>200	850	R/T cure	Per reactor used	Clear potting compound, good for heat sensitive components
Dolphon® CC-1024-A	Epoxy	>200	1,400/ 1,600	R/T cure	Per reactor used	Casting/potting unfilled
Dolphon® CC-1092	Polyester	88	100/200	Two parts	60–120 min R/T	Two part polyester compound for sand filled transformers
Dolphon® CC1093	Polyester	132	145/255	R/T cure	Per reactor used	Potting/encapsulating VT monomer, shore A
Dolphon® CN-1065	Epoxy	>200	Cement	R/T cure	Per reactor used	Adhesive, two components
Dolphon® CN-1097	Polyester	132	12,000/ 20,000	R/T cure	Per reactor used	Encapsulation, glass filled for deep section cure, W/O cracking, for sealed systems
Dolphon® CN-1119	Epoxy	>200	Paste	–	7–8 h at 300°F	Wet winding one component
Dolphon® CN-1121	Epoxy	>200	Paste	–	3–5 h at 325°F	Wet winding one component
Dolphon® CN-1139	Polyester	88	85,000/ 95,000	1-7 min at 212°F	1–7 min at 212°F	Gel coat
Dolphon® CR-1035	Epoxy	>200	Paste	R/T cure	24 h at 70°F	Low viscosity encapsulation red casting for wash down motors
Dolphon® CR-1050	Epoxy	>200	3,500–4,000	R/T cure	Per reactor used	Casting and potting, low shrinkage, machinable
Dolphon® CR 1056	Epoxy	>200	Paste	1-2 h at R/T	24 h at 70°F	Adhesive
Dolphon® CR-1098	Epoxy	>200	7,000–13,000	1 h at 300°F	1 h at 300°F	Topcoat/dip one component high viscosity for heavy build, flexible, tough
Dolphon® CZ-1153	PBD	>200	3,500	R/T cure	Per reactor used	Potting 1 to 1 mix white flame retardant, UL94V0

Green Resins

All our new products are engineered to be environmentally friendly and economical, with low processing costs as well as low associated maintenance costs. Innovation in impregnation resins and varnishes is a genuinely collaborative enterprise involving a great deal of teamwork with many different internal and external partners.

Von Roll provides extensive support to the industry thanks to its knowledge of the UL 1446 standard and test requirements at the low-voltage systems testing lab and thanks to two high-voltage laboratories in Schenectady (USA) and Breitenbach (CH).

Last, but not least, within Von Roll, innovation in liquids is a global effort: both American and European R&D teams constantly exchange information to accelerate time to market.

In the industry several complex environmental programs and directives are already in effect. We are now in a position to offer good technical as well as economical solutions to our customers in the face of these new challenges.

Product name	Chemistry	Diluents	Flash point °F	Viscosity at 25°C (cps)	Gel time	Cure time at temperature	UL 1446 system max. rating	Main characteristics
Aqua-Therm® BC-365	Polyester	Water	>200	Per customer spec.	–	1–3 h at 162°C	220°C	Environmentally friendly low VOC's
Aqua-Therm® BC-365LTC	Polyester	Water	>200	Per customer spec.	–	1–2 h at 150°C	220°C	Environmentally friendly, low VOC's, faster cure than BC-365
Aqua-Therm® BC-368	Polyester	Water	>200	Per customer spec.	–	1–2 h at 150°C	220°C	Environmentally friendly, VOC's < .05%, low odor, no co-solvent, high bond
XL® -2101	Polyester	–	>200	200–400	8–13 min at 100°C	20–40 min at 127°C	220°C	High flash, very low VOC's, low odor
XL® -2102	Polyester	–	>200	250–650	125 min at 100°C	1–2 h at 150°C	220°C	High flash, low VOC's, low odor, excellent tank stability
XL® 2105	Polyester	–	>200	220	10 min at 124°C	1–2 h at 150°C	220°C	High flash, very low viscosity, low VOC's, superior tank stability, low odor
XL® -2110	Polyester	–	>200	1000–1300	8–13 min at 100°C	30 min at 121°C	220°C	High flash trickle/roll through resin, low VOC's, medium viscosity
XL® -3102	Polyester	–	>200	700–1100	15–30 min at 118°C	2-4 h at 150°C	In Progress	High flash, low odor, low VOC's, excellent tank stability
Permafil® 74046	Epoxy	Water	>200	150–300	–	1–2 h at 160°C	In Progress	High bond epoxy emulsion
Aqua-Therm BC-379	Epoxy	Water	>200	30–100	–	2–4 h at 160°C	180°C	Environmentally friendly, low VOC's
Aqua-Therm BC-380	Epoxy	Water	>200	20-40	-	2–4 h at 160°C	180°C	Environmentally friendly, low VOC's

Glossary of VPI Terms

Bond strength
The measure of force required to break the bond of varnished helical coils of enamelled magnet wire.

Bump
Briefly revert from vacuum to atmospheric pressure and again draw the vacuum.

Centipoise (cps)
Unit of viscosity. Usually measured by the drag on a turning spindle immersed in the liquid, Brookfield viscosity. A force of 0.01 dyne per centimeter.

Film build
Average build-up of cured resin on one side of a metal panel.

De-aerate
Remove air and other gasses by vacuum.

Dielectric strength
The voltage a material can withstand before break-down occurs. Usually expressed in “Volts Per Mil”. Interestingly, a thicker section of material has a higher total breakdown but a lower dielectric strength, i.e. dielectric strength for one mil Mylar tape may be 3000 VPM but for 2 mils, breakdown would be only 5000 Volts (2500 VPM).

Dissipation factor
An indication of energy loss in the circuit, as in the production of unused heat.

Flash point
The temperature at which enough vapor is generated to flash if a spark or flame is introduced.

Half lap
Spiral tape wrap in which each turn overlaps the previous one by a half tape width. Provides a double thickness of tape.

Millibar
A unit of atmospheric pressure: 0.75 mm Hg (75 microns). One mm equals 1.33 mbar.

Preheated oven
Oven heated until the skins (inside walls) are at temperature and temperature has stabilized. May take several hours.

Random wound
Describes a coil in which the wires do not lie in an even pattern. Not shaped before insertion in the devise. Also a motor containing such coils. Sometimes called “Mush Wound”.

Storage life
The time during which a liquid resin can be stored at 70 F and remain suitable for use. Also called “Shelf Life”. See Tank Life.

Tank life
The time the product remains usable in service. Tank life is affected by the frequency of use, processing temperature, turnover of material, storage temperature, and occasionally by contaminants. Also called “Pot Life”.

Thermal conductivity
The ability of a material to conduct heat. Usually expressed as: calories/sec/cm2/’F/cm thickness.

Thixotropic (Thixotropy)
Describes materials that liquefy or flow when agitated (mixed) and return to a thick consistency when allowed to rest, e.g. ketchup. A thixotropic material can therefore, be used at both high and low viscosities.

Torr
Unit of pressure (vacuum): 1 mm Hg.

Vacuum chamber
Vessel where devices are processed and could be equipped for both vacuum and pressure. Usually also includes 2 portholes, the sight port and the light port, one for illumination, the other for viewing the process.

Vapor pressure
An indication of the evaporation rate. The pressure in an enclosed container when the vapor and liquid are in equilibrium.

Viscosity
The resistance of a material to flow. Higher viscosity liquid flows more slowly, lower more quickly. May be measured in centipoise, or in minutes and seconds.

Volume resistivity
The ability of a material to resist the passage of electricity through its bulk. The value is expressed in “Ohm-Cm”.

We Enable Energy

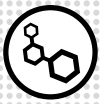
Von Roll is the sole full-range supplier of materials and systems for the insulation of electrical machines as well as high-performance products for various high-tech industries.

Mica
All materials related to high-voltage insulation. Von Roll's commitment to mica starts with mining and ends with finished tapes.

Wires
Insulated round, flat and Litz wires for high-voltage, low-voltage and electronic applications.

Cables
Mica tapes for fire-resistant cables. Von Roll provides a wide range of products that are ideally suited to all commonly used standards.

Resins
Impregnation resins for high- and low-voltage, potting resins, casting resins, as well as encapsulating and conformal coatings.



Composites
Engineered materials made from a resin and a support structure with distinct physical, thermal and electrical properties. They can be molded, machined or semi-finished.

Flexibles
Insulating flexible materials for low-voltage applications such as flexible laminates and adhesive tapes.

Ballistic Protection
High-quality systems for armored defense based on thermoset / thermoplastic products in single-use or tailored combinations.

Water
Von Roll BHU Umwelttechnik GmbH provides solutions for process engineering tasks in the field of water and wastewater management.

Testing
Von Roll provides electrical, thermal and mechanical testing of individual materials as well as complete insulating systems.

Training
Von Roll Corporate University provides a training program in high- and low-voltage insulation for its customers.

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About Von Roll

Von Roll is the global market leader for electrical insulation products and the only company to provide the complete range of electrical insulation and composite products, systems and services for generators, high- and low-voltage motors, transformers and other electrical applications.
Von Roll has strong expertise in resins and varnishes worldwide, with liquids production plants in Europe (2), America (1), China (1) and India (1). In 2007 Von Roll purchased the American company John C. Dolph's, and in May 2013 Von Roll acquired the Italian company Albesiano Sisa Vernici S.r.l. With a highly committed research and development department and application laboratories in all continents, Von Roll offers a strong technical support as well as a superior sales and service network to customers all over the world.

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