



Impregnating Resins and Varnishes

We Enable Energy

As one of the oldest industrial companies of Switzerland, founded in 1803, 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 insulations 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 both steady increases in power output and smaller and more compact machines.

Customers enjoy the following benefits:

- » One single source for all insulating materials
- » Thorough expertise from power generation and transmission to its efficient utilisation
- » 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 provides a comprehensive product spectrum of resins and varnishes for the electrical industry. These products have the following characteristics:

- » For high voltage applications
- » For low voltage applications
- » To meet all international standards
- » Wide range of environmental-friendly products
- » A wide choice of thermal classes up to class C



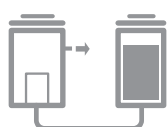
Vacuum Pressure Impregnation (VPI) Resins

Vacuum pressure impregnation is a leading process for the handling of resin in traction motors, high-voltage motors and generators. Whether your company uses a single-bar or a global impregnation process, we assist you in selecting the most appropriate resin for your application, equipment and expected performance.

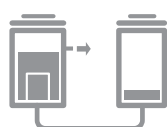
Thanks to our expertise in VPI systems, system components and high-voltage testing, we are able to provide unrivalled guidance in testing and assessing the performance of our resin in your system.

Finally, once you have selected the resin that best fits your needs, please ask for our technical support for the first impregnation trials: we will help you to fine-tune your processes to get the most out of our impregnation resin.

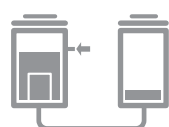
This selector guide includes a selection of our finest resin choices in either epoxy, polyester, polyesterimide or silicone chemistries. All these resins have been tested and proven in our own laboratories and have been successfully used by our customers.



1.
Transfer preheated object 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 object back in oven and cure.

Product	Chemistry	Thermal class	Diluent/solvent	Flash point (°C)	Viscosity at 23°C (mPa.s)	Storage temp. (°C)	Impreg. temp. (°C)	Curing process*	Comments on products and use
Traction									
Damisol® 3551	100% silicone	C	None	> 100	1300	23	40–50	8 h at 180°C	1K silicone resin. Excellent reference for high-temperature-resistant motors, like traction.
Damisol® 3500 LoV	Epoxy without solvent	F	None	> 100	600	23	23	6 h at 160°C	No VOC. One component epoxy resin. Low viscosity for easy traction repair.
Damisol® 3412	Epoxy 2K	F	None	> 100	1000	<5	23	10 h at 150°C	Highly reactive. Good results on static curing. Very well adapted for traction motors.
Permafил® 707	Polyester	H	9151	53	1000	23	23	8 h at 150°C	Alternative to silicone resins for AC and DC high-voltage traction motors. Outstanding resistance to thermal shock.
Traction and HV motors up to 6.6 kV									
Damisol® 3340	Polyesterimide (Samicabond)	H	9151	53	200–500	23	23	8 h at 150°C	Highly reactive, yet highly stable room-temperature impregnating resin. Good results on static curing.
Damisol® 3032	Polyesterimide (Samicabond)	H	9117	32	200–300	23	23	8 h at 140°C	Highly reactive, yet highly stable room-temperature impregnating resin. Good results on static curing.
Permafил® 74041	Epoxy 1K	H	NA	> 100	4000–8000	23	23	4 h at 160°C	Good thixotropic resin. High resin build. High-temperature resistance.

*Without heating-up time

NA: not applicable

Product	Chemistry	Thermal class	Diluent/solvent	Flash point (°C)	Viscosity at 23°C (mPa.s)	Storage temp. (°C)	Impreg. temp. (°C)	Curing process*	Comments on products and use
Traction and HV motors up to 15 kV									
Damisol® 3308	Polyesterimide (Samicabond)	H	9117	32	150	23	23	8 h at 140°C	Highly reactive, yet highly stable room-temperature impregnating resin. Good results on static curing.
Damisol® 3309	Polyesterimide (Samicabond)	H	9151	53	170	23	23	8 h at 150°C	Highly reactive, yet highly stable room-temperature impregnating resin. Good results on static curing.
HV motors and generators up to 15 kV									
Damisol® 3313	Polyesterimide/epoxy	H	9153/9117	39	100	23	23	8 h at 150°C	High mechanical properties. Good results on static curing.
Permafil® 74038	Epoxy 1K	H	None	>100	1200	23	23–60	8 h at 160°C	1K epoxy resin without diluent. Very low organic emission (VOCs<2%).
HV motors and generators up to 22 kV									
Damisol® 3407	Epoxy/anhydride 2K	F	None	>100	400	<10	40–70	10 h at 170°C	Accelerated tape needed.
Damisol® 3415	Epoxy/polyester	F	9117	32	90	<5	23	8 h at 150°C	Highly reactive room-temperature impregnating epoxy-modified resin. Storage below 5°C.

Overcoat Varnishes

The Damicoat® range of finishing and overcoat varnishes includes air-drying and oven-curing solutions. They are all single-component for easy processing by spray, brush and even dipping and dip-rolling processes.

Product	Chemistry	Color*	Thermal class	Diluent/solvent	Flash point (°C)	Viscosity at 23°C (mPa.s)	Drying time**	Comments on products and use
Damicoat® 2404	Alky phenol	RB/G	F	9114	38	200/400	15–20 h	Highly chemically resistant overcoat varnish.
Damicoat® 2405-1	Alkyd	N/RB/B	F	9147	39	200/470/500	40 mn	Multipurpose fast-curing overcoat varnish with good fungicide characteristics. Outstanding antitracking properties.
Damicoat® 2407	Alkyd-modified	RB	F/H	9114	38	470	1–2 h	High-temperature-resistant overcoat varnish, used up to class H high-voltage and traction machines.

*B: black G: gray N: natural RB: red/brown

**Tack-free



Atmospheric and VPI Dipping Resins

The following range of Damisol® impregnating resin is designed for the treatment of low-voltage rotating machines and transformers.

Product	Chemistry	UL	Thermal class	Diluent/solvent	Flash point (°C)	Viscosity at 23°C (mPa.s)	Curing process*	Comments on products and use
Damisol® 2005	Alkyd phenolic	Yes	H	9114	37	390	5 h at 150°C*	Universal varnish with good mechanical properties for any kind of application on motors or transformers.
Damisol® 2053	Polyesterimide	Yes	H	9114	37	270	6 h at 150°C*	High-temperature-resistant varnish with excellent flexibility. Commonly used on transformers and resin-rich processes.
Damisol® 2014 SFR	Modified epoxy	Yes	H	9169	31	150	5 h at 150°C*	Universal varnish with outstanding chemical resistance properties, including all freon types (hermetic motor use).
Damisol® 2413	Modified alkyd	Yes	F	9162	25	450	5 h at 150°C*	Very flexible universal varnish. Excellent solution for repair shops.
Damisol® 2101	Silicone	No	C	9114/ 9158	25	100	8 h at 200°C*	High-temperature-resistant class C silicone varnish. Especially convenient for traction motors and fire resistance applications.
Damisol® 3305-2	2K polyesterimide	Yes	F	9117	32	85	2–4 h at 120–140°C*	Multipurpose class F resin. Commonly used on low-voltage motors in continuous process.
Damisol® 3032	Polyesterimide	Yes	H	9117	32	200–300	2 h at 140°C*	Multipurpose class H resin. Outstanding dielectric properties up to class H.
Damisol® 3040	Polyester/epoxy	Yes	H	9153	39	200	2 h at 150°C*	Class H resin with outstanding bond strength at elevated temperature. Mainly used on low-voltage motors and generators.
Damisol® 3340	Polyesterimide	Yes	H	9151	53	200–500	2 h at 150°C*	Class H resin. Outstanding dielectric properties up to class H. The 200 mPa.s version will be used on transformers.
Damisol® 3500 LoV	Epoxy 1K	Yes	H	None	>100	600	6 h at 160°C*	Extremely low organic emission (VOC) epoxy resin. Outstanding stability and dielectric properties up to class H.
Damisol® 3630	Polyesterimide	Yes	H	None	>100	300–600	2 h at 150°C*	Multipurpose solventless varnish. High stability. Outstanding thermal aging properties. No VOCs. Low organic emission.

*Most common oven-curing process

Trickle and Dip-Roll Resins

Product	Chemistry	UL	Thermal class	Diluent/solvent	Flash point (°C)	Viscosity at 23°C (mPa.s)	Curing process*	Comments on products and use
Gelcoat® 3007-2	Special 2K polyester	Yes	F	9117	32	20,000**	15 mn at 120°C*	Excellent bonding resin for power tool collectors. Very high mechanical properties under high stress.
Damisol® 3030-2	2K polyesterimide	Yes	H	9117	32	85	5–7 mn at 120°C*	Strongly reactive, resistant to high mechanical and electrical stress resin. Mainly used for rotors (power tools).
Damisol® 3026-2	2K polyesterimide	Yes	H	9117	32	150	8–12 mn at 120°C*	Strongly reactive, resistant to high mechanical and electrical stress resin. Mainly used for rotors (power tools).
Damisol® 3035-2	2K polyesterimide	Yes	H	9151	53	80	4–6 mn at 140°C*	Highly reactive and flexible resin. Recommended for low-voltage industrial stators.
Damisol® 3032	Polyesterimide	Yes	H	9117	32	200–300	30 mn at 130°C*	Multipurpose class H resin. Highly reactive compared to any other single-component resins, yet very stable.
Damisol® 3040	Polyester/epoxy	Yes	H	9153	39	200	30 mn at 150°C*	Multipurpose class H resin. Excellent high-temperature mechanical properties. Commonly used on low-voltage motors and generators.
Damisol® 3500 HiR	Epoxy 1K	Yes	H	*None	>100	600	30 mn at 160°C*	Extremely low organic emission (VOC) epoxy resin. Outstanding reactivity and mechanical properties up to class H application.
Damisol® 3630	Polyesterimide	Yes	H	None	>100	300–600	30 mn at 150°C*	Multipurpose solventless varnish. High stability. Outstanding thermal aging properties. No VOCs. Low organic emission.

*Measured on the copper **Thixotrop effect

Bonding and Encapsulation Resins

Product	Chemistry	Thermal class	Diluent/solvent	Flash point (°C)	Viscosity at 23°C (mPa.s)	Curing process*	Comments on products and use
Damisol® 2154	Epoxy water-based varnish	F/H	Water	>100	450	6–8 h at 135°C*	Specific water-based varnish used to glue power generators and stator plates.
Damival® 15182OA/ Damival® 15174OB	Epoxy 2K unfilled	F	NA	>100	1500	24 h at 25°C	Low-viscosity cold-curing class F system for glass and polyester fiber impregnation. Already approved for high-voltage generators.
Damival® 15182OA/ Damival® 9030	Epoxy 2K unfilled	H	NA	>100	4000	4 h at 135°C	Hot-curing system with higher temperature resistance than Damival® 15182OA / 15174OB. Already approved for high-voltage generators.
Damival® 15230OA/ Damival® 15230OB	Epoxy 2K unfilled	F	NA	>100	10,000	24 h at 25°C	Cold-curing system, suitable for casting of end bars connection boxes. Already approved for high-voltage generators.
Damival® 15350NA/ Damival® 15210OB	Epoxy 2K unfilled	F	NA	>100	2300	24 h at 25°C	Cold-curing system, low viscosity, UL94 V0 approved, excellent level of thermal conductivity, suitable for low-voltage stator encapsulation.
Damival® 13553AN/ Damival® 13500	Poylurethane 2K	F	NA	>100	3000	12 h at 25°C	Cold-curing system, UL94 V0 approved, low smoke emission type, good thermal conductivity, suitable for low-voltage stator encapsulation.

*Under press

NA: not applicable



The Green Range

Announcing the new Von Roll European impregnating resin portfolio: Damisol®, Damicoat® and Damival®. All our new products are engineered to be environmental-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.

As far as system testing is concerned, Von Roll provides extensive support to the industry thanks to its UL 1446 certified laboratory for voltages below 600V 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 European environmental programs and directives are already in effect:

- » REACH (Registration, Evaluation and Authorization of Chemicals)
- » ROHS (Regulation on Health and Safety)
- » VOC (Volatile Organic Compound directives 1 999/13/CE-2004.42/CE)

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	Chemistry	Thermal class	Flash point (°C)	Viscosity at 23°C (mPa.s)	Curing time	Comments on products and use
Damisol® 3630	Polyester-imide	H	>100	300–600	30 mn at 150°C**	Multipurpose class H solventless varnish. High stability. Outstanding thermal aging properties. No VOCs. Low organic emissions.
Damisol® 3500 LoV	Epoxy 1K	H	>100	600	6 h at 160°C*	Multipurpose class H solventless varnish. No VOC. Very low organic emission. Outstanding stability and dielectrical properties up to class H application. Recommended on atmospheric, V(P)I or hot-impregnation dipping process for low- to medium-voltage motors and transformers.
Damisol® 3500 HiR	Epoxy 1K	H	>100	600	30 mn at 160°C**	Multipurpose class H solventless varnish based on epoxy chemistry. No VOC. Very low organic emission. Outstanding reactivity and mechanical properties up to class H application. Recommended on trickling and dip-rolling process for low-voltage motors.
Permafil® 74038	Epoxy 1K	H	>100	1100	8 h at 160°C*	1K epoxy resin without diluent used for high-voltage machines up to 15kV. Very flat dissipation curves up to 220°C. Very low organic emissions (<2%).
Damisol® 3551	Silicone	C	>100	750	8 h at 180°C*	1K silicone resin for class C application. Excellent reference for high-temperature-resistant traction motors.

*Most common oven-curing process

**Measured on the copper

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

Materials related to high-voltage insulation. Von Roll's commitment is extensive including all the steps in the manufacturing process.



Flexibles

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



Wires

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



Transformers

High-performance transformers for power transmission and distribution, tailored solutions to all applications of today's energy supply companies.



Cables

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



Testing

Von Roll provides electrical, thermal and mechanical testing of individual materials as well as complete insulating systems. We are UL-certified.



Liquids

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



Training

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



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.

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About Von Roll

As one of the longest established industrial companies in Switzerland, founded in 1803, we focus on products and systems for power generation, transmission and distribution, rotating machines and mechanical engineering. Von Roll is the global market leader in insulation products, systems and services and is represented at more than 32 locations in 19 countries with around 3,400 employees.