



Thermal Protection

We Enable Energy

As one of the oldest 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 for insulation products and the only company to offer the complete range of insulation products, composites, consulting, tests and services for the electrotechnical 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:

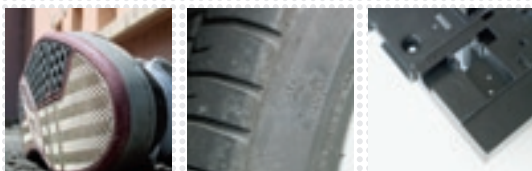
- » One single source for all insulating materials
- » Thorough expertise from power generation and transmission to its efficient utilization
- » Proven compatibility for system components
- » Testing at Von Roll of both materials and systems
- » Consulting for applications and technologies
- » Training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

Protecting people and machinery, optimizing production processes and saving energy are priorities for us and our customers. Von Roll has developed a portfolio of efficient, asbestos-free and enduring thermal products for all appliances, which require long-lasting heat protection as for example:

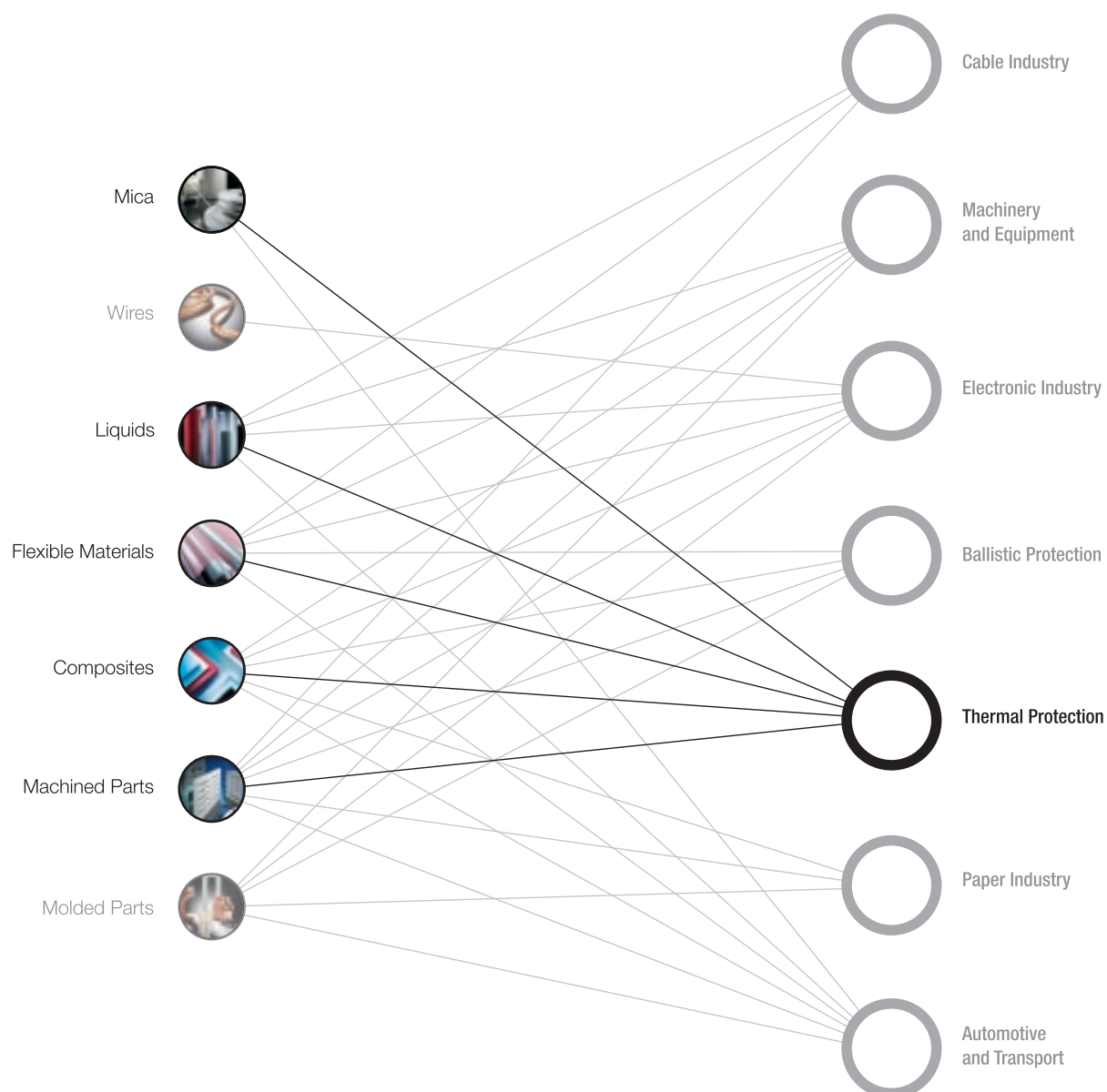
- » Household appliances
- » Rubber tires for cars, trucks and aircraft
- » Plastic and rubber injection and molding
- » Compressed wood or particle panel presses
- » Tool makers for presses
- » Induction ovens and arc furnaces
- » Smelters, furnaces and foundries

Our thermal products are able to withstand continuous temperatures of between 200°C and 900°C and peak temperatures of up to 1200°C under different pressures and environmental conditions.

The proven insulation effects and the long-term use of Von Roll composites enable substantial cost savings and significant improvements in quality that brings value to our customers.



Our Products for Thermal Protection



Von Roll offers full system solutions for every market. Please contact us or visit our website www.vonroll.com for further information.

Thermal Protection Applications

Demand for higher performance and reliability in applications using thermal insulation products is continuously increasing. The synergies that exist between Von Roll and its customers have resulted in the development of efficient combinations of materials – glass mat, glass cloth, mica, cement – combined with high-temperature resin systems to optimize properties such as:

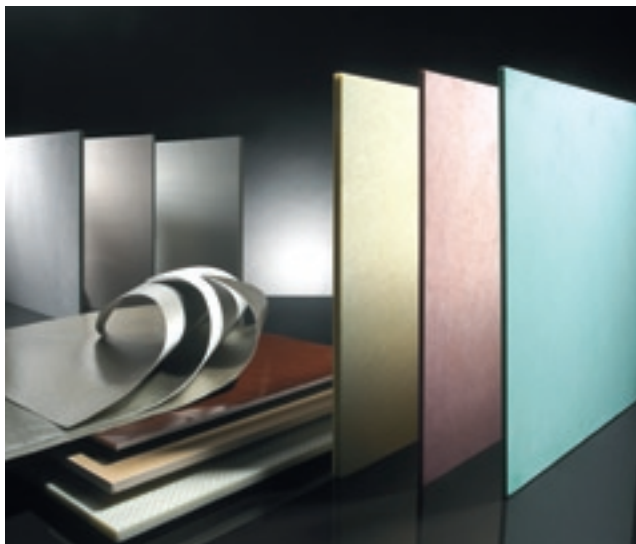
- » Low thermal conductivity
- » Excellent temperature resistance and product endurance
- » High mechanical resistance especially at elevated temperatures
- » Very good machineability

Von Roll provides a comprehensive product spectrum of asbestos-free thermal insulation materials with proven application properties, available in the form of:

- » Resins and varnishes
- » Flexible laminates
- » Sheets and plates
- » Tubes
- » Machined parts

The wide variety of material grades combined with the expertise of our machining centers allow us to offer the perfect solution for thermal protection in many industrial and domestic applications:

- » Household appliances
- » Heating press platen insulation
- » Induction and arc furnaces
- » Foundries and smelters
- » Fire-protection equipment



Household Appliances

Band heating equipment design is based on heating processes employing the use of wound resistance wire. Such equipment has to provide heat quickly and utilises the convective heat-transfer principle.

Von Roll provides high-temperature-resistant materials based on mica paper and silicon resin, referenced as Heater Samicanite® 41610/41620 and Samicanite® 41220. Heater Samicanite® 41610 (muscovite type) and Heater Samicanite® 41620 (phlogopite type) are rigid plates that allow easy manufacture of thin and lightweight elements. Samicanite® 41220 is a flexible-grade material that is produced in sheets and rolls providing further options in heater element design and manufacture.

Advantages of Heater Samicanite®

- » Rigid insulation plate
- » High thermal resistance and product longevity
- » Low thermal conductivity
- » Good mechanical properties enabling the support of wide heating spirals or wire windings
- » Intrinsic electrical characteristics provide excellent arc and dielectric properties
- » Excellent fire resistance: UL94 V-0 classification
- » Low smoke emission: classification M0 I0 F0 tested according to NF F 16-101
- » Thin thicknesses with a variety of sheet formats benefit component optimisation and element design
- » Outstanding consistent quality
- » Ability to be punched, supporting cost-effective & mass production processes
- » Thin material sections permit rapid heat transfer and beneficial cooling of the heating element

Product name	Type	Matrix	Reinforcement	Standards	Heat resistance	Sheet size/ thickness range (mm)	Highlights	Main applications
Heater Samicanite®	41610	silicone	muscovite mica paper	IEC 60371-3-3, HP 5	450°C and above	2400x1000 1200x1000 0.2 to 2.0	rigid, excellent thermal and electrical properties UL94 V-0	heat-resistance supports, insulation in household, insulation in industrial appliances
Heater Samicanite®	41620	silicone	phlogopite mica paper	IEC 60371-3-3, HP 5	450°C and above	2400x1000 1200x1000 0.2 to 2.0	rigid, excellent thermal and electrical properties UL94 V-0	heat-resistance supports, insulation in household, insulation in industrial appliances
Flexible Samicanite®	41220	silicone	muscovite mica paper	IEC 60371-3-3, HP 5	450°C and above	1200x1000 0.2 to 2.0	flexible, good electrical properties	thermal and electrical shield in heating and industrial appliances

The table above shows an overview of our Samicanite® laminates.



Application examples include:

- » White goods such as toasters, hairdryers, grills, ovens, tumble dryers, irons, micro-waves etc.
- » Heating devices such as electric radiation heaters, convention heaters, fan assisted heaters, spiral wound heating elements, band heating elements, etc.

Heated Press Platen Insulation

Correct thermal insulation of a heated press is of a paramount importance to achieve low energy consumption, consistent product quality, an acceptable working environment and is a pre-requisite for today's cost-driven, quality conscious industries.

Von Roll meets these challenges with it's range of platen insulation products by offering customers the following advantages:

- » Retention of heat within the press results in a constant temperature providing consistent product quality
- » Prevention of radiated heat loss reduces the need for continuous energy input so achieving lower operating costs
- » Prevents flame cracks and hydraulic cylinder leaks

The inherent material characteristics of Von Roll products provide optimum insulation solutions to serve the following press designs:

- » Wood and compressed wood presses
- » Plastic injection presses
- » Compression molding presses e.g. tire and rubber components
- » Toolmakers for presses
- » Heat sealing equipment used in the packaging industry

Von Roll's thermal insulation product portfolio of thermo-setting rigid composites encompass Deltherm® 68330/68890, Lightherm® 68880, E-Therm, Vetrotherm, Siltherm, Pamitherm® and C-Therm®. Material characteristics such as compressive strength, low thermal conductivity, rates of low thermal expansion and peak temperature resistance of up to 900°C provide our customers with high performance thermal insulation giving peace of mind for many years of trouble free operation. Siltherm for example, has exceptional compressive strength. It's large sheet format allows single component bespoke solutions offering significant technical and commercial advantages to our customers.

Product features:

- » Adaptable high quality surface finishes to meet specific application requirements
- » Accurate material parallelism
- » Excellent thermal endurance for extended product life in the press
- » Robust, durable construction minimises maintenance procedures
- » Customized machined components meeting exact customer needs
- » Product mechanical stability permits dimensional accuracy through CNC fabrication from drawings, CAD files or reverse engineering process
- » Available in a comprehensive range of thicknesses and formats to satisfy larger press requirements
- » Possibilities to create hybrid composites to meet exact performance criteria

Engineered insulation solutions such as thermal insulation boards, specific machined parts and hybrid composite materials find excellent acceptance in:

- » Wide variety of heated molds, temperature controlled machines, tools and equipment employed in the manufacture of complex plastic and rubber products
- » Industrial machines designed for use in packaging, heating sealing, welding and soldering applications
- » Induction and arc furnaces, annealing and curing ovens and heat exchangers



Thermal insulation for press

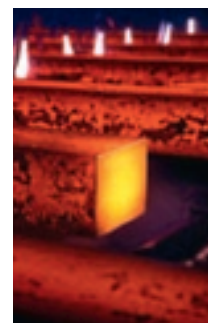
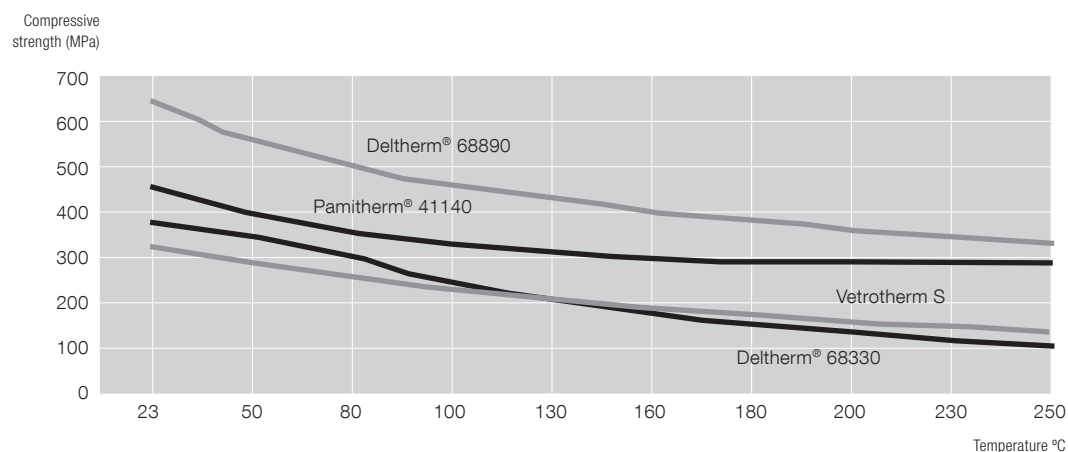


Machined parts for thermal insulation

The following table shows an overview of our thermal insulation product range with temperature resistances between 200°C to 500°C.

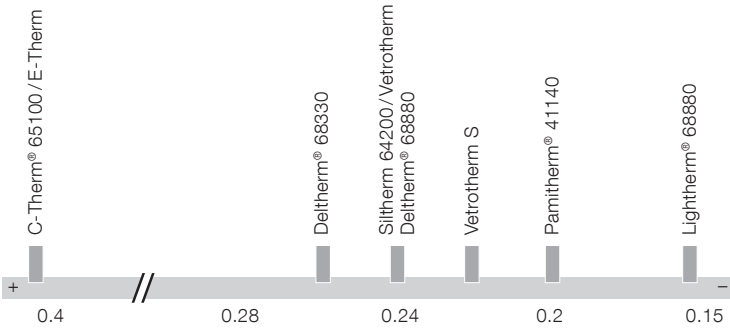
Brand names	Units	Test methods	Deltherm® 68330	Lighttherm® 68880	E-Therm	
Mechanical characteristics						
Compressive strength at 23°C flatwise	MPa	ISO 604	330	300	600	
Compressive strength at 200°C flatwise	MPa	ISO 604	120	120	390	
Flexural strength	MPa	ISO 178	160	250	420	
Physical characteristics						
Density	g/cm ³	ISO 1183	1.9 +/-0.1	1.4 +/-0.1	1.9 +/-0.1	
Water absorption	%	ISO 62	0.1	0.15	0.05	
Thermal characteristics						
Heat resistance	°C		180 – 200	180 – 200	200	
Max.heat resistance (short periods)	°C		220	240	250	
Thermal conductivity	W/mK	DIN 52612	0.27	0.15	0.25	
Coefficient of linear expansion //	10 ⁻⁶ /K		20	15	10	
Form of delivery						
Sheet sizes	mm		2000x1000	2950x1330 1335x975	2070x1070 1070x1070	
Thicknesses (mm)	%		6 to 25	6 to 50	3 to 75	
Standard surface treatment			sanded both sides	sanded both sides	sanded both sides	

Development of flatwise compressive strength against temperature
Curves of Von Roll product range



	Deltherm® 68890	Vetrotherm	Siltherm 64200	Vetrotherm S	Pamitherm® 41140	C-Therm® 65100	C-Therm® M 65110
	520	650	700	220	450	80	100
	350	400	420	150	300	70	80
	420	500	580	120	180	23	30
	1.9 +/-0.1	2.0 +/-0.1	2.0 +/-0.1	1.7 +/-0.1	2.2 +/-0.1	1.9 +/-0.1	1.6 +/-0.1
	0.08	0.05	0.07	0.1	0.2	10	15
	200 – 240	200 – 240	220 – 240	260 – 280	450	500	500
	280	280	300	350	800	900	900
	0.24	0.24	0.24	0.23	0.18	0.4	0.4
	15	10	10	10	9	10	10
	2950x1330 1335x975 2350x1335	2070x1070 1070x1070	1250x1250	2070x1070 1070x1070	1200x1000	1220x910	2520x1240
	3 to 50	3 to 75	6 to 30	3 to 75	2 to 60	6 to 75	6 to 25
	sanded both sides	sanded both sides	sanded both sides	sanded both sides	unsanded	unsanded	unsanded

Thermal conductivity scale of a Von Roll product range



Induction and Arc Furnaces

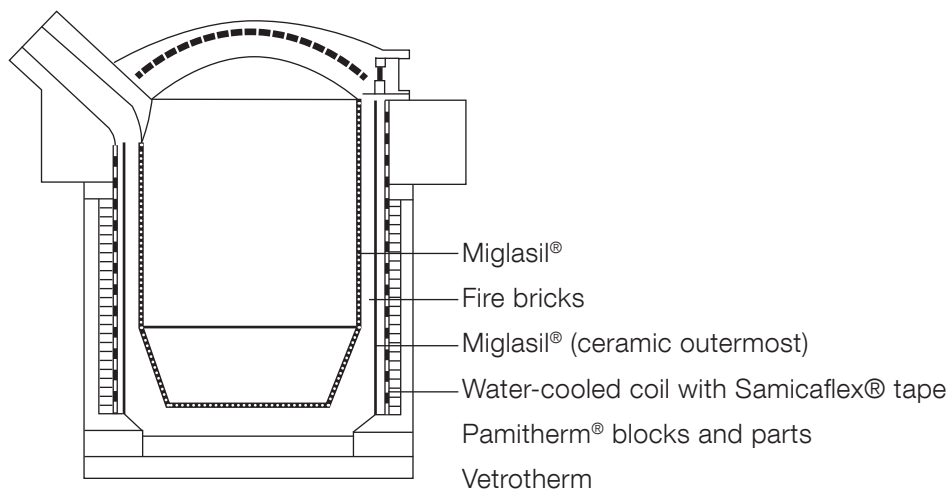
Arc furnaces operate at very high temperatures. Arc furnaces can process titanium, zirconium, tantalum, niobium, titanium aluminides, super alloys, reactive or refractory metals, including nuclear materials.

Inorganic and refractory materials are often used in the center of arc furnaces where temperatures are very high. Von Roll insulating materials can be used for thermal insulation on the external side of the furnace. Von Roll products provide significant benefits in terms of high electrical insulation; good temperature resistance and excellent mechanical reinforcement. Such material characteristics are necessary in these demanding operational areas.

The construction of a typical arc furnace consists of:

- » A pot connected to a high source of electrical current
- » Graphite electrodes in the pot, forming arc-melting metal
- » A water-cooling system to cool the arc-arm & furnace
- » Accessories

Induction furnace



Induction furnaces benefit from a compact size in relation to their melting capacity. Such equipment is less suitable for refractory metals than other furnace types. Induction furnace construction requires robust, electrically insulating, mechanically strong and thermally resistant support columns for the purpose of mounting the induction coils. This application criteria is ideally suited to Von Roll products.

Pamitherm® 41140 is an insulation material typically used around furnace cylinders.

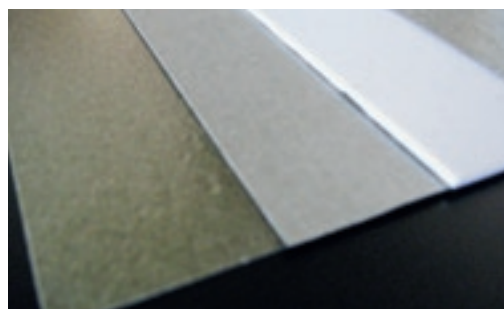
Miglasil® products lend themselves for use in heating elements, industrial furnaces, induction furnaces and ovens. The main features of Miglasil® are:

- » High flexibility and available in thin sections
- » Easily fabricated. Can be folded, punched, cut, and creased to permit fitting around complex shapes.
- » Completely free of asbestos
- » Outstanding heat resistance up to 1200°C
- » Excellent dielectric properties
- » Noncombustible, no emission of toxic gases or halogens
- » High compressive strength
- » Resistant to partial discharges and corona effects

Brand name	Type	Matrix	Reinforcement	Heat resistance	Sheet size/ thickness range (mm)	Highlights	Main applications
Rigid							
Pamitherm®	41140	silicone	muscovite mica paper	450 up to 800°C	2400x1000 1200x1000 2.0 to 60	excellent fire resistance: M0 I0 F0, high mechanical resistance	high-temperature-protection parts, thermal and mechanical insulating parts
C-Therm®	65100	cement	inorganic fibers	up to 500°C	1220x910 6 to 75	excellent thermal insulation	heater element support in electrothermics, glass industry, induction furnaces
Flexible							
Miglasil® range	362.50	silicone	phlogopite mica paper	up to 1200°C	rolls of 25 meters x1000/0.27 and 0.40 or sheets 570x1020 and 1500x1000 0.70/1.0/1.5/2.0	pure mica + silicon binder	thermal and electrical shield in heating and industrial appliances
	368.90-10	silicone	phlogopite mica paper, glass	up to 1200°C	rolls of 25 meters x1000/0.31	pure mica + silicon binder + one layer of glass fabric	thermal and electrical shield in heating and industrial appliances
	368.90-50	silicone	phlogopite mica paper, glass	up to 1200°C	rolls of 25 meters x 1000/0.62	pure mica + silicon binder + two layers of glass fabric	thermal and electrical shield in heating and industrial appliances



Foundry



Miglasil® flexible laminates

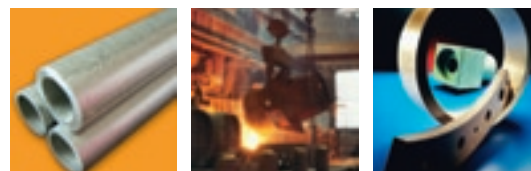
Foundries and Smelters

A foundry is synonymous with heat processing – heat containment or hot metal. Foundries produce metal castings for a wide range of products and industries, including automotive, household appliances and various items for the ICT and aerospace industries. Many foundries also produce complex mass produced high-value castings for specialist markets.

In the foundry industry, process equipment fitted with proper insulation materials:

- » Prevents undesirable heat gains and losses
- » Maintains consistent process temperatures
- » Protects personnel from burns
- » Prevents condensation on cold equipment surfaces
- » Ensures comfortable working temperatures around the hot or cold process equipment

Brand names	Matrix	Reinforcement	Sheet size (mm)	Thickness range (mm)	
Rigid					
Delmat® polyester 68170	polyester	glass mat	2000x1000	0.8 to 60	
Deltherm® 68890	high temperature	glass mat	2950x1330 2950x1335 1335x975	3 to 50	
Vetronite® G11	epoxy	glass fabric	2070x1070 1170x1070 or other sizes	0.2 to 150	
Vetronite® SGS	silicone	glass fabric	2070x1070 1170x1070 or other sizes	0.2 to 150	
Pamitherm® 41140	silicone	muscovite mica paper	2400x1000 1200x1000	2 to 60	
C-Therm® 65100	cement	inorganic fillers	1220x910	6 to 75	
Flexible					
Miglasil® range 362.50	silicone	phlogopite mica paper	rolls of 25 meters x1000 or sheets 570x1020 and 1500x1000	0.27 and 0.40 0.70 / 1.0 / 1.5 / 2.0	
368.90-10	silicone	phlogopite mica paper, glass	rolls of 25 meters x1000	0.31	
368.90-50	silicone	phlogopite mica paper, glass	rolls of 25 meters x1000	0.62	
Tubes					
Vetronite® G-11 T	epoxy	glass fabric	inner diameter from 3.5 up to 1400	possible length up to 1500	
Vetronite® SGS T	silicone	glass fabric	inner diameter from 5 up to 1400	possible length up to 1200	
Samicanite® ST	silicone	muscovite mica paper	inner diameter from 8 up to 1400	possible length up to 950	



For hot working environments Von Roll's selection of thermal insulation materials helps you to find the right solution. Pamitherm® 41140, Vetronite® G11 and Vetronite® SGS sheets and tubes, C-Therm® 65100, Delmat® polyester 68170 sheets or Miglasil® can be used in foundries on pipe lagging, boiler coverings, as insulation in fan housings, in gloves, aprons and curtains, as insulation in cupolas in ladles and insulation in sand molds. Von Roll thermal insulation products are also used as blocking parts, spacers, as insulation between electrode holders or on cooling systems. They are attractive both for their good mechanical and electrical characteristics and their temperature resistance.

Miglasil® products are used mainly for thermal insulation of heating elements in industrial furnaces, induction ovens and similar devices. They can also offer a solution in foundries and smelters for seal joints or lifting magnets.

Highlights	Main applications
dimensionally stable at high temperatures: 210°C	high-temperature-resistant machined parts
excellent mechanical properties at high temperatures	high-temperature-resistant machined parts
excellent mechanical properties at high temperatures	high-temperature-resistant machined parts
high temperatures up to 280°C	insulated parts in environments with elevated temperatures
excellent fire resistance: M0 I0 F0, high mechanical resistance: 450°C	thermal and mechanical parts for insulating platens
excellent thermal insulation at elevated temperatures up to 500°C/700°C	heater element support in environments with elevated temperatures
pure mica + silicon binder	thermal and electrical shield in heating and industrial appliances
pure mica + silicon binder + one layer of glass fabric	thermal and electrical shield in heating and industrial appliances
pure mica + silicon binder + two layers of glass fabric	thermal and electrical shield in heating and industrial appliances
excellent mechanical properties at high temperatures	high-temperature-resistant machined cylinders
high temperatures up to 250°C	insulating cylinders in environments with elevated temperatures
excellent temperature resistance	insulating cylinders in environments with elevated temperatures

Fire-Protection Equipment

With many years of experience and in cooperation with our customers, Von Roll has developed state-of-the-art materials that fulfill our customers' fire-protection needs: Flamival® resins.

Flamival® – a high-tech resin for passive fire protection – is a specific type of resin which creates “a thermal barrier”. Based on a two- or three-component organic resin, Flamival® creates a ceramic shield, when subjected to sharp temperature increases or directly by a fire, due to its intumescent properties. It can be applied on other rigid thermal insulation products.

Flamival® has the following properties:

- » Fire stop compound
- » Intumescent system preventing temperature increase in case of flame exposure
- » Solventless, VOC- and halogen-free
- » Flexible, high-impact resistance
- » Suitable for use at low temperatures (–70°C)
- » Application by spray casting – one thick layer achievable (up to 1 cm) in one coat
- » Easy to repair, recastable
- » Good water resistance and tightness

Flamival® electrical insulating resins exhibit exceptional fire arresting properties and with their minimal heat transfer characteristics are the ideal solution where extreme conditions of temperature and heat can be found. Such technologically advanced products guarantee continuity of operation and contribute to the reduction of risk, financial damage and loss of life.

Flamival resins are used in:

- » Energy supply
- » Power plants
- » Offshore plate forms
- » Chemical storage tanks and spheres
- » Pipeline connections
- » Safety cable lines
- » Sensors subjected to high operating temperatures
- » Structural steel for building construction



Chemical storage spheres

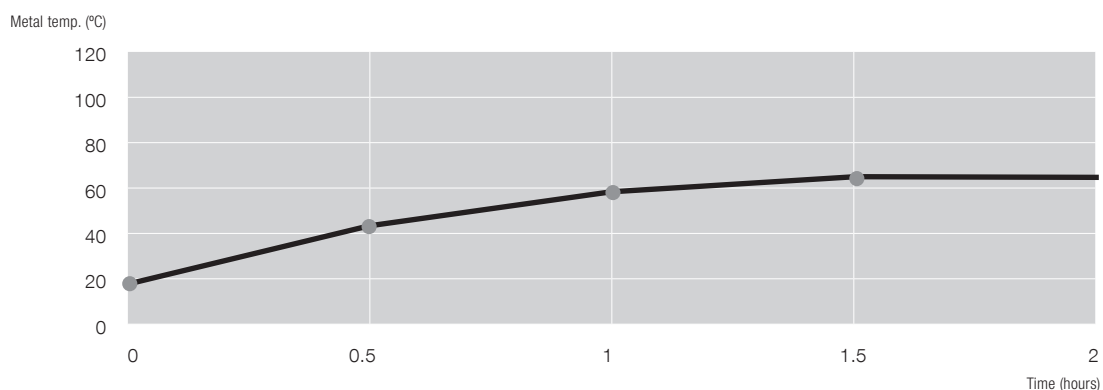


Insulating joints of pipes in gas storage



Cable joints

Temperature increase of a 0.5 mm-thick metal substrate exposed to a 1000 °C flame protected with an 8 mm-thick Flamival® layer



Testing

To ensure that the required specifications concerning mechanical, electrical and thermal characteristics are satisfied, materials must be tested.

Von Roll laboratories can test their customers' materials according to IEC, UL and other specifications.

- » Thermal, electrical and mechanical aging tests
- » Mechanical measurements at temperatures up to 300°C with a pressure of 20 tons
- » Permittivity and loss factor measurements at different temperatures and high frequency
- » Partial discharge measurements with different voltage ranges
- » Fire equipment for self-extinguishing measurements
- » Tridimensional measurements

Specific approvals are also sought among universities or external laboratories.

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.



Ballistics

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



Cables

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



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.



Liquids

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



Mica

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



Transformers

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



Wires

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



Testing

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



Training

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

Please contact us or visit our website www.vonroll.com for further information:

Europe, Middle East, Africa

Von Roll Holding AG
Steinacherstrasse 101
8804 Au ZH
Schweiz/Switzerland
P +41 44 204 3500
F +41 44 204 3010

Asia/Pacific

Von Roll Asia Pte Ltd.
Blk 6 Serangoon North Avenue 5
Singapore 554910
Singapore
P +65 6556 4788
F +65 6556 4959

Americas

Von Roll USA, Inc.
200 Von Roll Drive
Schenectady
NY 12306
USA
P +1 518-344-7100
F +1 518-344-7288

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.