



Cablosam® Tapes for Fire-Resistant Cables

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, process equipment, 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 in application engineering
- » Training in insulation materials and systems

New technologies require a wide range of electrical and electronic functions and this means a considerable increase in demand for cables of all types – power transmission, communication, multi-core and others. Safety requirements in the modern world have increased significantly resulting in electrical appliances and installations needing to function reliably even in the most demanding environments, especially fires. An oil platform is an artificial environment that depends on electrical functions at all times. Electrical integrity is paramount whenever a fire occurs. Lives, materials and the environment are at risk and need protection.

By developing and producing state-of-the-art Cablosam® tapes for the manufacture of fire-resistant cables, Von Roll is making an important contribution to disaster prevention. Our Cablosam® mica products have a worldwide reputation and have been specifically developed for use with our customer's taping technologies, whilst complying the most stringent international standards.



Legislation

The legislation governing safety cables is extensive. Norms follow regional, national or international standards for different levels of protection and cable design. Some of the most important European standards have worldwide significance. The levels of protection can be classified as follows:

| | |
|---------------------------------------|---|
| Flame-Retardant | These cables make sure that flames extinguish by themselves |
| Fire-Retardant | These cables ensure that there is no fire propagation, but do not assure circuit integrity |
| Fire-Resistance | These cables must guarantee circuit integrity during specified fire conditions Cablosam® is a major contribution to this type of cable |
| Smoke Emission | Regulations concerning smoke levels |
| Emission of Corrosive and Toxic Gases | Regulations concerning the chemistry and emission of toxic gases |

Standards

IEC 60331 Fire Test – International Standards

This norm provides for different fire tests; they all relate to IEC 60331, which determines tests for electrical cables under fire conditions (circuit integrity):

| | |
|----------------|---|
| IEC 60331 – 11 | relates to fire alone and a flame temperature of 750°C |
| IEC 60331 – 12 | relates to fire alone and a flame temperature of 850°C |
| IEC 60331 – 21 | relates to cables up to and including 0.6kV/1.0kV |
| IEC 60331 – 23 | relates to data transmission cables |
| IEC 60331 – 25 | relates to optical fiber cables |
| IEC 60331 – 31 | relates to fire with shock for cables up to and including 0.6kV/1.0kV |

Note that norm NEK 606 – Cables for offshore installations, halogen-free and/or mud-resistant – uses the IEC fire norms 60331 – 11 / 21 / 25.



Offshore oil-rig

BS 6387 / BS 8434 / EN 50200 – British and European Fire-Resistant Standards

These standards define the performance of electric cables when subjected to fire conditions including fire with water spray and fire with mechanical shock. The latest standards in this area are the BS 8434 standards, which are similar to the EN 50200 standards.

| | |
|-----------------|---|
| BS 6387 Cat. C | 950°C for 3 hours |
| BS 6387 Cat. W | 650°C for 15 minutes then 650°C with water for a further 15 minutes |
| BS 6387 Cat. Z | 950°C for 15 minutes then 950°C with mechanical shock for a further 15 minutes |
| EN 50200 PH 30 | 830°C for 15 minutes for the fire and impact phase, and an additional 15 minutes for the fire, impact and water phase |
| EN 50200 PH 120 | 930°C for 60 minutes for the fire and impact phase, and an additional 60 minutes for the fire, impact and water phase |

Mainly national standards have been incorporated in the EN50200 standards.

DIN 4102 part 12 Functionality of Electric Cable Systems – German Standards

DIN 4102 part 12 tests cables in conjunction with cable trays and clamps used in real-life applications. The specimens are mounted in the test chamber and supported by the structures provided for this purpose or fastened to the ceiling or wall in order to simulate real-life applications. The temperatures may be as high as 1050°C; the test voltage is 400 V for power cables and 110 V for communication cables. The test applies the following classifications, subject to the measured duration of circuit integrity (no short circuit and no interruption of current):

| | | | | | |
|------|--------------|------|--------------|------|--------------|
| E 30 | > 30 minutes | E 60 | > 60 minutes | E 90 | > 90 minutes |
|------|--------------|------|--------------|------|--------------|

Australian Standard

The above represent some of the standards that are applied to fire-resistant cables. Other countries have even more stringent requirements, some of the most difficult being the Australian standard. This requires 120 minutes at 1030°C followed by a mechanical test and a water spray. Circuit integrity is to be maintained at all times.

Cablosam® Applications

Fires can occur anywhere, but their effects can be particularly hazardous wherever large numbers of people are gathered together, where safety-related equipment is in use or in environments where there is a particularly high fire risk. In such fire conditions, vital information and functions need to be maintained, and power and signal cables have to be adequately protected for a predefined period of time.

Fire-resistant cables are used in a variety of installations such as:

- » Offshore oil-rigs
- » Inshore oil plants, petrochemical installations
- » Transport: e.g. ships, railways, subways, aircrafts
- » Buildings: e.g. skyscrapers, airports, hospitals, public buildings
- » Power stations, nuclear plants
- » Industrial plants
- » Telecommunication centres
- » Tunnels, mines
- » Military facilities, marine



Highest skyscraper in the world, Burj Dubai



The types of cables used vary widely and are manufactured to customers' specifications.



» Multi-core cables



» Power cables



» Communication cables

Fire Testing

To ensure the conformity to the applicable national and international regulations, Von Roll can test fire-resistant cables to customer's specifications and norms.

Manufacturing processes

Our cross-wound spools allow following benefits to our customers:

- » zero scrap
- » lower machine downtime (less changes)



Laminating machine for manufacturing of Cablosam® tapes



High-tech slitting machine for cross-wound spools

The Cablosam® Product Range

The Cablosam® product range consists of mica tapes that enable cable manufacturers to meet the most demanding standards.

- » Cablosam® tapes comprise Samica® mica paper, a support of glass fabric or polyethylene film and silicone resin.
- » Cablosam® tapes are free from halogens and does not create hazardous fumes.
- » Cablosam® tapes withstand mechanical pressure at high temperatures.
- » Cablosam® tapes provide a reliable flame barrier within the survival cables.

Two types of Samica® paper, with Muscovite or Phlogopite mica, are used for Cablosam® tapes. This alumino-silicate mineral retains its laminar structure up to its melting point of 1200 to 1300°C thus ensuring that the tapes have outstanding fire-resistant properties. The difference between the two types of mica is to be found in their chemical composition and calcination characteristics; Muscovite releases small amounts of water above 600°C and Phlogopite above 800°C.

When exposed to fire, Cablosam® tapes sinter to each other and to the copper conductor, forming a mechanically resistant and electrical insulating layer. This layer is then responsible for maintaining electrical integrity during a fire.

The Cablosam® product range comprises three families:

Cablosam® HP

Cablosam® “High Performance” fire-resistant tapes are used in order to meet the most demanding standards as well as to satisfy the highest requirements during the cable manufacturing process (taping). Our glass backed special Muscovite mica Cablosam® 366.21-10 is extremely soft, due to the special manufacturing process of the mica paper and the appropriate formulation of the silicon resin. It exhibits a dry surface which is slightly sticky and available in width of tapes from 4mm and joint free.

Cablosam® AP and Cablosam® G

Fire-resistant tapes Cablosam® “All Purpose” and Cablosam® “Gold” also meet all international standards. They offer a cost-effective solution for standard fire-resistant cables that are subject to mass-volume production. They exhibit a dry, non-tacky surface and are available in tape widths from 4mm upwards with AP quality having the additional joint free feature.

| Product | Total weight (g/m ²) | Thickness (mm) | Mica paper (g/m ²) | Support (g/m ²) |
|------------------------|----------------------------------|----------------|--------------------------------|-----------------------------|
| Cablosam® HP | | | | |
| Cablosam® HP 366.21-10 | 130 ± 11 | 0.12 ± 0.02 | Special Muscovite (75) | Glass fabric (23) |
| Cablosam® AP | | | | |
| Cablosam® AP MG90 | 120 ± 10 | 0.09 ± 0.02 | Muscovite (80) | Glass fabric (23) |
| Cablosam® AP PG90 | 120 ± 10 | 0.09 ± 0.02 | Phlogopite (80) | Glass fabric (23) |
| Cablosam® AP PG110 | 161 ± 12 | 0.11 ± 0.02 | Phlogopite (120) | Glass fabric (23) |
| Cablosam® AP PG130 | 170 ± 13 | 0.13 ± 0.02 | Phlogopite (120) | Glass fabric (32) |
| Cablosam® G | | | | |
| Cablosam® G PG80 | 107 ± 10 | 0.08 ± 0.02 | Phlogopite (65) | Glass fabric (28) |
| Cablosam® G PG95 | 125 ± 10 | 0.095 ± 0.02 | Phlogopite (80) | Glass fabric (28) |
| Cablosam® G PG100 | 132 ± 10 | 0.10 ± 0.02 | Phlogopite (80) | Glass fabric (35) |
| Cablosam® G PG105 | 147 ± 12 | 0.105 ± 0.02 | Phlogopite (100) | Glass fabric (28) |
| Cablosam® G PG120 | 170 ± 13 | 0.12 ± 0.02 | Phlogopite (120) | Glass fabric (28) |
| Cablosam® G PG125 | 178 ± 13 | 0.125 ± 0.02 | Phlogopite (120) | Glass fabric (35) |
| Cablosam® G MG95 | 128 ± 10 | 0.095 ± 0.02 | Muscovite (80) | Glass fabric (28) |
| Cablosam® G MG100 | 135 ± 10 | 0.10 ± 0.02 | Muscovite (80) | Glass fabric (35) |
| Cablosam® G MG105 | 151 ± 12 | 0.105 ± 0.02 | Muscovite (100) | Glass fabric (28) |
| Cablosam® G MG110 | 158 ± 12 | 0.11 ± 0.02 | Muscovite (100) | Glass fabric (35) |
| Cablosam® G PPE100 | 140 ± 10 | 0.10 ± 0.02 | Phlogopite (100) | Polyethylene (24) |
| Cablosam® G PPE110 | 156 ± 10 | 0.11 ± 0.02 | Phlogopite (120) | Polyethylene (24) |
| Cablosam® G PPE130 | 205 ± 15 | 0.13 ± 0.02 | Phlogopite (168) | Polyethylene (24) |

Processing

Cablosam® tapes are applied to stranded wires, conductors and cables by strip-winding machines in one or more tangentially or radial overlapping layers. The tapes have to be applied with the glass fabric facing outwards and the mica paper inwards, against the conductor. Adhesive tapes are used to join the ends of pads or cross-wound spools during production.

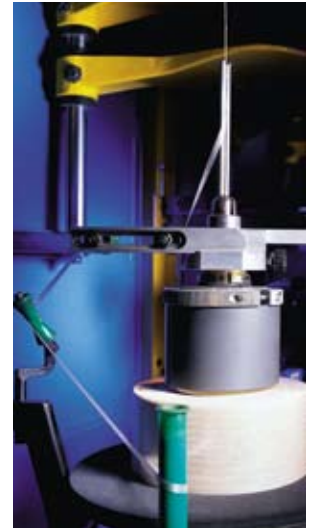
Conductors, stranded wires or cables insulated in this manner can then be covered with thermoplastic material to form the final product.



Perfect de-rolling of the spools



No deflection of wire during taping



Taping cross wound spools with state of the art machines

Delivery Form

Cablosam® tapes from widths of 4 mm upwards in pads or cross-wound spools. The length of the pads depends on the width of the material required to assure correct stability and may be in excess of 1200 m.

Cross-wound spools may be up to 20 km in length depending on the width and dimensions of the spool. Used in conjunction with a suitable taping machine, such spools can be extremely cost-effective, permit extended run-times and reduce production down-time. Mini cross-wound spools, a variant of the cross-wound option, offer the possibility for use on existing equipment to optimise the taping process.

Von Roll offers the market the possibility for fully taped conductors using bare, tinned, single or stranded wires, which can be produced to individual customer requirements.



Regular pads



Cross-wound spools



Cablosam taped conductors

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, solutions tailored 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.



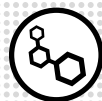
Liquids

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 for 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.