CATENARY WIRES
SOLUTIONS FOR URBAN TRANSPORT SYSTEMS AND HIGH-SPEED RAIL NETWORKS
WE ARE A SOLUTIONS COMPANY

Every client’s requirements are different. And that is why every client receives a unique solution, specific to their needs.

Whether refurbishing an existing line or building from scratch; whether focussing on urban transport, high-speed rail or anything in between, you will find Lamifil the perfect partner for all your catenary wire requirements to keep your services running efficiently.

Using our knowledge, insight and over 85 years of experience, no company is better suited to design, manufacture and supply the complete range of high quality catenary wires used for railway electrification. CuMg, CuCd, CuCdSn, CuSn, CuAg, Cu ETP and Al are all manufactured within our vertically integrated production facility in the heart of Europe, where the fidelity of our products can be assured without doubt. Backed by our extensive R&D department, state-of-the-art machinery and an independent, ISO 17025, on-site laboratory doing Factory Acceptance Testing (FAT) as well as participatory research with our clients, the Lamifil name has become synonymous with quality.

Our commitment to excellence is to create value for our clients - it ensures the quality of products, innovations to lower your Total Cost of Ownership and services that make working with us a pleasure. In fact, customer satisfaction surveys put us at the top of our industry.

We invite you to enter into a partnership with Lamifil today.

ARE YOU LOOKING FOR A PARTNER WHO

> OFFERS RELIABLE AND FLEXIBLE SERVICES FOR YOUR PROJECT?
> CONTINUOUSLY PURSUES INNOVATION AND IMPROVEMENTS?
> HELPS YOU TO CHOOSE THE RIGHT PRODUCT FOR YOUR SPECIFIC CHALLENGES?
> DOES NOT ACCEPT ANY COMPROMISE ON ITS HIGH-QUALITY PRODUCTS?
> HAS DECADES OF EXPERIENCE WORLDWIDE?
> MANUFACTURES IN-HOUSE FROM RAW MATERIAL TO END PRODUCT?
> HAS AN INDEPENDENT ISO 17025 LABORATORY TO GUARANTEE QUALITY?
MARKET TRENDS AND NEEDS

The full potential of rail is yet to be realised. With an increasing demand for lower emissions and greater reliability, combined with an increased choice for passengers, rail network operators are looking for ways to increase efficiency, and lower Total Cost of Ownership. Lamifil designs and produces catenary wires to provide you with solutions to face these challenges and enable your rail network to reach its full potential.

DECREASING THE ECOLOGICAL FOOTPRINT

Since rail is two to five times more energy-efficient than road or air, the EU’s Roadmap 2050 for a low carbon Europe foresees rail as a major contributor to cutting oil dependency and reducing greenhouse gases in transportation by 60%. With goals of shifting 50% of road freight over 500 km to rail by mid-century, we see more and more electrification projects appearing, old diesel lines being electrified and reliable catenary solutions playing an increasingly important role.

RELIABLE NETWORKS, RELIABLE RAIL SERVICES

Passenger expectations for reliable and on-time services increase constantly. Interruptions due to temperature conditions (snow, ice, etc.) and cable breakages are no longer acceptable from rail operators and increase the need for reliability of catenary lines. Any emergency intervention not only means high costs, but also loss of revenue as train services cannot continue for some time.

Copper theft has also become a serious problem in Europe and worldwide, posing a threat not only to daily operations and scheduling, but also to passenger safety.

INCREASING PASSENGER MOBILITY

Rail competes with cheap airlines and the car to offer passengers increased mobility. However to compete effectively, it requires networks to offer reliable, high-speed, cross border lines with good local connections to tram lines. This puts increasing pressure on networks and their catenary systems to ensure those demands are met.

Market needs

INCREASE CAPACITY
Upgrade the capacity of existing lines by replacing catenary wires, whilst keeping existing infrastructure or build new lines with innovative catenary wires.

REDUCE LOSSES
Better-designed catenary wires reduce losses and increase efficiency, which contribute to lowering your Total Cost of Ownership.

REDUCE TOTAL PROJECT COSTS
Reduce the number of substations in new-build projects with innovative catenary wires.

INCREASE RELIABILITY AND OFFER BETTER SERVICE
Use high-quality products that withstand wear and tear, thus reducing maintenance and emergency interventions.

ENVIRONMENTALLY FRIENDLY
Saving energy means less CO2-emission, resulting in greener solutions.
**PRODUCTS**

Taking into account the required mechanical and electrical properties, together with power supply, speed of trains, traffic frequency, lifetime expectation, maintenance and accessibility, we are able to advise on the best choice of catenary wire.

We supply a comprehensive range of wires for the rail industry; however, should there be the need, we have an extensive R&D department and a certified ISO 17025 laboratory to create new alloys to suit your requirements.

**COPPER AND ITS ALLOYS**

Lamifil ensures the high quality of our alloy catenary wires by starting with raw materials and controlling the manufacturing process all the way to the completed products, whilst testing at every stage. Our copper alloys are thus the result of our extensive metallurgical expertise and experience, and allow our customers to select them with certainty and confidence.

**CUMG**

Copper Magnesium has the highest tensile strength when compared to other alloys, making it the perfect alloy for contact wire in high-speed lines with speeds well above 300 km/h. Together with the CuCd, it is the preferred alloy for the messenger cables, having the appropriate strength to carry the entire catenary system.

**CUSN**

The development of a high performance Copper-Tin alloy was an imperative, displaying the right balance of electrical and mechanical properties. CuSn has applications for use in the contact wires for both high-speed and conventional railway lines.

**CUAG**

Copper-Silver offers electrical and mechanical characteristics similar to those of ETP copper, but has better thermal stability. This allows higher overcurrent on DC lines, without increasing the wear on the contact wire. Ideal for contact wires in high frequency, conventional railway lines.

**CU**

Copper ETP is still the most universal metal, but is increasingly being replaced by alloys with better characteristics. Non-alloyed Cu offers the best possible conductivity, and is typically used in contact wires for tramways and conventional railway lines, but is most appropriate for auxiliary conductors and feeder cables.

**AL**

Aluminium, with its lower weight and lower cost, is best used in return and feeder cables. Lamifil, with its expertise in Aluminium manufacturing, offers an extensive range of in-house produced aluminium cable types: All Aluminium Conductors (AAC), All Aluminium Alloy Conductors (AAAC) and Aluminium Core Steel Reinforces Conductors (ACSR).

Lamifil took innovation a step further, improving certain alloys to offer extra benefits. (See pages 8 & 9 for more information on our alloys.)
CATENARY WIRES

PRODUCT RANGE

Lamifil manufactures products to cover the entire spectrum of bare wires used in electrically operated railway infrastructure:
> Contact wire
> Messenger wire
> Feeder cable
> Dropper wire
> Auxiliary cables

All our wires comply with a number of international standards, such as EN, DIN, BS, NFC, etc.

Messenger wire is available in:
> Different sections
> Different alloys
> Different compositions

Contact wire is available in:
> Different sections: From 65 mm² to 193 mm²
> Different alloys
> Different shapes: circular, flat

Lamifil not only designs, produces and supplies products, we also improve the Total Cost of Ownership (TCO). By developing products that offer better performance and improved conductivity, the TCO can be reduced directly in different ways:
> Energy is saved with fewer voltage drops
> Reliability and frequency of services is improved, leading to greater revenue
> Lower investment costs in new lines due to fewer substations being required

<table>
<thead>
<tr>
<th>CONTACT WIRE 150 MM² CuMg 0,5 STANDARD</th>
<th>LAMIFIL</th>
<th>IMPROVEMENT</th>
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<tbody>
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<td>Resistance 0/km</td>
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<table>
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<tbody>
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<td>Max. resistance 0/km</td>
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<td>0,273</td>
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<tr>
<td>Breaking load kN</td>
<td>63,6</td>
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</table>
INNOVATIONS

With over 85 years of expertise in the production of copper and its alloys, we are constantly innovating ways of delivering extra value to our customers - from direct capital expenditure saving, improved Total Cost of Ownership or improved cable characteristics.

IMPROVED ALLOYS

Lamifil’s CuMg alloy offers significant improvements over standard CuMg. Using the EN50149 standard as a starting point, the improvements deliver advantages in several areas:

> Reducing the diameter of the messenger wire, with the same conductivity. This reduces the amount and weight of raw material required, which leads to considerable savings. Replacing a CuMg cable with our CuMg HC cable, allows a saving of up to 6.5% in copper weight.

> Reducing the number of substations. Instead of building substations every 20 km, our high efficiency CuMg allows them to be placed at intervals of 50 km. This reduces total project cost significantly.

> Reducing Joule losses. Total Cost of Ownership is reduced by reducing energy losses on the lines. This not only has a positive impact on the environment, but also adds up to substantial savings for installers and operators. This programme is open to interested companies. In the future, we plan to initiate further research programmes.

> Increasing the frequency of trains on your line by 15%, could directly lead to improved earnings.

This illustrates how diverse the advantages could be for every project, and how we are able to offer better suited solutions. Clients have also seen the incredible contribution we are able to deliver when included in the design phase of a project, as it ensures offering you the best possible options before things are set in concrete.

We are developing innovative new alloys, details of which we would be pleased to share with you.

CREEP TESTING

Every railway infrastructure owner or installer knows the cost and time implications of creep. After installation one can allow a certain resting period to compensate, or one could try frequent measuring, and constant maintenance. However both options are time consuming, expensive and result in a network at standstill.

Using our in-house ISO 17025 laboratory, Lamifil has introduced a participatory research programme to better understand, and control, the effects of creep during and after installation of copper alloys such as CuMg, CuSn, CuAg, etc. This exhaustive research, will lead to much more efficient installation, thereby decreasing costs for installers and operators. This programme is open to interested companies. In the future, we plan to initiate further research programmes.

MARKINGS

Lamifil offers different marking possibilities for catenary wires, offering benefits for various industry challenges:

> Traceability: Imprinting a unique production code, project name or client name makes it easier for installation crews to recognise wires and their intended projects. Furthermore, production lot coding adds to traceability for fault detection and maintenance.

> Identification: Marking catenary wires with an extra groove or by using a Z-shaped wire in the cable, makes identification of the type of material used easier when it comes to replacement.

> Theft: To discourage theft, anti-theft markings are the primary means of deterrence. We can also add an extra alloy that pollutes the value of the copper when melted. Both methods discourage theft and allow for traceability when stolen materials are intercepted.

These are just a few examples of possible innovations. If you have a specific challenge, please let us know so we can work on a solution together.
As our client, you are always our central focus at Lamifil. We work to meet your needs and specifications at every step in every one of our processes: design, development, manufacture, testing and even packaging and delivery.

ACCREDITED LABORATORY

Our ISO 17025-accredited on-site laboratory gives us the opportunity to not only ensure the quality of products, but to also pursue new innovations.

> As part of our continuous monitoring of production processes, we perform quality checks on samples at every step of the manufacturing process. This ensures full traceability and materials of the highest standards at all times.
> We develop new designs in collaboration with our clients or on our own initiative.
> Our independent materials laboratory is specifically equipped and recognised for all industry tests and international quality standards, and can be sourced independent of production by Lamifil.
> Our laboratory is open to our clients to participate in the Factory Acceptance Testing (FAT) procedure so they can witness the results of their own products.

CUSTOM DESIGN

At Lamifil, you and your project are always our priority. With an understanding of your project and its specifications we produce a superior product that is better suited to your specific needs. We use our experience and expertise to tailor your catenary wires to your unique requirements. At the same time, we work with you to identify methods of reducing your Total Cost of Ownership and your capex.

PACKAGING SERVICES

Efficient packaging reduces weight, volume, transportation costs and helps with faster, more reliable installation. We work with you to determine the best solution for you, and offer many options like:

> specially designed drums that simplify on-site handling with square spindle holes replacing the traditional round ones;
> marking options that aid identification and allow for quicker, more accurate installation.
> the option of returning your drums – a quick, convenient and helpful way of reducing waste and your ecological footprint.

LOGISTICS SERVICES

With our own in-house logistics department we can ensure that your delivery schedules are met, including Just-In-Time schedules. Our location near the port of Antwerp gives us further shipping options, and optimises transport costs. Our team is multi-lingual and has considerable experience with international clients, having concluded projects in over 30 countries.

Allow us to show you the Lamifil difference at any and every stage of your project.
A RELIABLE PARTNER

MEETING YOUR STANDARDS

As a fully vertically integrated and independent manufacturer, Lamifil has in-depth metallurgical knowledge and unrivalled flexibility to best serve our customers’ needs. Our willingness to solve problems and overcome challenges, has to Lamifil being awarded the highest rating in customer satisfaction surveys.

CONSTANT INNOVATION

From our founding expertise in copper and copper alloys 85 years ago, Lamifil continuously invests in production facilities and the latest technology to offer clients the widest choice, and best options for their needs. Yearly, we invest between 6 and 10% of our GVA in production facilities and R&D. Our laboratory also benefits from continuous investment to be at the technological forefront, enabling us to make the latest innovative designs available to you.

A HIGHLY SKILLED TEAM

With most key personnel boasting engineering backgrounds, and a significant percentage of people working in Research & Development, along with a continuous commitment and investment in training programmes, Lamifil’s people make us what we are: a specialised, flexible organization with extraordinary capabilities to design solutions to suit every customer need.

QUALITY ASSURANCE

Lamifil owns the entire production process, enabling us to start with raw materials and end with products whose quality we can guarantee with certainty—having carefully managed and tested every stage of the process. From the exact composition of the catenary wire, to the size and consistency of contact wires, we offer our clients what few others can - the confidence to call us a reliable partner.

REFERENCES

Lamifil has over 85 years of experience in products for railway electrification, with over 100,000 km of wires installed in over 30 countries worldwide. We offer full technical support at each and every stage of your project - during the design phase, tender phase, manufacturing or delivery phase.
Lamifil is one of the world’s leading manufacturers of overhead conductors, catenary cables, wires and wire-based products of quality in copper and aluminium and their alloys, delivering the highest value to clients.

Combining over 85 years of experience and expertise, Lamifil innovates, designs and manufactures cable and wire products for the railway and power distribution industry, as well as speciality wires for the automotive, aviation and aerospace and steel industry, and a diverse range of consumer goods.

Lamifil has the capabilities to tailor-make new alloys and products specific to every client need, each carefully tested in our ISO accredited lab, and is regarded as a reliable service partner by the industries we work with in all six continents.

Based in Hemiksem, Belgium, in close proximity of the port of Antwerp, we are passionately driven by excellence through expertise and experience.