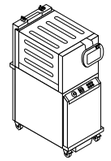
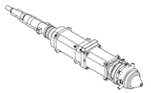

Laserline
Cladding & Additive
Manufacturing
laserline

7500

With more than **7,500** installations worldwide, Laserline‘s diode lasers are among the most successful beam sources for industrial applications in the multi-kilowatt range.



Laserline‘s diode lasers
for metal, fibrous composite material and additive manufacturing



Laserline’s optics
for industrial material processing with diode lasers

On the Surface

Cladding is the most efficient way of deposition welding. With a single laser beam source, all wire and powder layers can be applied on a surface regardless of whether it is heavy industry, automotive or agriculture — anti-corrosion coating, wear protection, repair or a new component.

How to Protect Investments in a Smart Way

Cladding has been established in many industries as a technological benchmark. With continuous technological innovation and a wide application spectrum, Laserline's cladding solutions are currently being used in many fields, increasingly displacing classic methods and conquering new fields of application.

Repair Welding

Worn surfaces, torn-off pieces and other damages to high-quality components are repaired effectively.

Corrosion Protection

Laser coatings are protected against creep corrosion and crevice corrosion with low-alloyed basic materials.

Wear Protection

Hard materials in the coating field protect e.g. tools or brake discs from wear.

High Speed Cladding

Extremely high-speed cladding for lower powder consumption and higher area output.

High Volume Cladding

High-power diode lasers allow for never-before-attained powder deposition rates at the coating of large components.

Additive Manufacturing

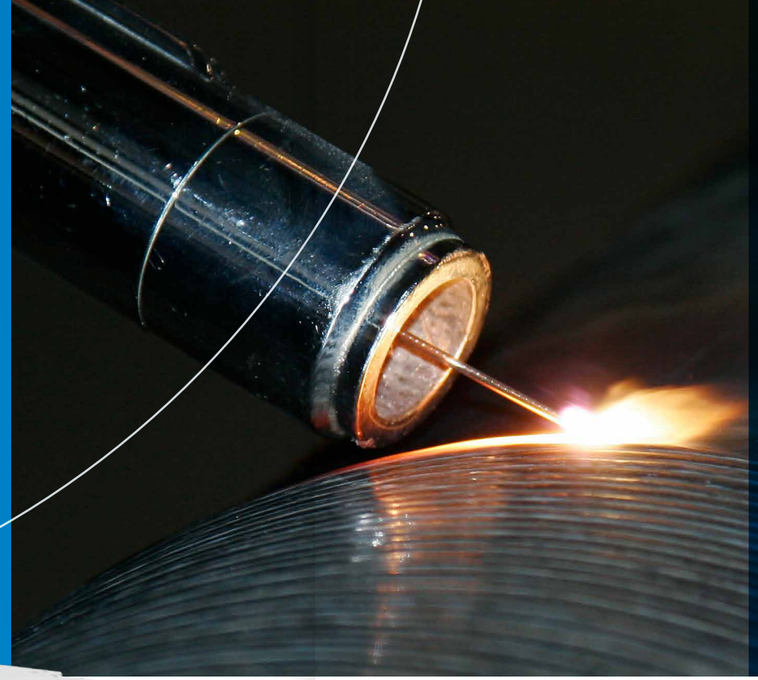
Layer-by-layer components are created - also possible with complex structures.

"As an Institute in the Fraunhofer Society, we always follow the target to develop innovative solutions for industrial processes that allow the user to take a definitive and great leap forward. Here, we have appreciated the extremely constructive and successful collaboration with Laserline."

Fraunhofer

Prof. Dr.-Ing. Christoph Leyens,
Head of Fraunhofer Institute for Material and Beam IWS Dresden and Director of Institute of Material Science, Technical University Dresden

Upcycling in a Big Way



Cracks, tears, removals and damaged coatings can become expensive. Repair through laser deposition welding ensures that valuable components do not need to be replaced completely.

During **repair welding**, wire or powder is metallurgically joined with the basic material. After ablation of the old coating is done and the workpiece is cleaned up, new stable coatings can be created e.g. on rollers, gear wheels, drive shafts, molds, tools or bearings.

To repair worn surfaces, torn-off pieces or other damages, usually identical materials are applied to the base material, e.g. stainless steel, nickel and cobalt base alloys or aluminum. Basically, any weldable material is conceivable.

The compact LDM diode laser in a 19-inch rack mount is the perfect industrial tool for cladding applications.

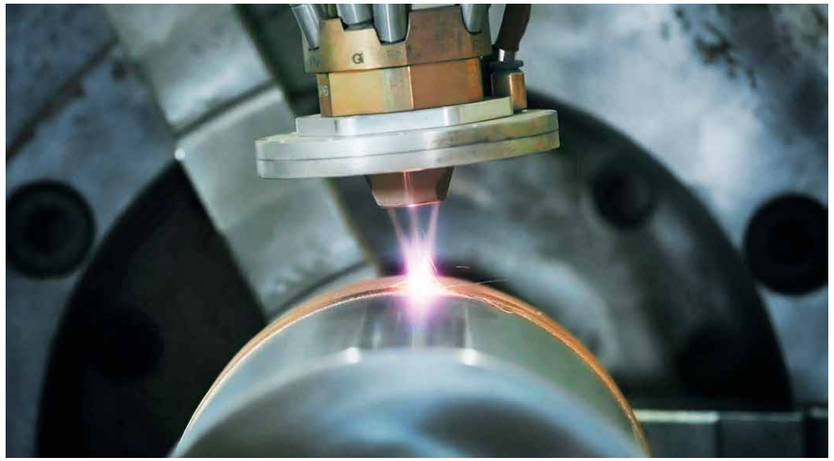
“GTV as a leading manufacturer turnkey coating centres has to rely on robust and reliable laser. Diode lasers from Laserline offer us the ideal tool, in order to reliably withstand even the most demanding production tasks.”

Dr.-Ing. Konstantin von Niessen,
Managing Director of GTV Verschleißschutz GmbH

Turbine repairs at Siemens in Nuremberg / Germany.

Battle Against Corrosion

Industrial components must be protected especially well against corrosion. **Coatings with diode lasers** by Laserline make sure that expensive workpieces continue to work over long periods.



ADMOS Gleitlager GmbH in Berlin uses diode lasers to coat composite plain bearings for wind turbines.

Diode lasers for cladding are used for corrosion protection in the most diverse areas: In mining, on the high seas, in power plants and wherever coatings corrode quickly under the local atmosphere.

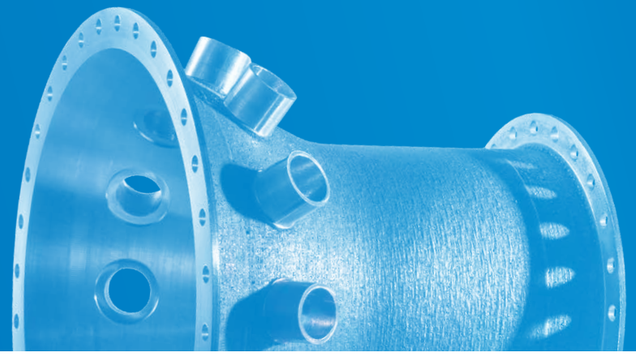
Whether it is ambient air, water, chemicals or pollution: every raw material reacts to its surrounding area. **Corrosion** is the inevitable consequence. Laser coatings offer the ideal protection. Creep and crecive corrosion can be prevented due additional layers that are applied highly precised.

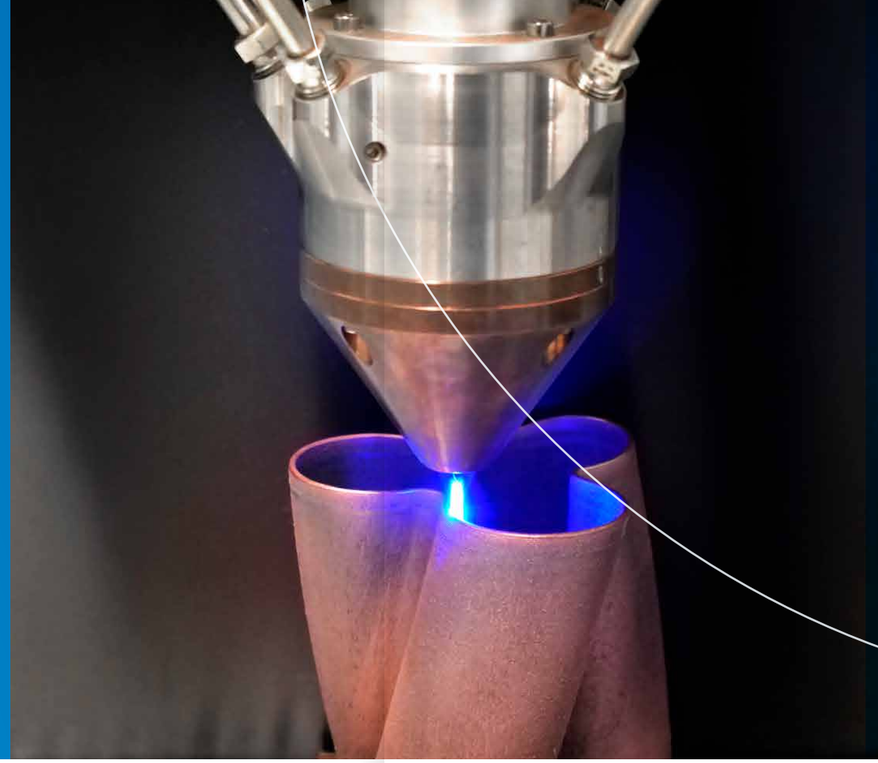
For this, stainless steels and nickel-base alloys are applied to low-alloy steels. When using a Laserline diode laser as energy source, the dilution of base and clad material is usually below 5%. Thus, a workpiece can be well protected even with a single layer of ca. 1 mm thickness (classical methods usually need two layers).

2x

Surface coating by diode lasers doubles the corrosion protection of components in challenging environments and is significally thinner than conventional methods.

3D Perspectives





3D print has become increasingly established in industrial fields. **Additive manufacturing** with Laserline's diode laser revolutionizes production methods by making it possible to produce complex components up to ten times faster.

Additive Manufacturing with Laserline diode lasers offers innovative production opportunities in many fields. With this method, layers from identical materials are applied with great efficiency, e.g. stainless steel, aluminum, titanium or even superalloys for aircraft construction. Thus, even complex manufacturing processes can be realized based on a single beam source.

The opportunities go far beyond additive powder deposition and subtractive machining. Lasers can also be used for welding and hardening in a twelve-axis milling machine, or for **3D structures** for prototypes and in mass production. A promising approach is the integration of the beam source into machine tools, e.g. when combining a laser with a 5-axis milling machine.

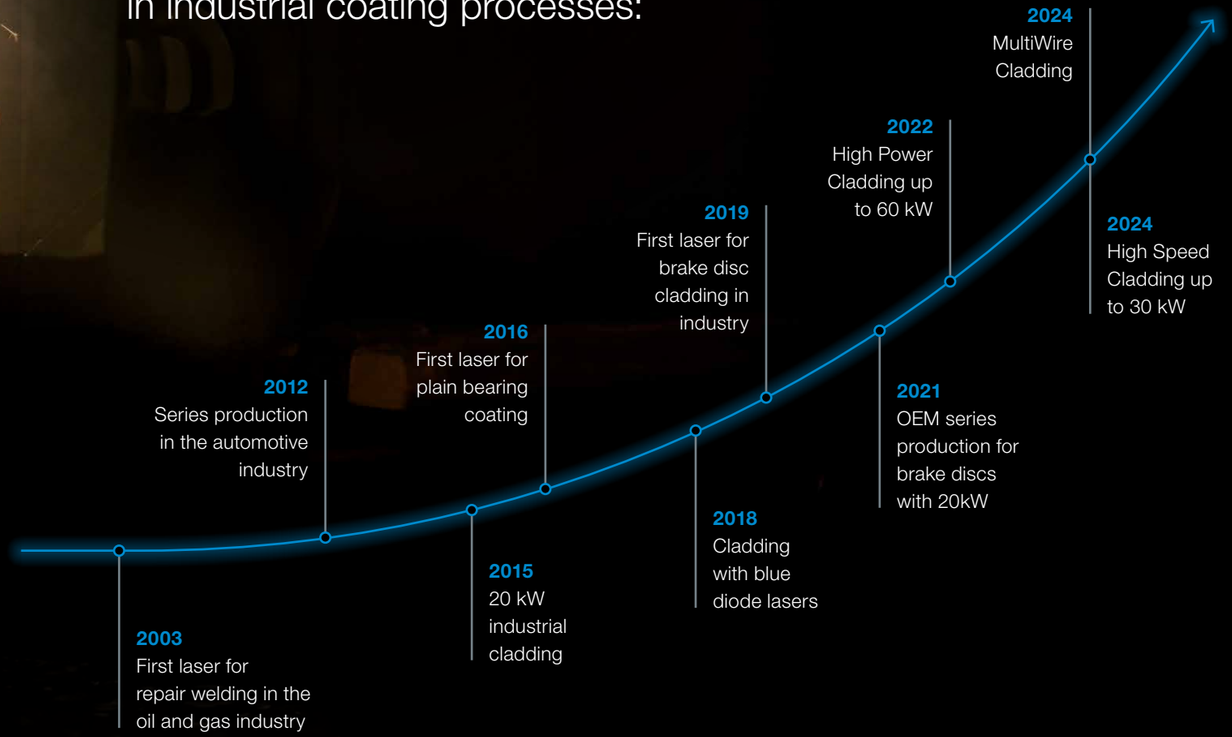
Laserline optics are very well suited for additive manufacturing.

Laserline diode lasers are successfully used in the additive manufacturing of rocket components components.

Image: DM3D; Rapid Large Scale AM of RS25 Engine Nozzle Liner

Laser Cladding: Efficient, precise and sustainable

Laserline as driving force of innovation in industrial coating processes:



"When coating composite plain bearings with laser cladding, our customers can save 70% non-ferrous metals and 90% energy compared to conventional casting processes."

Dr.-Ing. Thomas Molitor, Manager of Sales
General Manufacturing Laserline GmbH

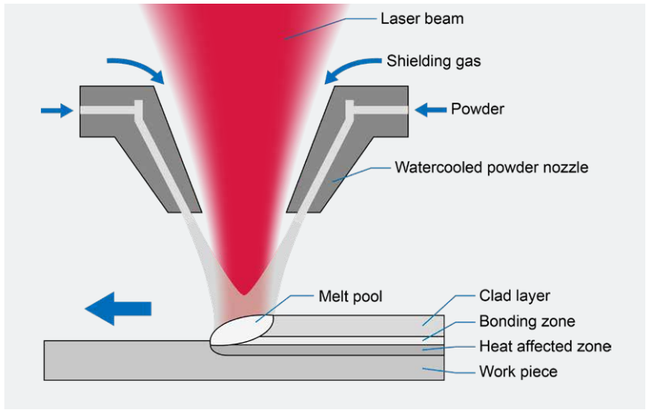
For more than 20 years, Laserline has been developing coating solutions with diode lasers together with partners and customers. For over two decades, laser cladding applications have firmly established in industrial production and are now sustainable alternatives to conventional processes. Even defective parts can be repaired and component lifespans significantly extended using laser cladding.

Low energy consumption and efficient material utilization save resources and reduce ecological footprint. For example, in the automotive industry, in brake disc cladding or in the offshore sector, when coating composite plain bearings. Increasing demand and technological innovations position laser cladding applications as a key technology for sustainable production.

Stays Longer, Protects Better

During a **laser cladding process**, new material is applied on a surface. Thus a metallurgical bond is created between the base material and the additional layer: Up to 300% lifetime extention!

Wear protection of saw-blades, disc harrows or counter blades in agriculture and forestry.



The laser beam creates a melt pool on the surface of the workpiece, to which the coating material (powder) is added and fused by the laser simultaneously.

Laser cladding provides excellent wear protection. Significantly longer lifetimes can be achieved thanks to the metallurgical connection between the base material and additional layer compared to the mechanical connection in thermal spraying. Essentially longer lifetimes of up to 300% can be realized. The cost benefits are obvious.

Mostly, **nickel-based alloys with tungsten carbides** are used for laser cladding – usually they make up to 60% of the applied layer's weight. Carbide-reinforced coatings can be optimally realized for example on iron-based materials by diode lasers. Among others, they protect the saw-blades, disc harrows or counter blades from wear and corrosion.

The lifetimes are up to 300% longer due to the **metallurgical surface refinement** by diode lasers.

Laser-coated brake discs, for example, lead to a **significant reduction of particulate emissions** and protect them better from corrosion. In this, within a high-speed process, a metallic melt splice between powder and base material is created that is only slightly loaded thermally. An ideal solution for industrial mass production - for example such as electric vehicles.

High Speed, High Volume

10 x

Acclelerated process speed through optimal adjustment.

The **high-speed laser deposition welding** offers an economical alternative to hard chromium plating, which is hazardous to health. Laserline‘s diode lasers are ideally suitable for the new method - an important step into a clean future.

High Speed Cladding

Hard chromium plating with chrome (VI) has been banned in the EU since 2017. The high speed cladding technique allows a **high processing speed at low layer thicknesses** and can cope wiht little laser power: Laserline’s diode lasers are perfectly suited for this.

Because of special adjustment to the laser beam and powder nozzles, **the layer material is fused** before it meets the workpiece. The process speed is accelerated by a factor of upt to 10 and energy and powder are saved ath teh same time. Even extremely thin layers around 10 µm are easily feasible.

High Speed Cladding on a hydraulic cylinder, ACunity GmbH, Aachen/ Germany.

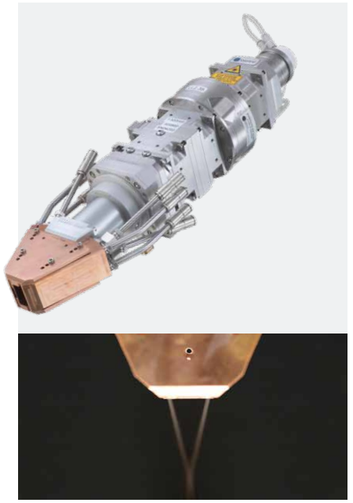
High volume cladding

For coating of large components or for **wear protection of cylinders**, multi-kW systems between 11 and 24 kW are used today already. Furthermore, application rates of up to 14 kg/h paired with powder efficiencies in the range of 90 percent are realized.

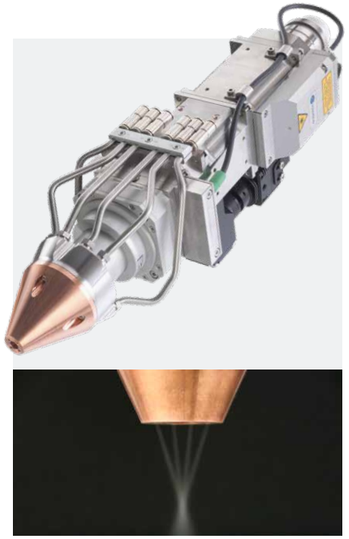
in the future, lasers with 50 kW output power will be used more frequently in industrial applications: **35 kg/h of powder and a clad rate of 3.5 m²/h at 50 kW** - this record outnumbers the state of the art by a factor of 2-3 and are already tested on a laboratory scale today.

It Depends on the Nozzle

Which optics and powder nozzles as well as right filler material are most suited for which application? We are pleased to help you with the configuration! The nozzle plays a key role in cladding and additive manufacturing processes.



Optics with wide stream nozzle
For cladding of large areas and cylinders.

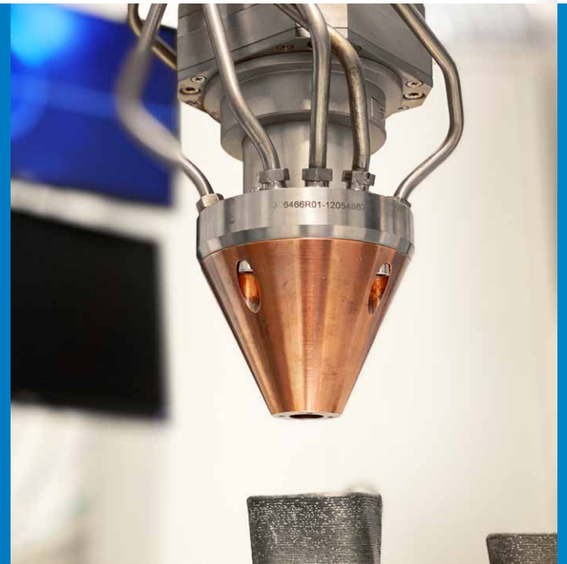


Optics with multistream nozzle
Among other applications suitable for corrosion and wear protection for brake discs.

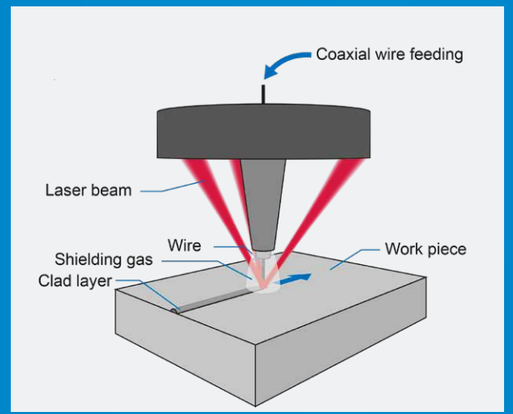
Optics with a variable spot size
No modification, no set-up: A variable spot size allows filigree contours and large-scale coatings with one processing head.

The **powder nozzle** decisively determines the efficiency and quality when it comes to cladding and 3D printing. Besides the supply of the filler material in powder or wire form, the processing location is shielded by protective gas from oxygen in the ambient air.

Spot size, material selection and accessibility of the processing location are just a few of the important selection criteria. Depending on the specific application and individual demands, the proper processing nozzle should be selected. Our experts will advise and support you all the way until you find the right configuration for your project.



The laser beam creates a melt pool on the workpiece surface, to which the coating material is added and fused by the laser simultaneously.

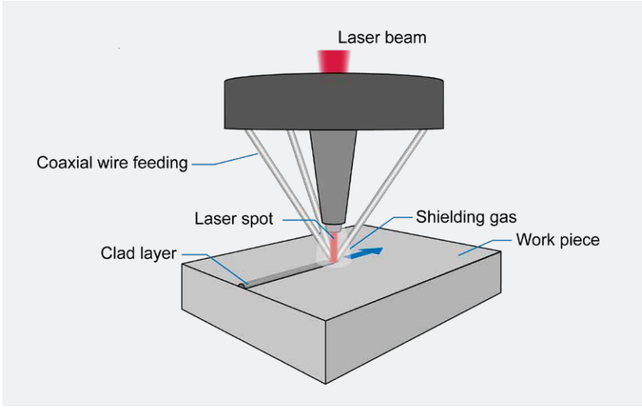


The **electronic optics monitoring system** controls the parameters throughout the entire process. This ensures that laser power and optics are always operated in the optimum range.

MultiWire Cladding with Diode Lasers

MultiWire Cladding with three wires enables particularly high surface deposition rates in a direction-independent, efficient process without material loss. Due to the reduced mixing of the base material, virtually no reworking is required.

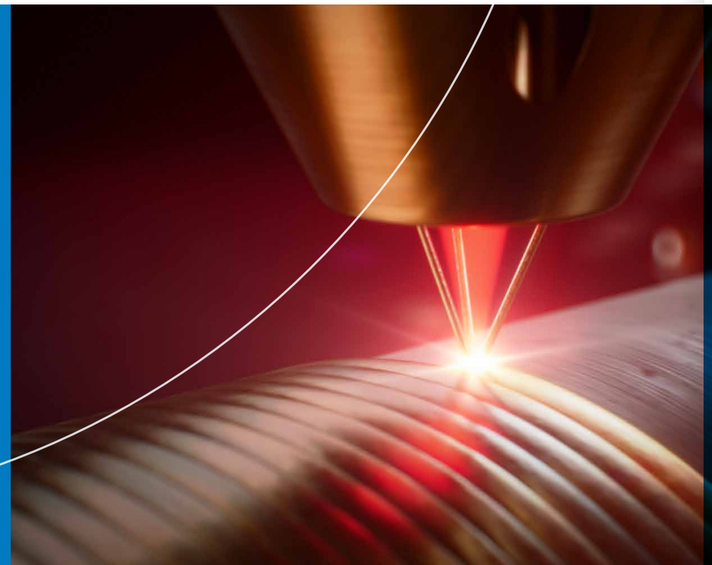
Direction-independent MultiWire cladding makes coatings significantly more homogeneous in less time.



The laser beam creates a molten pool on the workpiece surface, to which the cladding material (from up to three wires) is simultaneously fed.

Wire-based laser cladding is carried out using special **MultiWire processing optics**.

Electrical preheating of the wire means that less laser power is required for deposition welding, as the wire is almost completely melted before it is introduced into the weld pool. This results in several positive effects.



100

100% of the wire material
is fused efficiently and quickly with the base material.

100% of the wire material is fused efficiently and quickly with the base material. This cladding is more durable than coatings produced by thermal spraying and, unlike hard chrome plating, is harmless to health.

Feeding up to three wires simultaneously enables significantly higher deposition rates and improves efficiency. The use of multiple wires also enables a **direction-independent process**, which increases flexibility and adaptability for complex designs. As the entire wire is applied to the workpiece, there is no loss of material and therefore no contamination of the workplace arising from the cladded material.

To the Point

Tailored solutions constitute an essential part of the Laserline philosophy. In our **application laboratories** we define the optimal set-up of laser and optics for every specific demand - to ensurethat your cladding solution will be a success.

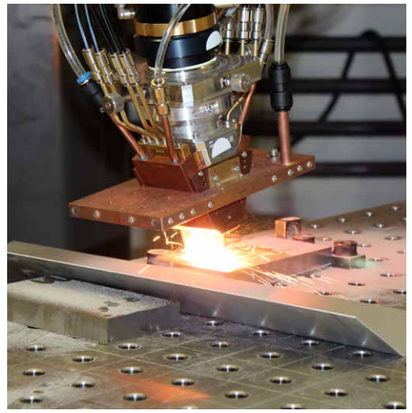
At Laserline's headquarters in Mulheim-Karlich as well as in China, Japan, Korea, India and in the USA, we have built first-class and fully-equipped **application laboratories**. Here, a team of experienced application engineers will take care of the first feasibility studies and advise you in terms of plant design and selection of suitable beam sources.

Our worldwide network of experts is available at any time - expert system integrators and representatives of renowned research institutions. When a sustainable concept is set up, a prototype can be created and tested under production-like conditions. The models for mass production will not be finalized until it is absolutely certain that the system will operate as planned.

In close coordination with you, we will develop a cladding solution step by step, that meets the specific needs of your application. The modular design of our diode lasers always proves to be a major advantage: subcomponents can be combined in different ways - even special spots or special optics are not a concern.

"We make cladding the new productive factor of your company."

Dr. Sörn Ocylok,
Head of Application &
Customer Support Cladding
Laserline



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