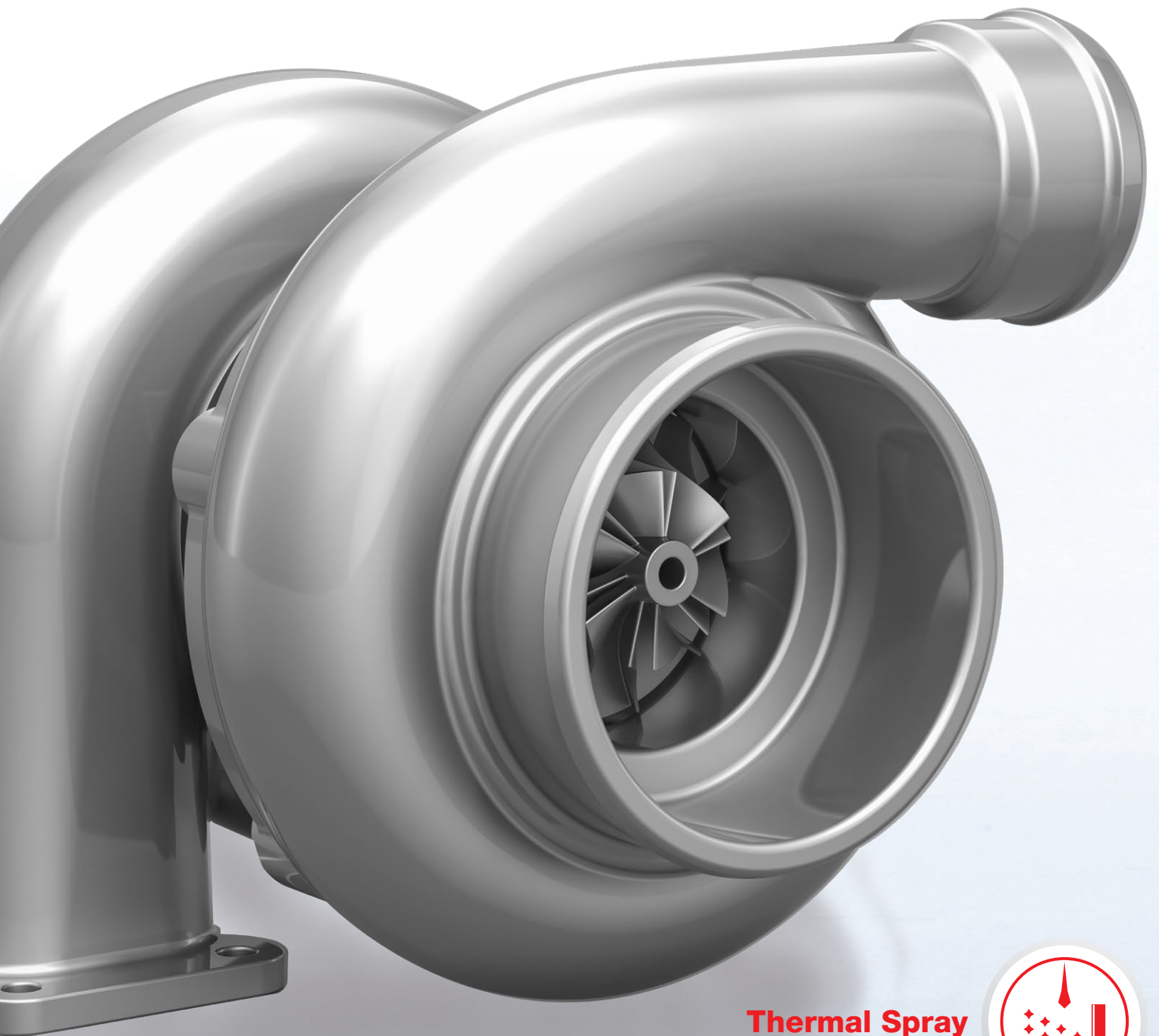


oerlikon
metco

Metco™ BOOST

Maximizing Turbocharger Performance



Thermal Spray

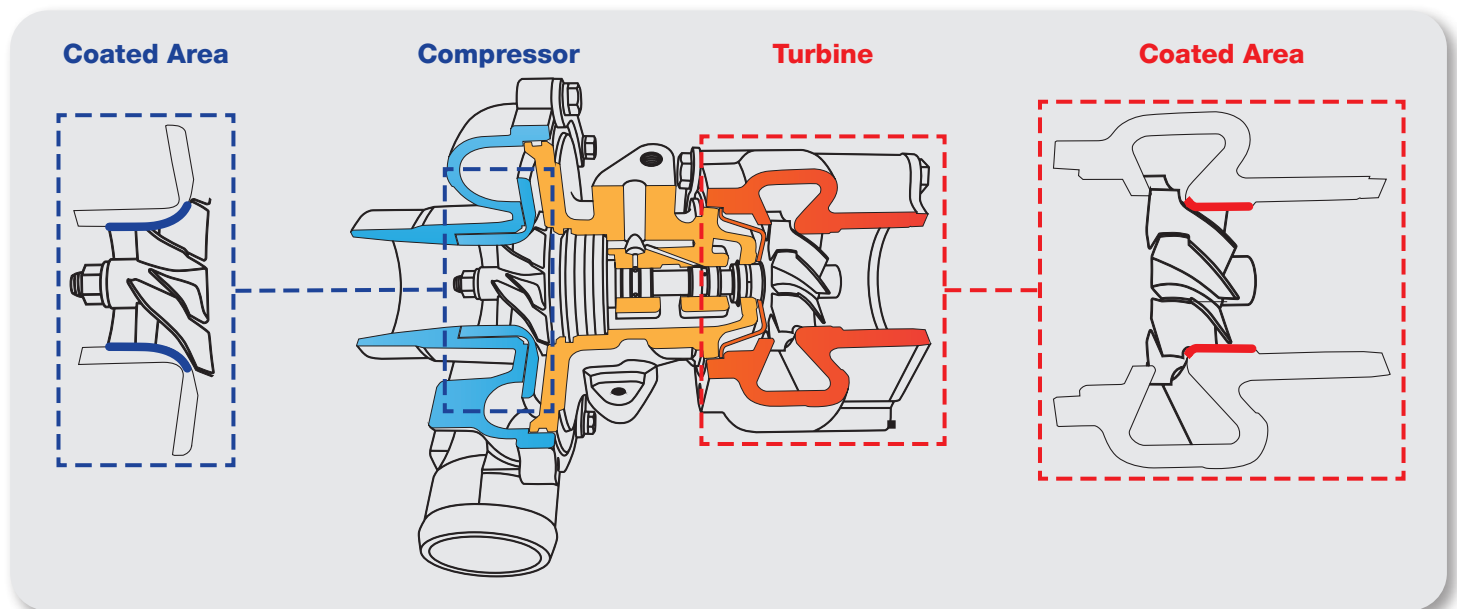


Turbochargers Boost Vehicle Performance, We Boost Turbocharger Performance

Oerlikon Metco's Metco BOOST coatings are a family of powder-based, thermal spray coating solutions that improve the performance and efficiency of turbochargers using clearance control technology. By applying a rub-tolerant coating on the turbocharger housing in the areas of the cold- and hot-side impellers, turbocharger performance and efficiency is improved.

- Better heat management within the engine
- Increased engine power allows smaller engine footprint
- Cost-effective sealing solution used on both the hot and cold side of the turbocharger
- Increased fuel efficiency that lowers operational costs
- Reduces CO₂ emissions, thereby avoiding regulatory penalties
- Improves safety in the event of a rub event
- Experienced supplier with mass-market capability and zero-defect quality

Improving performance and efficiency is nothing new for us — we've been developing clearance control solutions for turbomachinery applications, using materials and application technology that we pioneered, for more than half a century!



Thermal Spray Clearance Control Coating Benefits

Metco BOOST is applied using thermal spray technology, which is very customizable. Using a portfolio of select materials, we can apply coatings that are compatible with your turbocharger design requirements and service conditions. Thermal spray offers important benefits, such as:

- Reliable process with excellent repeatability
- Can be tailored for application and service conditions
- No metallurgical change to the substrate and no heat affected zone (HAZ)
- Coatings can be precision machined and/or ground
- Parts can be recoated, if necessary
- Long-lasting, cost-effective solution
- Scalable for mass production



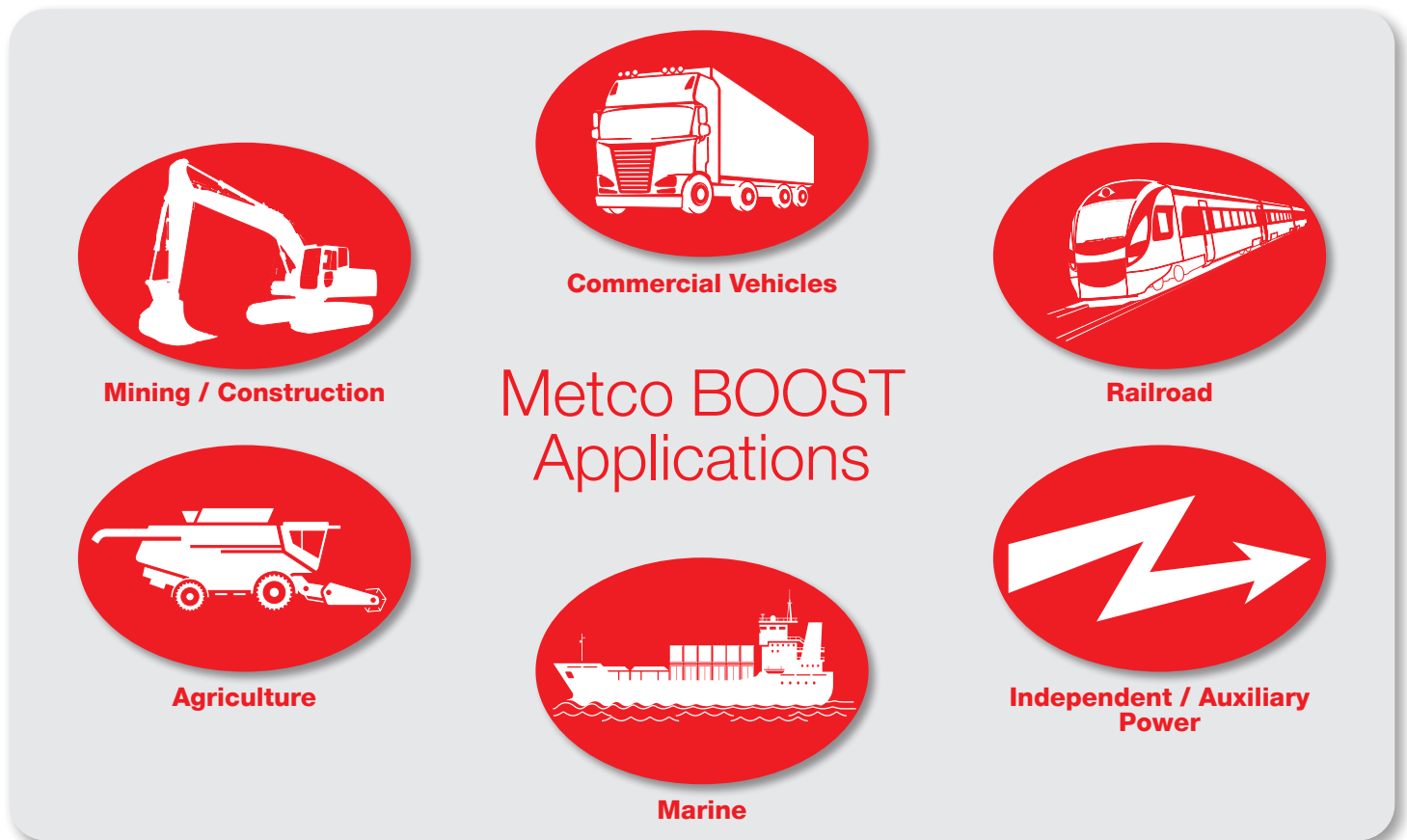
Let Metco BOOST Help You to Achieve Your Sustainability Goals

Metco BOOST increases fuel efficiency. For example, a typical fuel efficiency increase of **1%** for a Panamax cargo ship using 230 m³ (61 000 gal) of HFO per day would save approximately **2.3 m³ (610 gal) of fuel per day!**

For the same cargo ship, the associated daily CO₂ emissions would be reduced by **924 kg (2037 lb)**. In addition, the safety margin provided by Metco BOOST helps protect the turbocharger rotor and casing should a rub event occur.

Metco BOOST is Your Sustainability Winner!

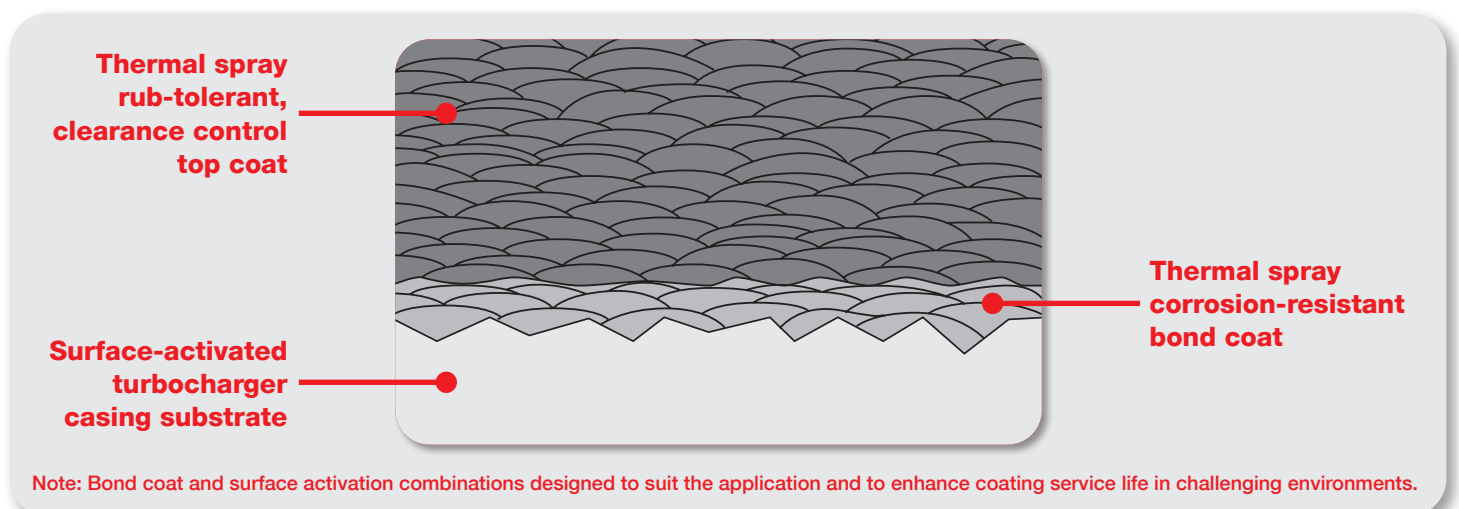
Choose Metco BOOST for a Wide Range of Turbocharger Applications



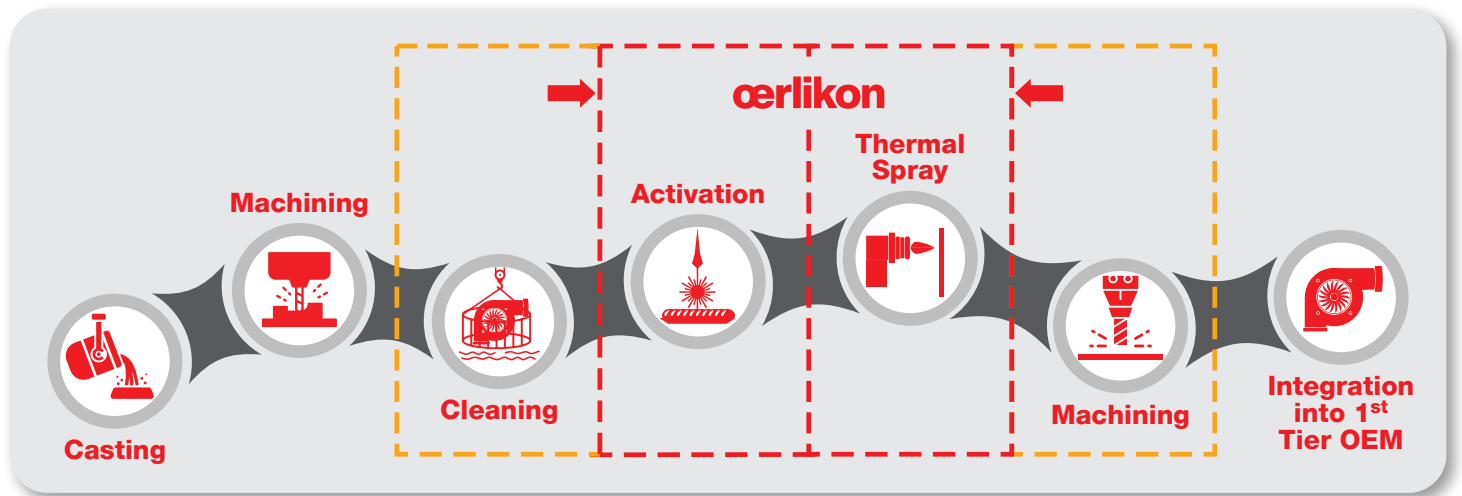
Coatings Designed for Efficiency and Performance

Metco BOOST coatings are applied using thermal spray and are designed for efficiency, performance and safety.

- 1. Activation:** The casing substrate is activated using either grit-blasting or laser-activation.
- 2. Bond Coat:** If required, a bond coat is applied which is corrosion-resistant and aids top coat adherence.
- 3. Top Coat:** The top coat is rub-tolerant and long-lasting. Once the top coat is post-coat machined or ground to a tight tolerance, it improves turbocharger efficiency and performance by closing the gap between the rotor and the casing. It also helps mitigate rotor damage should a rub event occur. In fact, "zero-clearance" between the rotor and the casing is possible for maximum efficiency and performance.



The Solution that Fits Seamlessly into Your Value Chain



Our Shop

Europe **Asia** **Americas**

Our coating service centers with high volume capability for turbochargers and excellent logistics to ensure we meet your production schedules.

Your Shop

Shop-in-Shop: Uses Oerlikon personnel, equipment and materials integrated into your facility.

Oerlikon Technology

- State-of-the-art coating application equipment
- Materials designed specifically for clearance control
- Highly experienced coating service personnel
- Experienced partner in the automotive industry
- Long-standing success and leader in thermal sprayed clearance control solutions
- Fully backed by our in-house equipment and materials R&D and manufacturing



Metco BOOST Clearance Control Solutions are Tailored to Your Requirements

Metco BOOST is flexible. Using a portfolio of select materials, we can apply coatings that are compatible with your turbocharger design requirements. With our capabilities, we can even develop and test new materials, if this is needed for your application!

| Coating | Service Temperature °C (°F) | Application | Blade Alloy Rub Compatibility ^a | | | | Description |
|----------------|--------------------------------|-------------|--|----|----|----|---------------------|
| | | | Al | Ti | SS | Ni | |
| Metco BOOST C1 | < 230 (445) | Compressor | ✓ | | | | Cost Effective |
| Metco BOOST C2 | < 300 (570) | Compressor | ✓ | ✓ | | | High Performance |
| Metco BOOST C3 | < 415 (780) | Compressor | ✓ | ✓ | ✓ | | Leading Edge |
| Metco BOOST T1 | > 700 (1290) | Turbine | | | ✓ | ✓ | Hot Section Sealing |

^a Indicates design intent. All Metco BOOST compressor coatings listed here are compatible with aluminum-based, titanium-based, stainless steel-based or nickel-based blades. These coating recommendations are based on compressor service temperature and the likely blade alloy type used. Final coating selections are determined once the service requirements and material properties for the specific application are known.

Increase Turbocharger Efficiency by 1% to 4%

Reduce Emissions and Avoid Penalties

Cost Effective Solution by an Experienced Supplier

Mass Production with Zero-Defect Quality



Metco BOOST Coating Services for Turbochargers — Advanced Technology Solutions and Services



Perfect solutions through optimum materials and innovative technologies

Oerlikon Metco is a global leader in surface engineering and advanced material solutions and services offering:

- A broad range of materials for thermal spray and other advanced technologies for critical industrial processes
- Leading thermal spray equipment and integrated systems
- Specialized coating and surface enhancement services
- Customer support services

Oerlikon Metco provides a comprehensive manufacturing, distribution and service network, catering to aviation, power generation, automotive and other strategic growth industries.

To take control of your material and surface engineering challenges, contact your Oerlikon Metco sales office, visit our web site at www.oerlikon.com/metco or e-mail us at info.metco@oerlikon.com.

Interested? Contact us to learn more about how Metco BOOST can maximize the output of your turbochargers!

And don't forget to ask us about our complete family of turbocharger coating solutions that include:

- Thermal management coatings for better efficiency
- Low friction coatings for turbocharger shafts
- Corrosion control coatings
- Erosion control coatings

About Oerlikon Surface Solutions Division

Oerlikon is a leading global provider of surface and additive manufacturing solutions and services. The division offers an extensive portfolio of market-leading thin-film, thermal spray and additive manufacturing technologies, equipment, components and materials. Emission reduction in transportation, maximized longevity and performance of tools and components, increased efficiency and intelligent materials are hallmarks of its leadership. Pioneering technology for decades, the division serves customers with standardized and customized solutions across a worldwide network of more than 170 sites in 37 countries.

With its technology brands – Oerlikon Balzers, Oerlikon Metco and Oerlikon AM – Oerlikon's Surface Solutions division focuses on technologies and services that improve and maximize performance, function, design, reliability and sustainability, which are innovative, game-changing advantages for customers in the automotive, aviation, tooling, general industries, luxury, medical, semiconductors, power generation and oil & gas markets.

The division is part of the publicly listed Oerlikon Group (SIX: OERL), headquartered in Switzerland. For further information: www.oerlikon.com/surface-solutions.

Information is subject to change without prior notice.