Making aerospace innovations fly

With high-end surface solutions, advanced materials and turbine components
Oerlikon – A global, high-tech engineering group with unique competencies

We are a market leader in advanced materials, surface engineering and polymer processing. Our solutions encompass materials, coating equipment, coating services, and the engineering of entire plants. We build our business on unique technology competencies, the widest global reach and trusted customer relations in highly demanding industries such as aerospace, automotive, energy, tooling and textiles. Every day, we develop novel materials, new surface technologies, new applications, components and textile manufacturing solutions to empower our customers to create and innovate better products.

Every major aero engine manufacturer trusts our technologies to boost performance, improve safety and fuel efficiency and reduce emissions.

The commercial aerospace market is driven by passenger traffic growth that has exceeded 6% per year for the past five years. Improved global economic conditions, income growth and strong MRO demand support that trend. Boeing recently forecast that revenue passenger kilometers will grow 4.7% per year over the next 20 years, requiring 41,000 new airplane deliveries to support market growth and aging aircraft replacement.

Our solutions for enhanced aircraft components

1 Machining of lightweight materials
2 Tools for structural development
3 Tools for chassis processing
4 Air conditioning systems
5 Engine pylons, fuel pumps
6 Turbine hot section components such as combustors, HPT blades and vanes
7 Fan blades, LPC and HPC blades, vanes, shrouds and rotor seals
8 Actuation systems
9 Airframe & flight controls
10 Landing gears
11 Interior decoration
Making aerospace safer, more powerful and more efficient

**Industry challenges**
- Improve engine performance and efficiency to reduce fuel consumption and meet CO₂ and NOₓ emission standards
- Enable hot engine components to operate at higher temperatures to improve efficiency and extend lifespan
- Meet demanding requirements for next-generation aircraft landing gears, while replacing noxious hard chromium processes
- Reduce weight and production cost of complex engine parts, structural components and replacement parts

**Solutions**
- Engines sealed with abradable coatings achieve improved performance, increased safety, decreased fuel consumption and reduced CO₂ and NOₓ emissions.
- Thermal barrier coatings used in combustor and turbine sections of engines protect underlying materials from temperatures that these substrates could otherwise not tolerate.
- Landing gears coated with our high-velocity oxygen fuel thermal spray technology achieve superior performance and safety. These coatings replace the noxious hard chromium process.
- Functional PVD coatings significantly improve the performance and durability of precision components and tools. Component service life is increased by using our coatings that reduce friction and protect against wear.
- Attractive wear protection color coatings with long life and high performance for interior appliances.
- Additive manufacturing technology is ideally suited for aerospace parts to reduce weight, increase design complexity and improve functionality.
- To improve aircraft engine efficiency, we produce sheet metal and machined components such as honeycomb seals, inserts and compressor vane assemblies.
Oerlikon Balzers surface solutions

Thin film solutions for aerospace components and cutting tools

Protect valuable components and cutting tools from all types of wear

We are one of the world’s leading suppliers of thin-film technologies that significantly improve the performance and durability of precision components as well as tools. Protected with our BALINIT® coatings, the lightweight components used in the aerospace industry permit greater loads, meet closer tolerances, and lower the cost of maintenance. BALINIT® and BALIQ® coated cutting tools meet the highest expectations in machining high-end aerospace materials like titanium and nickel alloys as well as CFRP (carbon fiber reinforced plastics).

Thanks to our network of Nadcap-certified customer centers in all relevant industry locations around the globe, our aerospace customers benefit from high-end coating services wherever they are.

BALINIT TURBINE PRO – a compressor erosion coating

BALINIT® TURBINE PRO, the new anti-erosion coating for compressor blades, offers outstanding protection from solid particle erosion (SPE) and liquid droplet erosion (LDE) without affecting your component’s fatigue life.

BALINIT® TURBINE PRO is 40 times more erosion resistant than steel and 5 times more erosion resistant than other PVD coating solutions.

Coatings for cutting tools to machine aerospace components

Cutting tools have to resist wear under serious conditions, from high cutting temperatures to heavy loads causing friction and difficulties in removing chips.

We supply state-of-the-art BALINIT® coatings that fulfill those requirements — and are based on the environmentally friendly and future-oriented PVD and PACVD coating technologies.

Advantages of coated tools:
- Longer tool life
- Retention of tolerances and surface quality
- Increase of productivity due to higher cutting speed and feed
- Possibility of reduced lubrication and dry machining
- Enable machining within smaller tolerances
- Excellent wear resistance of the tools

Balinit TURBINE PRO

<table>
<thead>
<tr>
<th>Coating material</th>
<th>MeAlN</th>
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<tbody>
<tr>
<td>Coating hardness Hv</td>
<td>32 ± 2 GPa</td>
</tr>
<tr>
<td></td>
<td>4841 ± 300 ksi</td>
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<tr>
<td>Typical coating thickness (µm)</td>
<td>5 – 25</td>
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<tr>
<td>Friction against steel, dry running</td>
<td>~ 0.5</td>
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<tr>
<td>Coating temperature</td>
<td>&lt; 500 °C / &lt; 932 °F</td>
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<tr>
<td>Max. service temperature</td>
<td>&lt; 700 °C / &lt; 1292 °F</td>
</tr>
<tr>
<td>Color</td>
<td>Violet-gray</td>
</tr>
</tbody>
</table>

Coatings for aircraft interior design

Oerlikon Balzers offers attractive wear protection color coatings with long life and high performance for interior appliances. Cabin fixtures can be coated with BALTONE™ coatings offering a wide range of colors to match your aircraft interiors.
Today, almost all turbine-powered aircrafts have our solutions on board, and we have more OEM approvals than any other coating material supplier. Our next-generation solutions are designed to protect expensive aerospace components from wear, corrosion, oxidation, thermal attack and more. Even as operating temperatures continue to rise for aircraft power plants, our solutions will be there to keep them operating efficiently and safely.

A trusted partner today that’s ready to protect and optimize the performance of tomorrow’s aircraft.

Our advanced EBC coating solutions protect ceramic matrix composites from CMAS attack.

Our laser cladding services apply advanced materials to blade tips for effective clearance control.

New HVOF spray technology and materials apply coatings to landing gear IIDs that rival HVOF OD coatings.

As the leader in abradable coatings, we continually evolve our solutions to more effectively improve efficiency in all parts of the engine.

Advanced corrosion coatings protect HPC, HPT and LPT blades from oxidation and corrosion.

New compositions for advanced-structured TBCs and efficient, novel approaches to applying them allow engines to operate at higher temperature over long service intervals.
Technology and services designed to provide the best performance and efficiency

We ensure our customers get the best solution by using all of our expertise and know-how during every step of the process. Our goal is to provide our customers with a solution that not only meets their exact technical requirements, but is also as efficient and cost-effective as possible.

One stop solution provider for hot and cold section turbine engine components

- Production cell concepts servicing high level of delivery performance
- LEAP program supplier
- Cross functional work approach with customers for new part introduction
- Leading, high-end machining and manufacturing processes such as EDM, laser cutting, drilling

Turbine airfoils cooling hole drilling
Cooling holes (transversal / longitudinal) prevent the deformation of rotating airfoils from the intense heat of the engine’s hot section. These cooling holes are processed through ECD or EDM processes and inspected by airflow testing.

Vane inserts
Sheet metal inserts provide accurate impingement cooling on the inside of the hollow airfoils. Blanks are pressed into the correct shape. Welding assures the closure of the insert.

Honeycomb and braze materials
Lines the inside of air seals and ring segments in order to provide a porous, heat-resistant surface to seal airflow against the rotating blades. Thin sheet metal ribbons are spot welded together into a final assembly.
Oerlikon AM additive manufacturing solutions

Making aircraft safer, lighter and more efficient

Typical aerospace applications are complex engine parts, structural components and replacement parts. Additive manufacturing enables the production of such parts at a lower weight and significantly reduced life-cycle costs.

For aircraft applications like brackets, ducting, and seat belt buckles, additive manufacturing can be leveraged for weight and flow optimization, sound reduction, near net part substitution, and part count reduction.

Additive manufacturing can also have a significant impact on aero engines by integrating components for reduced part counts and mass for compressor vanes, diffusers, acoustic attenuation, heat exchangers, and more.

From brackets to instrument housings in helicopters, and from fuselage structures to battery compartments in UAVs, additive manufacturing makes a difference in a variety of rotorcraft and defense applications.

1 Brackets
2 Seat belt buckle
3 Ducting
4 Impact protection
5 Compressor vanes
6 System integration
7 Heat exchangers
8 Ducting
9 Diffuser
10 Acoustic attenuation
11 Vents
12 Windshield defogger duct nozzles
13 Brackets
14 Housing and enclosures
15 Drain fairings
16 Payload enclosures
17 Camera mount & gimbal
18 NACA duct
19 Fuselage structure
20 Fuel tank
21 Shrouds & closeouts
22 Wing structure
23 Battery compartment
24 Oil tank
25 Aileron & flaps
Why choose us as your partner?

We provide:

- AS9100, ITAR registered, full spectrum Oerlikon AM capabilities for quality control and traceability, and affordability, with powder atomization, R&D and production all delivered in-house.
- Aerospace-specific application engineering with focus on areas like generative design / weight reduction, highly customized parts, weld elimination, reverse engineering and replacement of obsolete parts. Support for material and component qualification.
- Collaboration opportunities: Material development, data set / design allowables generation, R&D, application engineering, series production and prototypes.

Your expert with a strong background in aerospace and defense.
Count on a powerful network of over 150 sites in 37 countries

Nadcap accredited
- Troy, MI / USA (Metco)
- Westbury, NY / USA (Metco)
- Salzgitter / Germany (Metco)
- Ft. Saskatchewan / Canada (Metco)

Accredited in accordance to ISO-17025
- Barchfeld / Germany (Metco)

EN/AS/JISQ 9100 certified quality management
- Wohlen / Switzerland (Metco)
- Ferrières-en-Brie / France (Balzers)
- Milton Keynes / UK (Balzers)
- Stockport / UK (Metco, Neomet)
- Debrecen / Hungary (Metco, Eldim)
- Lomm / Netherlands (Metco, Eldim)
- Ft. Saskatchewan / Canada (Metco)
- Westbury / USA (Metco)
- Troy / USA (Metco)
- Salzgitter / Germany (Metco)
- Barchfeld / Germany (Metco)
- Guelph / Canada (Balzers) planned

Contact us today and tap into our productivity-boosting expertise in surface solutions, advanced materials, turbine components and additive manufacturing solutions — tailored explicitly for aerospace applications!