

## Lubricant Solutions for the Aerospace Industry



# LUBRICANTS. TECHNOLOGY. PEOPLE.

We concentrate solely on high-quality lubricants and related specialties.

We develop innovative and holistic solutions for a wide variety of applications.

We value the high level of commitment of our employees and their trusting interaction with one another.



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## Facts and figures

**Company:** FUCHS SCHMIERSTOFFE GMBH, a company of the FUCHS Group

**Headquarters:** Mannheim

**Product range:** A full range of more than 2,000 products and 6,000 articles

**Certifications:** DIN EN ISO 9001:2008, ISO/TS 16949:2009, DIN EN ISO 14001:2004 BS OHSAS 18001:2007, KTA 1401

**References:** Leading lubricant OEM for the German automotive industry

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FUCHS has developed, produced and sold high-quality lubricants and related specialties for more than 85 years – for virtually all areas of application and sectors. With over 100,000 customers and 60 companies worldwide, the FUCHS Group is the leading independent supplier of lubricants.

A team of more than 800 specialists across Germany works to guarantee the satisfaction of our customers. Whatever their requirements, we have the ideal lubricant for their specific applications and processes. In our technology center we link interdisciplinary expertise in a quick and efficient way – and work on innovative lubricant solutions to meet the demands of today and tomorrow every single day.

FUCHS lubricants stand for performance and sustainability, for safety and reliability, for efficiency and cost savings. They represent a promise: technology that pays off.



## INNOVATIVE METAL CUTTING FLUIDS FOR AEROSPACE MACHINING

Quality precision machining of aerospace components requires high performance specialist coolants. At FUCHS, we understand the unique challenges of aerospace machining and dedicate our expertise to ensuring our cutting fluids deliver competitive advantage to your production.

We research, develop and manufacture bespoke machining fluids – technology that is approved for use by leading manufacturers and available globally via the FUCHS organisation.

### Structures

Materials used in the manufacture of ribs, stringers, spars and bulkheads are becoming more exotic. Utilised for their strength to weight ratio, these materials create unique demands on the cutting fluids, which FUCHS' technology addresses head on.

FUCHS is able to offer specialist cutting fluid solutions providing optimum efficiency, from the initial bulk metal removal through to the high speed machining of thin wall components.

### Engines

Aerospace engine machining requires unsurpassed accuracy, precision and quality. Through many years of partnership with leading global engine producers, we are able to supply innovative coolant solutions for all key components and substrates in the modern jet engine.

Turbine blade grinding, blisk milling and super-finishing are just some of the applications for which FUCHS can provide specialist coolant technology.

### Landing gear

Modern landing gear uses high strength sophisticated materials (such as Ti 5-5-5-3) in its manufacture. These are increasingly difficult to machine and create unique demands on the coolant.

Only by working with OEM manufacturers, machine tool builders and tooling suppliers is FUCHS able to understand the full parameters of the operation and to develop build coolants capable of matching the production demands of the customer.

### Composite materials

In the aerospace industry the use of composites is becoming ever more important, with a large number of secondary structures in aircraft airframes made of composites. The latest progression in the industry is in developing new aircraft in which a large structural percentage is built out of these materials.

Durability and maintainability are key advantages, and composites often outperform their metal counterparts. The demand for coolant is limited, but compatibility with materials and resins, tool life and accuracy/repeatability are just some of the key factors addressed by FUCHS' technology.





## INNOVATION AND TECHNOLOGICAL LEADERSHIP FOR LUBRICANTS

We engage in application-oriented development directly at and in cooperation with the customer with the aim of adapting lubricants optimally to the process and machine-related requirements. In addition, great emphasis is placed on basis research in the FUCHS Group.

Our ultra-modern Technology Center at the headquarters in Mannheim coordinates the international network of experts, brings together expertise and supports knowledge transfer on global requirements.

**Super difficult metals**

Technology designed to assist with high metal removal rate whilst maximising tool life. Specifically designed for titanium and nickel based alloys.

**OEM approved**

FUCHS' coolant technology is approved by leading manufacturers globally including Boeing, Airbus, Rolls Royce and Pratt & Whitney, providing subcontractors with reassurance of quality and validity.

**High pressure coolants**

Technology designed to withstand the pressures of high velocity coolant delivery. Designed to offer maximum tool life, suitable chip evacuation and machining accuracy on a wide range of difficult-to-machine substrates.

**MQL**

FUCHS' product range includes minimum quantity lubricants for spray systems. Approved by aero manufacturers and equipment manufacturers.

**Features of our products**

Product	Boron	Biocide	Emulsion / synthetic	Nickel based- and titanium alloys	Aluminium alloys standard	Aluminium alloys critical
ECOCOOL TN 2525 HP-BFH	free	free	Emulsion	+++	++	+
ECOCOOL R-TN 2525 HP-RR	yes	free	Emulsion	+++	++	+
ECOCOOL S-AERO	free	free	Synthetic	++	+++	+++
ECOCOOL PHH-AL	free	free	Emulsion	++	+++	+++
ECOCOOL S 761 B	yes	yes	Emulsion	+++	++	++
ECOCOOL GLOBAL 10	free	free	Emulsion	+++	++	++

+ suitable ++ good suitable +++ especially recommended

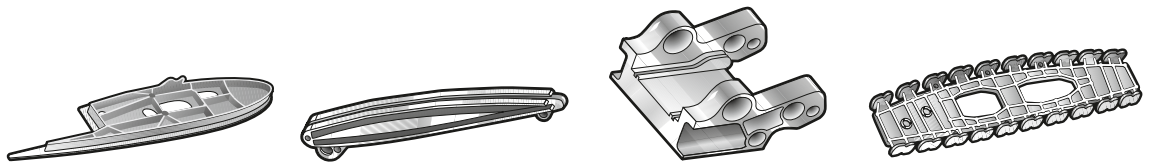


## OUR LUBRICANT SOLUTIONS TO THE SPECIFIC REQUIREMENTS OF AEROSPACE MANUFACTURING

Structural solutions | wing rib, engine mount, flap track, wing spar  
Engine solutions | front case, engine case, blisk, hub  
Landing gear solutions | slider, truck beam, links and braces



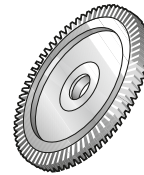
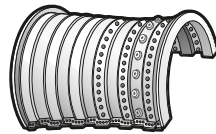
## Structural solutions



	Wing rib	Flap track	Engine mount	Wing spar
<b>Material</b>	7010 aluminium alloy	Ti 6Al 4V (Ti 6-4)	Titanium alloy	7010 aluminium alloy
<b>Operation</b>	Rough milling with solid carbide endmill	Helical side milling, roughing	Drilling	Rough milling, pocketing
<b>Criterion</b>	Surface finish, metal removal rate	Metal removal rate	Application security and productivity	Metal removal rate, productivity
<b>Recommendations</b>	<b>ECOCOOL S-AERO</b> <b>ECOCOOL PHH-AL</b> <b>ECOCOOL S 761 B</b>	<b>ECOCOOL TN 2525 HP-BFH</b> <b>ECOCOOL R-TN 2525 HP-RR</b> <b>ECOCOOL S 761 B</b> <b>ECOCOOL GLOBAL 10</b>	<b>ECOCOOL TN 2525 HP-BFH</b> <b>ECOCOOL R-TN 2525 HP-RR</b> <b>ECOCOOL S 761 B</b> <b>ECOCOOL GLOBAL 10</b>	<b>ECOCOOL S-AERO</b> <b>ECOCOOL PHH-AL</b> <b>ECOCOOL S 761 B</b>
<b>Concentration</b>	5–10%	5–10%	5–10%	5–10%
<b>Expected results</b>	Non-staining, increased tool life	Reduced cycle time, improved tool life	Reduced cycle time, improved tool life	Non-staining, increased tool life



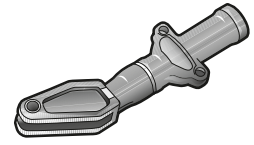
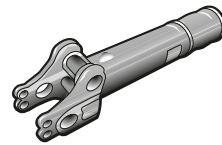
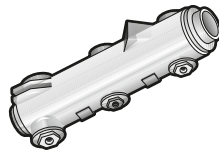
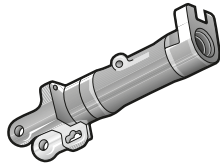
## Engine solutions



	Front case	Engine case	Blisk	Hub
<b>Material</b>	Inconel 718, Waspaloy	Ti 6Al 4V	Inconel 718 aged and hardened 48 HRC	Inconel 718 forged
<b>Operation</b>	Rough turning and finish top profile	Rough milling	End milling, slotting	Rough turn internal features
<b>Criterion</b>	Surface finish and dimensions	Metal removal	Surface finish	Reduce cycle time
<b>Recommendations</b>	<b>ECOCOOL TN 2525 HP-BFH</b> <b>ECOCOOL R-TN 2525 HP-RR</b>	<b>ECOCOOL TN 2525 HP-BFH</b> <b>ECOCOOL R-TN 2525 HP-RR</b> <b>ECOCOOL S 761 B</b>	<b>ECOCOOL TN 2525 HP-BFH</b> <b>ECOCOOL R-TN 2525 HP-RR</b>	<b>ECOCOOL TN 2525 HP-BFH</b> <b>ECOCOOL R-TN 2525 HP-RR</b>
<b>Concentration</b>	5–10%	5–10%	5–10%	5–10%
<b>Expected results</b>	Fine finish, increased tool life	Increased tool life	Non-staining, increased tool life	Reduced cycle time, improved tool life



## Landing gear solutions



	Slider	Truck beam	Links & braces	Links & braces
<b>Material</b>	Ti 6Al 4V (Ti 6-4)	Ti 5Al 5Mo 5Al 3Cr (Ti 5-5-5-3)	Ti 5Al 5Mo 5Al 3Cr (Ti 5-5-5-3)	Ti 6Al 4V (Ti 6-4)
<b>Operation</b>	Slotting	Rough milling by plunge contouring	3D milling, roughing	Square shoulder milling
<b>Criterion</b>	Metal removal rate, tool life	Metal removal rate, tool life	Metal removal rate, tool life	Metal removal rate, tool life
<b>Recommendations</b>	ECOCOOL TN 2525 HP-BFH ECOCOOL R-TN 2525 HP-RR ECOCOOL S 761 B ECOCOOL GLOBAL 10	ECOCOOL TN 2525 HP-BFH ECOCOOL R-TN 2525 HP-RR ECOCOOL S 761 B ECOCOOL GLOBAL 10	ECOCOOL TN 2525 HP-BFH ECOCOOL R-TN 2525 HP-RR ECOCOOL S 761 B ECOCOOL GLOBAL 10	ECOCOOL TN 2525 HP-BFH ECOCOOL R-TN 2525 HP-RR ECOCOOL S 761 B ECOCOOL GLOBAL 10
<b>Concentration</b>	5–10%	5–10%	5–10%	5–10%
<b>Expected results</b>	Increased metal removal rate vs tool life	Increased metal removal rate vs tool life	Increased metal removal rate vs tool life	Increased metal removal rate vs tool life





## Our support network



### Global team

Research and development, as well as product knowledge, are shared amongst our dedicated aerospace specialists across the FUCHS network. Customers, regardless of location, can be reassured by access to a global knowledge and resource base. You will also benefit from the support of expert engineers and metallurgists in the field of aerospace machining to ensure accurate product recommendations.

Coolant technology needs to adapt to the demands of the global industry. Our specialist team ensure that FUCHS' technology is functional, with modern machining techniques and processes, whilst being accepted and approved by leading OEMs.

### FUCHS range

The FUCHS range of aerospace cutting fluids has expanded rapidly to encompass the technologies needed for efficient and cost effective aerospace machining. The key to aerospace machining is the optimisation of cutting-edge geometry and coolant technology to the substrate being machined.

Our local engineers are trained to offer expert advice on coolant technology – helping to reduce cycle times, minimise negative outputs and maximise tool life and process efficiency.

### Advanced manufacturing research centre (AMRC)

The University of Sheffield Advanced Manufacturing Research Centre (AMRC) with Boeing is a world class centre for advanced machining and materials research for the aerospace industry. FUCHS is a proud partner of this facility and supports advanced machining initiatives, with research and development into the optimisation of the coolant performance in new and extreme machining conditions.

FUCHS uses such research to help customers ensure that all possibilities are explored and that the most practical and advantageous formulations are brought to market immediately.

### Machining innovations network (MIN)

Top priority of the Machining Innovation Network is to support its members with the initiation of joint development projects and to sharpen the competitive edge by offering additional services. The partners of the Machining Innovations Network work together to realize innovative products and methods.

The first leading topics have already been defined. These are to be expanded with additional issues and substantiated with new projects in the working groups of the association. FUCHS is member of this Aerospace network, too.

## Our support tools



### Research and development are key factors in the success

Over 400 FUCHS engineers and scientists engaged in research and development around the globe develop new products and help our customers solve their problems. They guarantee our technical advantage.

The most important facility for R&D is the new Technology Centre in Mannheim, Germany. Opened in 2012, it provides state-of-the-art test rigs, lab equipment and test machines. The laboratory facilities secure the measurements of over 350.000 samples per year. With this Technology Centre and the worldwide FUCHS R&D network we are in the position to guarantee the latest technical trends and perfect technical support for tailor-made solutions.

### Service

We have an experienced team of support engineers who can provide expert assistance in fluid equipment management. We can offer advice on all types of fluid handling including storage, distribution, collection, recycling and waste disposal.

We can supply "off the shelf" solutions to basic fluid handling projects but, through the FUCHS knowledge base, we can also design, manufacture and install turnkey solutions to each customer's specific requirement.

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## Chemical Process Management (CPM)

To obtain maximum efficiency from coolant technology, it is essential to ensure the fluid remains in good health. FUCHS' Chemical Process Management service is a complete lubricant management programme encompassing coolant "health checks". Regular condition monitoring, sampling and maintenance advice are provided to customers to ensure maximum productivity. This service tool is currently utilised by many leading aerospace manufacturers.

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## HOLISTIC SOLUTIONS TO THE AEROSPACE INDUSTRIES

Premium quality water miscible coolant solutions are just part of the FUCHS portfolio. FUCHS offers customers a full line supply service for all coolant and lubricant demands.

Included within our metalworking fluid portfolio are innovative solutions to meet the highly sophisticated demands of the aerospace industry, designed with the expertise of our aerospace group and approved by leading manufacturers. To support this, FUCHS carries a full range of lubricants suitable for aerospace applications.



### Minimum quantity lubrication (MQL)

MQL was developed by the American aerospace industry and is the process of applying very small quantities of high lubricity oil, mixed with air, at the point of precise contact between the tool and the workpiece. The benefits of such technology can be extensive, especially with a fluid optimised for the operation. The FUCHS range of MQL products, including the aerospace approved ECOCUT MIKRO PLUS 20, can help to deliver the advantages of minimal fluid usage, minimal waste creation, dry swarf for recycling and reduced cycle times.

### Electro-discharge machining (EDM)

Used predominantly in engine manufacture, this technique is often applied for fine finishing applications. FUCHS has a range of approved fluids for such applications, designed to offer users assurances over safety in production and accurate machining results.

### Full line supplier

According to the Institution of Mechanical Engineers, 80% of all machine lubrication failures are due to incorrect lubrication. FUCHS, through expert lubrication and application knowledge as well as an unsurpassed range of machine lubricants and ancillary products, is able to provide assurances of reliability and performance for your company's primary assets.

### Broaching

The Broaching process of aerospace materials creates high demand from the performance of the cutting fluid. In addition, the correct selection of EP additives is important to achieve the necessary surface finish and required tool life. The use of a suitable cutting oil is particularly important for the very difficult-to-machine such as Inconel, Hastelloy and high-alloy steels which are used in the aerospace industry.



FUCHS Industrial Lubricants

## Innovative lubricants need experienced application engineers

Every lubricant change should be preceded by expert consultation on the application in question. Only then the best lubricant system can be selected. Experienced FUCHS engineers will be glad to advise on products for the application in question and also on our full range of lubricants.



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