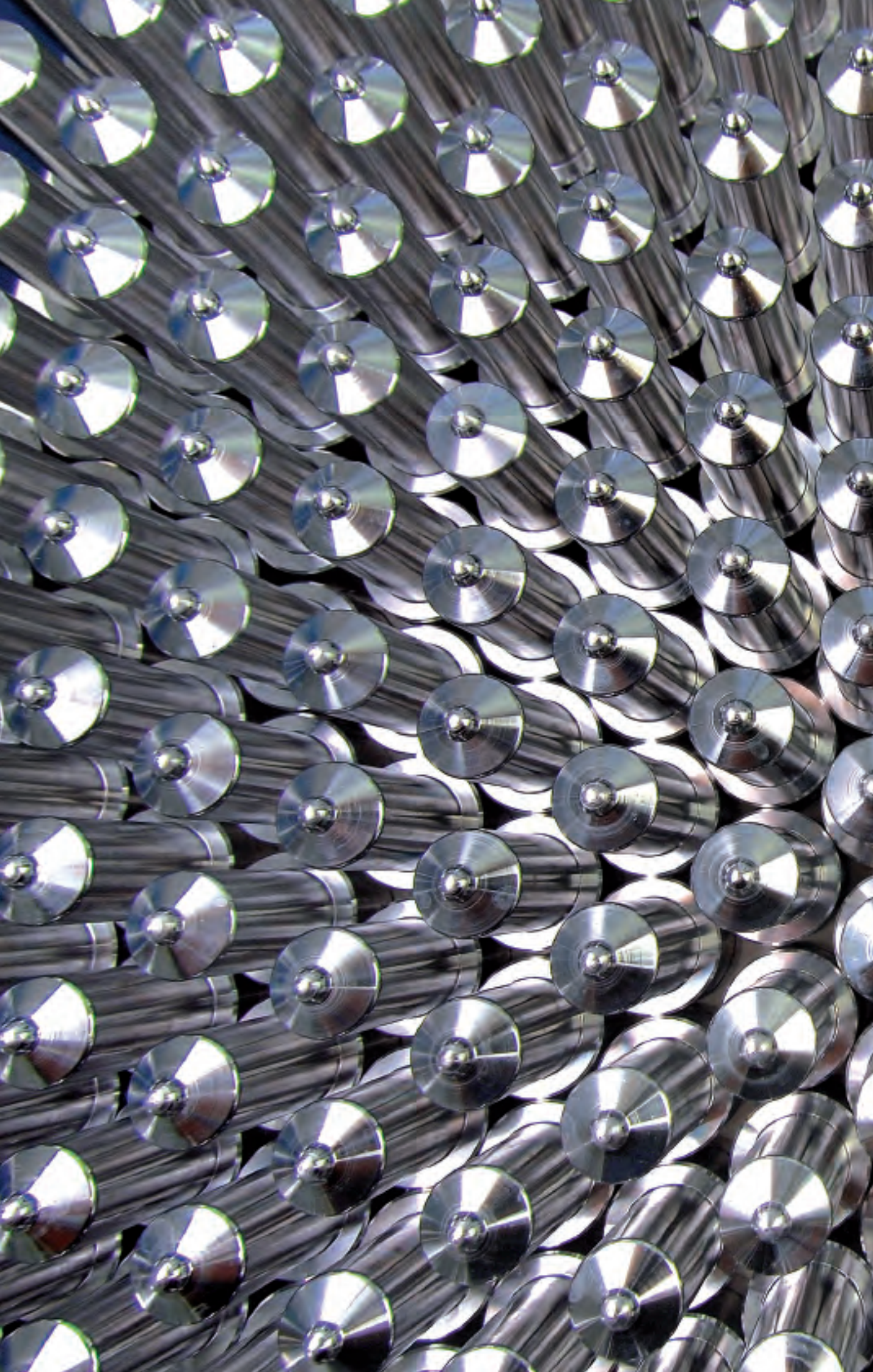


Precise. Innovative. Leading.  
**A portrait of the L'Orange brand**





Successful for over 80 years and a leading player in injection technology: L'Orange has reached its top position with a proven commitment to the utmost in precision and innovation. With this unwavering benchmark in the foreground, we succeed again and again at developing pioneering achievements that empower our international customers with leading-edge solutions.

All worldwide successful manufacturers of large diesel engines in the off-highway segment have come to count on L'Orange's power of innovation, knowledge and expertise, because they have a clear objective: to continue meeting future emission regulations on time. As their preferred market partner, we are well aware of our responsibility. This is why we are continuously setting new standards in injection – the key technology for diesel engines – with regards to quality, service life, fuel consumption and pollutant emissions, to enable our customers' advancement and to strengthen our leading market position.

Continuous improvement is our guiding principle. And the highest possible precision is behind our processes and products being ideally positioned to satisfy our customers' most discerning requirements – just like L'Orange technologies themselves. Our employees and our expertise establish the platform for our technological leadership. This is why we place as much importance on investing in training as we do on research, development and production technologies.

As a member of the worldwide Rolls-Royce Power Systems AG, which brings together comprehensive expertise in combustion engines, L'Orange makes a significant contribution to the Group's overall strategy. At the same time, the international Group provides L'Orange with sound financial backing. Especially in an environment of fast expansion, it is important for us to keep our open corporate culture and the vital character of a mid-sized organization. For our customers, we wish to remain an independent partner committed to delivering the best injection systems in the off-highway segment worldwide.

L'Orange's overriding passion is precision.  
One of the many we share with our customers

**Outstanding achievements come to life as the result of the consistent pursuit of a guiding principle. We call this guiding principle "Precision". At L'Orange, this is a universal benchmark reflected throughout all areas of the organization. It is expressed in our production, in how we deal with each other, in the way our projects begin and how they are executed, and especially, in how we work with our customers. Precision represents a clear and consistent orientation which is at the root of our common success.**

## Technological leadership

At the cutting edge of developments with all our products and services: as technological leader in injection systems, we place our priority, on the one hand, on the development and production of conventional solutions such as pump-line-nozzle systems, and on the other on the latest common-rail systems for diesel and heavy fuel – complemented by innovations such as dual fuel and water injection. Our objective is always to achieve sustained performance with low fuel consumption via precise fuel dosing – while respecting future emissions laws. The performance range of large diesel engines with L'Orange injection systems lies between 1,000 and 40,000 kW per engine. Their durability is such that we keep original spare parts available for older models to ensure many many years of use.

## Confidence

A strong collaborative effort – and even stronger results: building our customers' confidence and earning it again and again is intrinsic to our philosophy. Open, constructive discussion with our customers enhances our partnerships. Our approach is always led by the questions "What can we achieve together? How can we find the right solution?". Through close finetuning of the challenge presented to us, we develop system solutions that are ideally suited to our customers' requirements. And often it is the interplay of our customers' wishes and our vast experience that succeeds in bringing an even better idea to life. Since our products are used all over the world, we also ensure fast delivery of parts and reliable local service, thanks to our worldwide dealer network. This enables us, for instance, to demonstrate to our customers face-to-face just how the components of our injection systems can be assembled or changed.

## Specialization

Our markets are wherever our customers' engines are hard at work: specialization in medium-speed and high-speed diesel engines, as well as worldwide expansion, have led to our target market extending all around the world. The wide application spectrum in the off-highway segment for all international engine manufacturers is reflected in ships, locomotives, large construction vehicles, offshore drilling platforms and power stations. The fact that L'Orange injection systems work with the most varied types of fuel, as well as heavy fuel and diesel fuel, ranks among the many benefits they deliver. Thanks to meticulous optimization to the targeted function, the spectrum of applications as well as the reliability of L'Orange components are not subject to limitations of any kind.



High-level development expertise



New production technologies



Precise measuring technology



## Up front and face to face

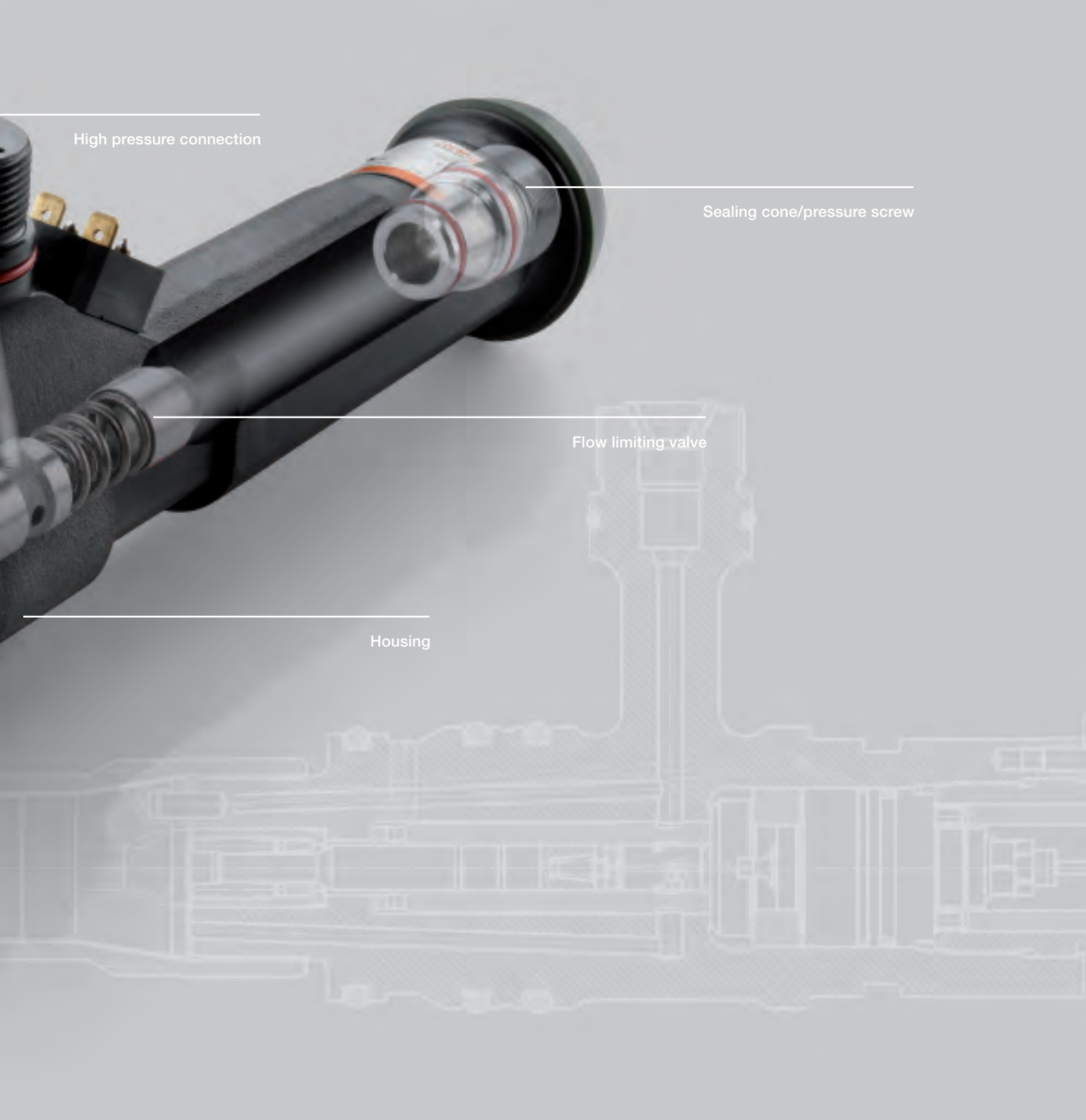
Face to face – rather than top to bottom. We at L'Orange deal with each other in an open and fair way – with our many employees in all areas of the company, who are focused on their tasks and who thrive on working in a constructive environment. This is why we invest heavily, in fact well above average, in our own expertise. We are continuously enhancing our power of innovation with idea management, ongoing improvement processes and a well-functioning employee suggestions system. Personal and professional development is strongly promoted through ongoing training and coaching. Our competence is further empowered with knowledge management. Moreover, promoting and supporting new talent plays a very special role at L'Orange as well. Yearly we take on a large number of trainees, interns and diploma students – cultivating close collaboration with universities and colleges.

Being a step ahead is a given at L'Orange.  
Because our customers deserve it



## Development expertise

Every single injection system our engineers develop serves three goals: the highest possible engine performance, optimized consumption and reduced emissions. Precisely defined and meticulously implemented development processes lead us to the best results. Multifaceted, real-life functional testing ensures this even before production begins. Each and every development process follows a targeted and results-oriented logical sequence. Even before the creation of initial prototypes, thorough analysis and simulation show whether the result is promising and in line with strict legislations. Our products' outstanding durability is further enhanced thanks to complex trials through over 20 component test benches for functional and endurance testing. In high-precision measuring procedures assessing pressure, temperature and pathways, we assess achievable results with high-level reliability. Injection pressures of 2,500 bar and more can thus be realized. To this end, our applied measuring technology is continuously optimized and further developed.



High pressure connection

Sealing cone/pressure screw

Flow limiting valve

Housing

## Ongoing advancement

Ongoing development is intrinsic to what it is that ultimately differentiates us in the marketplace. The fact that L'Orange engineers make use of their extensive experience in pre-development ensures that we are always a step ahead. Identifying today what will be required tomorrow, so that our customers do not have to wait for results, but can productively work with our solutions.

An example of our very special developmental expertise is L'Orange's spray diagnostic capability, whereby in testing without combustion, spray patterns from the nozzle can be gathered. These injection images deliver precise information on the quality and fineness of fuel atomization. This in turn is a key requirement to the especially efficient fuel consumption through L'Orange injection systems.



## Environmental protection

Since we not only contribute to environmental protection through continuous reduction of emissions and consumption reduction of our components in our customers' engines, as a company we are also committed to have our processes certified regularly by international environmental management norm DIN EN ISO 14001.

National and international safety orders and standards are especially stringent with respect to maritime applications. We implement all required authorizations and approvals using state-of-the-art equipment either in our own laboratories or on site at our customers' facilities. Partially under the supervision of renowned classification companies, or on our own authority on their behalf. L'Orange, with its worldwide presence, components that achieve continuous, high-level, reliable performance on all continents and in a wide variety of applications, is ideally positioned to make a sound quality promise: L'Orange technology is made in Germany.



In case where a 'thousandth' is decisive,  
nothing less than the highest level of precision will do

**Since our injection technology achieves heavy-duty performance for diesel engines, its manufacturing also needs to achieve the highest possible standards. L'Orange's state-of-the-art production processes and technologies guarantee the most high-precision, efficient manufacturing possible.**

## Customer orientation

From the selection of materials we work with through to processing, we work with a single standard: our customer's. In our production facilities in Glatten and Wolfratshausen, we hone, turn, mill, ream and grind – also working with robot-supported facilities of the highest quality. We harden steel in our own vacuum ovens, creating extremely compression-proof, wear-resistant materials. We further increase our components' service life through treatments in our high-pressure, radial expansion facilities which reach pressures of up to 10,000 bar. And, since even the tiniest impurity may imply a compromise in quality, at L'Orange, individual parts are assembled in a controlled clean room. Completely new production processes and manufacturing technologies are stringently assessed prior to their use via a separate process impact analysis (P-FMEA), machine capability testing (MFU) and pilot application testing.

## Process teams

Product-related, organized process teams ensure a perfectly smooth and efficient manufacturing process, which contributes to a high level of employee identification with our products and components. This is another reason behind L'Orange's outstanding quality. Our high investment in ongoing renewal and optimization of our machinery pays off for all our customers.

## Quality

For over 80 years, quality has been our standard as to how technological possibilities are capitalized on to the greatest extent possible and taken forward step by step. And always with the ultimate goal of selecting, testing and processing materials to ensure that our injection technology sets new standards and exceeds even the most stringent requirements. Such a quality standard can only be developed and maintained when the strictest criteria are used to evaluate products and processes. All our products go through thorough functional testing prior to their being delivered to our customers. To measure the most minute manufacturing tolerances, we work with all established measuring technologies such as 3D coordinate, form, surface and contour measuring technology, and we use function and endurance testing facilities as well. And of course, at L'Orange, quality optimization according to ongoing certification according to current DIN EN ISO 9001 norms is a given.



Original spare parts



Common-rail injectors



High-pressure pumps



## Service worldwide

As a Rolls-Royce Power Systems AG company, L'Orange employs a staff of over 1,000 employees throughout their worldwide customer network, to ensure a strong service and sales presence to support L'Orange brand quality. In Germany, L'Orange has four locations. Company headquarters in Stuttgart-Zuffenhausen house research and development as well as central sales. Both production facilities in Glatten (Baden-Württemberg) and Wolf-ratshausen (Bavaria) clearly reflect L'Orange's 'made in Germany' promise. And finally, in Northern Germany, we have a Service center in Rellingen near Hamburg.

Our subsidiary L'Orange Fuel Injection Trading (Suzhou) Co.Ltd., located in Suzhou, China, closely follows the same path of globalization as our customers'. As a regional service center, they are responsible for local sales, quality assurance and purchasing.



# HERITAGE

Bringing the future to life through our long-standing expertise:  
Innovations from L'Orange

1909 Pioneer Prosper L'Orange develops the prechamber principle for diesel engines

1933 Rudolf L'Orange founds the Gebrüder L'Orange Motorzubehör GmbH

1950 The unit injector is filed for patent

1965 Development of in-line and V pumps for large diesel engines

1977 Serial production of the patented monoblock pumps for heavy-fuel applications

1996 First electronic common-rail injection system for large diesel engines worldwide

2001 Common-rail injection systems for heavy fuel go into series production

2006 Second generation of the common-rail injection systems enters serial production

2009 Founding of L'Orange Fuel Injection Trading (Suzhou) Co., Ltd. in China

2014 L'Orange becomes member of the Rolls-Royce Power Systems AG

