

## DUAP – Quality is based on History

The history of DUAP is a story of continuity on the one hand and flexibility on the other. Since its establishment in 1943 DUAP has manufactured injection nozzles. The first customer was the leading tractor manufacturer in Switzerland.

Since 1963 DUAP have made co-operation agreements with the some of the most important engine builders, for example Sulzer brothers, S.E.M.T. Pielstick and Wärtsilä for whom DUAP has developed and produced modern injection systems for their engines.

During this time injection systems for Diesel engines of all power ranges have been delivered throughout the world covering the complete scope of applications, Marine, Traction, Stationary, Automotive, and Aeronautical. Based on its extensive experience DUAP is pushing forward with its own research and development into new areas of material processing.

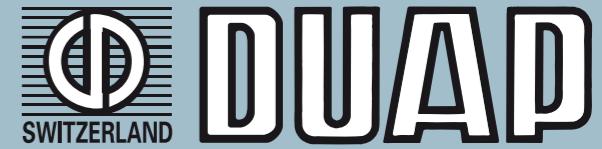
1943	Founded
1956	Move to present factory
1969	Commencement of high precision manufacture (turned parts from drilling machines)
1983	First pump injector built by DUAP
1985	Continuous extension of own heat treatment plant
1987	Focus on EFI Diesels with manufacture of trial samples and testing equipment
1996	Building of the first Piezo Common Rail injector
1998	Launching of the new high quality DUATOP product range
2000	Market introduction of the DUARAIL common rail system with modular construction, own high pressure pumps (up to 2000 bar), high pressure piping systems and rails, injectors and electronic controls.
2006	Introduction of the RECON for EFI diesels.



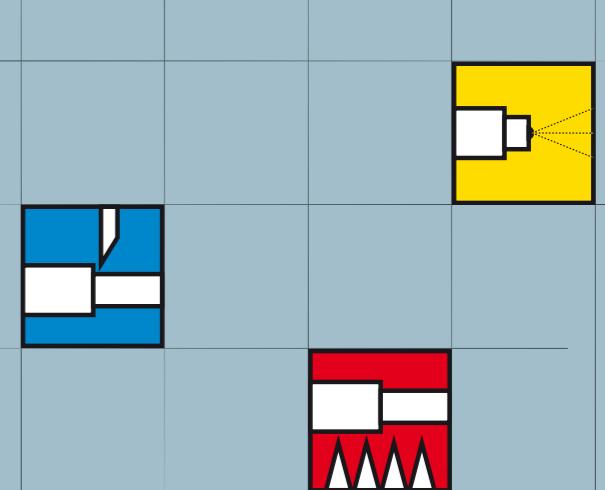
Fuel Injection Systems  
dedicated to high-precision

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## INJECTION SYSTEMS (EFI DIESELS)

DUAP develops manufactures and sells complete injection systems and their spare parts throughout the world. A re-conditioning service is also offered to the original manufacturer of large diesel engines. In this way a long term co-operation is built up between the users and the suppliers of our products.

DUAP also continues to develop spare parts such as nozzles, pump elements, constant pressure valves and delivery valves to ensure the continued economic viability of older engines even after the engine builder has ceased further development, for example the very popular DUATOP nozzle solution.



With the launch of complete common rail systems (EFI Diesels) electronic components have joined our range under the brand DUATRON. These components complement the functioning of our DURAIL systems in an optimal way. The mechanical, hydraulic and electronic facets of our system are carefully matched one to another in order to provide the ideal overall system. The results are: long life of the engines, lower fuel consumption and reduced outputs of NOX and HC providing a significant benefit to our customers and the engine operators (shipowners, energy producers, railways etc.)

DUAP has focussed on Diesel engines, Heavy Fuel engines and pilot injection systems on gas engines. In the area of large diesel engines we cover all applications. Our systems are installed on main and auxiliary Diesels engines on ships as well as on locomotives and industrial power generating stations. The power range goes from 500 kW to 20 000 kW. With the combination of several high pressure pumps in pressure units a considerable greater power range can be covered.

DUAP offers the highest quality with all its components, pump elements, pressure valves, injection nozzles and injection systems. Leading engine builders and their customers rely on our products thanks to our experience and strict quality control throughout the manufacturing process.



The creativity of our staff is a vital thread in our success. They are the people who are responsible for the high quality of our products. Our workforce is highly trained and well motivated and they are both challenged and supported by DUAP.

### EFI DIESELS

- E = Electronical, mechanical, hydraulical
- F = Fuel means: Diesel, HFO, Gas, Biomass
- I = Injection up to >2000 bar
- DI = Diesel, 2 Stroke, 4 Stroke
- E = Engines for ships, energy production, locomotives, big trucks
- S = Special (designed)
- E = Executions (very light, small, big, etc.)
- L = large 500 kW-20 000 kW and more
- S = size 6 Cyl.-24 Cyl.

## INNOVATIONS FROM DUAP'S SAMPLE TESTING CENTRE

Development is required not only in the design of new components but also in production. In many cases it is necessary to develop the processes which make it possible to realise new technical ideas. Our production has its own 3D large-screen computers with software and hardware which is compatible with our development department. «State-of-the-art» calculation and simulation programs are available to both departments.

In our sample testing centre we are able to carry out further development of injection systems in large and small Diesel engines with a particular focus on optimising the atomisation and combustion processes in the cylinder.



Our production and development departments are very flexible. With the latest machining centres we are able to produce complete systems from A – Z and with our highly qualified staff we can take a project from computer drawings to finished product in the shortest possible period meeting customer requirements in a timely and economic way.

In co-operation with well known engine builders we are developing products for new applications as well as producing prototypes and small batches for testing. The modern technical infrastructure and the know-how of our development engineers ensure practical solutions will be found.



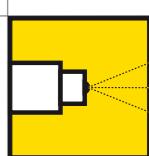
### QUALITY

At DUAP we produce quality rather than rely wholly on retrospective control systems. For this reason our workstations are equipped with all necessary measuring instruments.

Under the expression «quality» we are not talking of something which is just good. We are talking of:

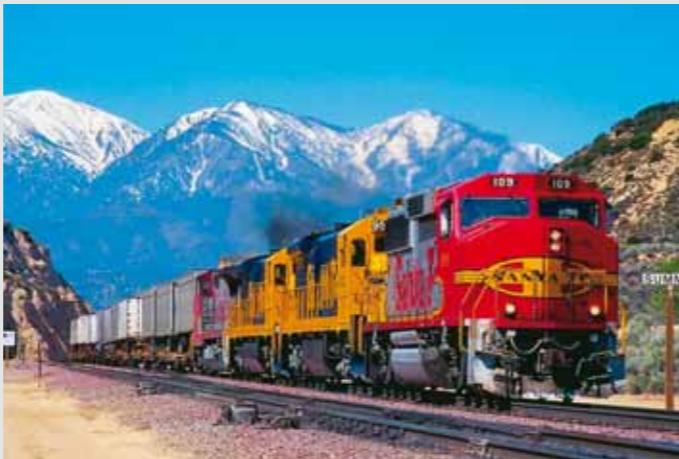
- The highest precision in machining according to the drawings
- Correct function in practical operation by continuous improvement
- Long operational life maintaining constant function
- Low environmental impact
- Economical use of resources

As a medium sized company we believe that our strongpoint is in providing quick decisions and our high adaptability to new factors. We offer «tailor-made» solutions in order to match our customers' requirements.



## INJECTION SYSTEMS FROM DUAP MOVE THE WORLD

Large Diesel engines keep the wheels of the world's economy in motion. Injection systems from DUAP guarantee a reliable, economic and environmentally friendly operation of the power units in industrial generators, ships and locomotives irrespective of size. Ultra-light injection systems are also built at DUAP for special applications in aircraft, truck and car engines.



2 Stroke Diesel 80 080 kW (108 900 PS)



## RECONDITIONING

With the reconditioning of injectors, pumps and pressure valves we offer the engine builder an additional service. Parts operating under high pressures, must be machined with the greatest precision and assembled under clinically clean conditions. As part of our policy to ensure the economic use of resources we offer a reconditioning service for these products at planned intervals which have been agreed with our customers. In this way we are able to control the function of injection components which have already been in operation for a long time, and we guarantee optimal reconditioning in our dust free assembly rooms with the result that we can offer an «as new» guarantee for the additional operating hours.

## HEAT TREATMENT (HARDENING)

In addition to our internal requirements for EFI Diesels and high precision parts, the heat treatment plant works mainly (i.e. more than 80% of the total turnover) for third parties, who measure performance by the durability of these products.

- We have extensive experience with the general thermal treatment processes as well as with specific processes developed for individual applications.
- We focus on the metallurgical analysis and provide our customers with these analyses and relevant laboratory certificates.
- We are certified in accordance with ISO 9001

Our equipment is computer controlled and is available to our customers seven days a week. As a result we can collect the customers' goods before the weekend and deliver them back in time for the beginning of the next week.



## FOCUS ON ESSENTIALS

Our customers gain from the professional way in which our staff can load and feed the hardening and annealing furnaces as well as the equipment for vacuum nitriding, carbon nitriding, annealing and soft nitriding. In these areas we have developed our own processes to meet our customer's specific requirements.

Today a modern heat treatment plant can only be operated with its own metallurgical laboratory and with close connection to material research institutes such as EMPA, ETH etc. Consequently we have specialists available in the area of ships maintenance, hardness measurement including measuring the depth of hardness. This is complemented by our own test equipment which is up to the latest technical standard.



## HIGH PRECISION PARTS (MACHINING)

DUAP is a specialist in high precision machining. Our extensive experience combined with our modern and flexible work centres ensure the highest quality in all processing areas from turning and milling to heat treatment and the finest finishing processes such as grinding, lapping, remaining and honing. Irrespective of whether non-ferrous metals or high value tool steels are to be machined, DUAP will meet even the most unusual demands.



Our machining centre is equipped with «state of the art» drilling machines. They form the basis for a successful co-operation. Everyday we gain new experience from the processing of high precision parts.

We machine:

- Rotationally symmetrical parts on multi axis turning machines and
- Cubical parts on palette loaded machining centres

We specialise in:

- Deep hole boring using machines which were developed by us
- Internal, external, flat and round grinding
- Honing, lapping, producing precision radii
- Assembly of complete units in clean room conditions (absolutely dust free)

The machining centre has profited from the long-term development of DUAP and is today in the position to operate as an independent profit centre.

We work mainly for the aerospace, medical, turbocharger, security, engine, turbine, defence industries and for special processes where the highest quality is demanded.

The all embracing professional competence of our staff and our modern infrastructure provide the necessary preconditions for satisfying the many demands of our widely distributed customer base.



## EVERYTHING FROM ONE SOURCE

Our specialised workforce forms the basis of our high precision manufacture of injection systems and components to  $\pm 2/10,000$  mm. Our scope of supply covers everything from the planning of new developments, production in our own high precision machine centre, heat treatment, stringent quality control up to and including a highly effective world-wide distribution network.



## COMPANY PHILOSOPHY

It is important for our customers to know what sort of a company we are and how we approach our responsibilities in business.

Man stands at the centre of our philosophy. To identify correctly his wishes and complex problems and to offer solutions for these, is in the interests of both parties. We have to listen! «Give and Take» is an intrinsic part of all partnerships and from this stems the AVSP (added value sharing partnership) Philosophy.

