

WATERjet[®]

micro|waterjet[®]



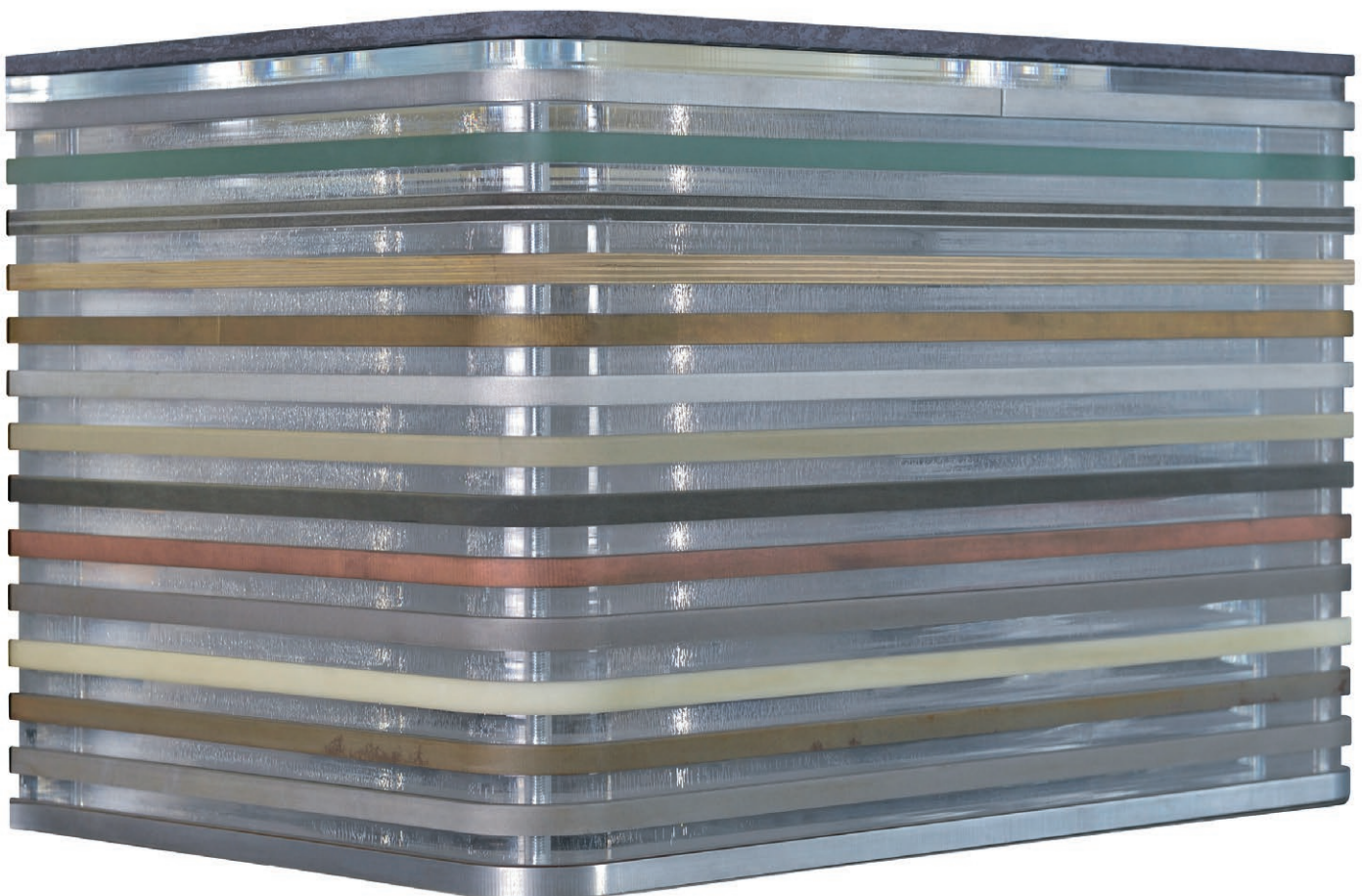
SWISS WATER JET TECHNOLOGY
SINCE 1989

PROCESS

ONE PROCESS FOR ALL MATERIALS

Waterjet is the European leader in the field of water jet cutting and machining. Our water jet cutting process is a cold separation process at both the micro and macro level. It combines the advantages of other methods with those of the water jet: Water jet cutting technology is thermo-neutral and cuts virtually all materials, making it an efficient alternative to conventional separation methods.

With water jet cutting, there are no thermal stresses in the material during the cutting process. Therefore the material realizes no deformation and both the micro-structure and strength of the material are maintained. There are no cracks, recast layer or toxic gases. Cutting takes place without stress.



Great cutting performance.
High material thickness.
All Materials

ONE PROCESS. 3 METHODS

During the water jet cutting process, inside a HD pump water is pressurized between approx. 350 – 6200 bar (5,076 - 89,923 psi), routed through a needle valve, rectified (laminar) in a collimation tube and delivered to the water nozzle. In this nozzle, which has been developed specifically for this purpose, the pressure is converted into a speed of approx. 900 m/s in accordance with the baffle plate principle. Our patented AWJmm® (abrasive water jet micro machining) technology is used to set the pressure and velocity distribution in the water jet for its subsequent task. This way, we achieve a high energy density, optimum acceleration of the abrasive particles and a clean, precise cut.

METHOD: PURE WATER

During pure water jet cutting, the AWJmm® technology generates an extremely dense and concentrated jet that remains coherent over a longer distance and that cuts the respective materials precisely with a jet of 80 µm. This method is particularly suited for soft materials, such as plastic, foam and rubber.

METHOD: ABRASIVE

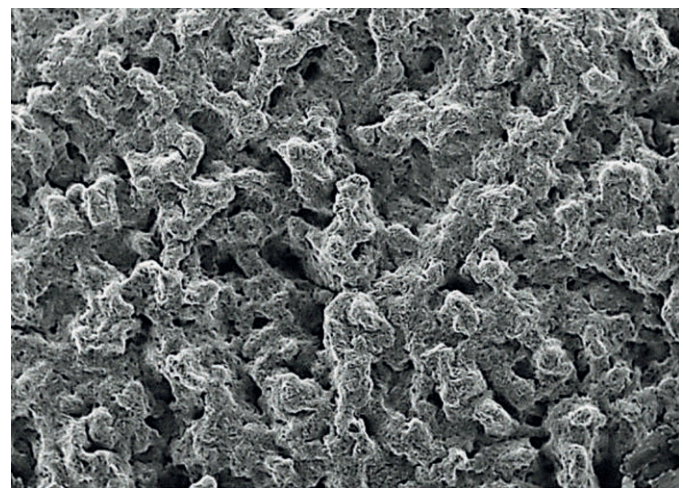
Abrasive water jet cutting is an addition to pure water jet cutting and was developed for cutting hard materials. The abrasive water jet hits the work piece with an impact speed of 500 to 700 m/s. At Waterjet, we distinguish between macro and micro cutting

Macro water jet cutting: AWJmm® technology is used to set the water jet to the optimum acceleration of the abrasive particles. The objective is a high and precise cutting performance.

Micro water jet cutting: AWJmm® technology is used to set the water jet to an optimally round, coherent jet. The abrasive particles take on this shape and are accelerated. The objective is the highest level of precision and the finest cuts.

METHOD: SUSPENSION

With the suspension jet principle, a pre-prepared mixture (suspension) of functional particles and liquid is expelled from the cutting nozzle under high pressure. This method is particularly suited for structuring, peening, shot peening or changing the material surface or the microstructure. At Waterjet we are, particularly in this method, raising the bar and holding a number of patents. The photo below shows a nanostructure on titanium, created in Aarwangen using the water jet slurry method.



46.1

2015.09.29


HMUD7.7 x100

1 mm

PROCESS

THREE METHODS FIVE APPLICATIONS

The following machine concepts are used for the three «pure water», «abrasive» and «suspension» methods at the Aarwangen headquarters of Waterjet AG:

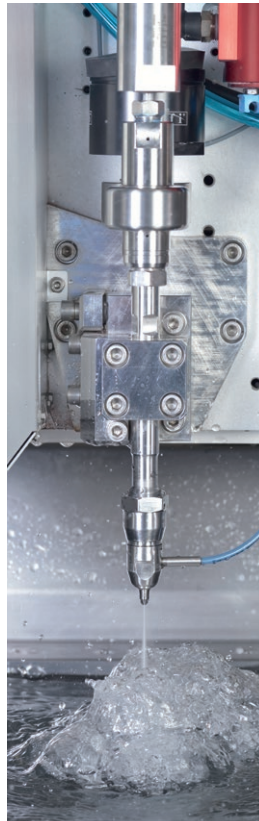
- A** 2D machines up to 3m x 8m, incl. twin head, partially with rotation and/or drilling axis
 - B** 3D machines up to 3m x 6m x 1.2m, partially with rotation axis or twin head
 - C** High-precision water jet machines 1m x 0.6m, partially with drilling axis and twin head
 - D** High-precision water jet machines with taper compensation 2m x 3m
 - E** 6-axis high-precision robot for 2 different applications
-  For the current machinery, please visit: <http://www.waterjet.ch/en/machinery>



A



B



C



D



E

ADVANTAGES

THE 4 ADVANTAGES OF WATER JET CUTTING

CUTTING QUALITY ACCORDING TO SN 214001:2010 IN (ALUMINIUM, 15MM)



ECONOMICAL

Water jet cutting is resource saving (the small kerf helps to save raw material) and cost saving (e.g.: due to the selection of the cut quality, from the separating cut to the high-precision cut). As we work with a flexible tool and low set up time, we are fast and efficient, even with small series.

We cut even the hardest materials with only 2.7 litres of water and 350 grams of abrasive per minute; at the micro level, this is even less with 0.17 litres of water and 10 grams of abrasive. With a new computer- controlled pump management system, we are reducing the energy consumption by half.

PRECISE

Precision in water jet cutting was introduced by the AWJmm[®] technology and is recently even more important than small dimensions or overall size of the parts. For Microwaterjet[®] this means, for instance in material with a thickness of 1mm, a process capability of 30 μ (manufactured with a Cpk value of 2.5), a 200 μ kerf and a positioning accuracy of up to 0.5 μ m. Thanks to the unique, patented SK15 cutting system and the “Jetfeed μ^2 ” abrasive dosing system, we cut with high precision and minimum taper.

MATERIAL-EFFICIENT

Water jet cutting facilitates gentle cutting in the micron range, even of thermally sensitive materials, composite materials and exotic alloys. “Cold cutting” prevents structural changes in the material. With water jet cutting, the mechanical stress exerted on the material is very low.

DEFINED PRODUCTION CONDITIONS

High-tech products for medical technology made of biocompatible materials, seal parts for mechanical engineering, components made of composites for automotive suppliers – at Waterjet we cut all materials under production conditions defined by the customer. If required, we cut in a protective atmosphere and use special particles and fluids.

THE 5TH ADVANTAGE OF WATERJET AG

Access to all 5 applications means that we are extremely flexible, while our large range of machinery means that we are unrivalled in terms of speed.

MACRO WATER JET CUTTING

HIGH CAPACITY – SHORT DELIVERY TIMES

CAPACITY

Due to the large, diverse range materials inventory, coupled with the state-of-the-art 2D, 2½D and 3D cutting machines, we are able to process customer orders within a very short time. For instance, we are capable of machining 50,000 semi-finished products made of 12 mm titanium within a few days. If required, we can produce in shift operation and/or unmanned. This is supported by our flexible staff and our «AWJmm® process control».



CUTTING

In the core competency of cutting at the macro level, there are no limits for Waterjet AG. We cut on the largest CNC machining centres in Switzerland. For instance, 100 pieces of 8 x 3 m aluminium sheet for a facade, which had a hole pattern and, when put together, formed a picture (see image on the left). Or 8 m rods made of wear-resistant sheet metal as an protection grille for a hydraulic power station.

The picture above shows the cutting of a shell segment for the Anna-Maria Bauer fountain (image on the right) at Bremgarten AG.



GEOMETRIES

The extremely strong cutting jet with a diameter of 0.8 mm facilitates the cutting of complex geometries even in thick, high-tensile materials. We do not require any start holes, even for internal contours. The high-energy jet pierces through the material very quickly. The efficient nesting process helps to save raw material; by merging the cuts, additional costs can be saved.

ENGRAVING

The water jet technology of the Waterjet Company is also suitable for engraving all, even soft, materials. The challenge lies in selecting the parameters. With this method that we developed in-house, we engraved, for instance, a cross pattern and product name on 5.5 m x 2 m die plates. Further applications of this method are cooling slots in grinding discs, centre markings, labelling, etc.

The image above shows a die plate engraved in Aarwangen and the product (PavarooF) manufactured by Pavatex SA.



3D THE LARGEST 3D SYSTEM IN SWITZERLAND.

WATER JET CUTTING

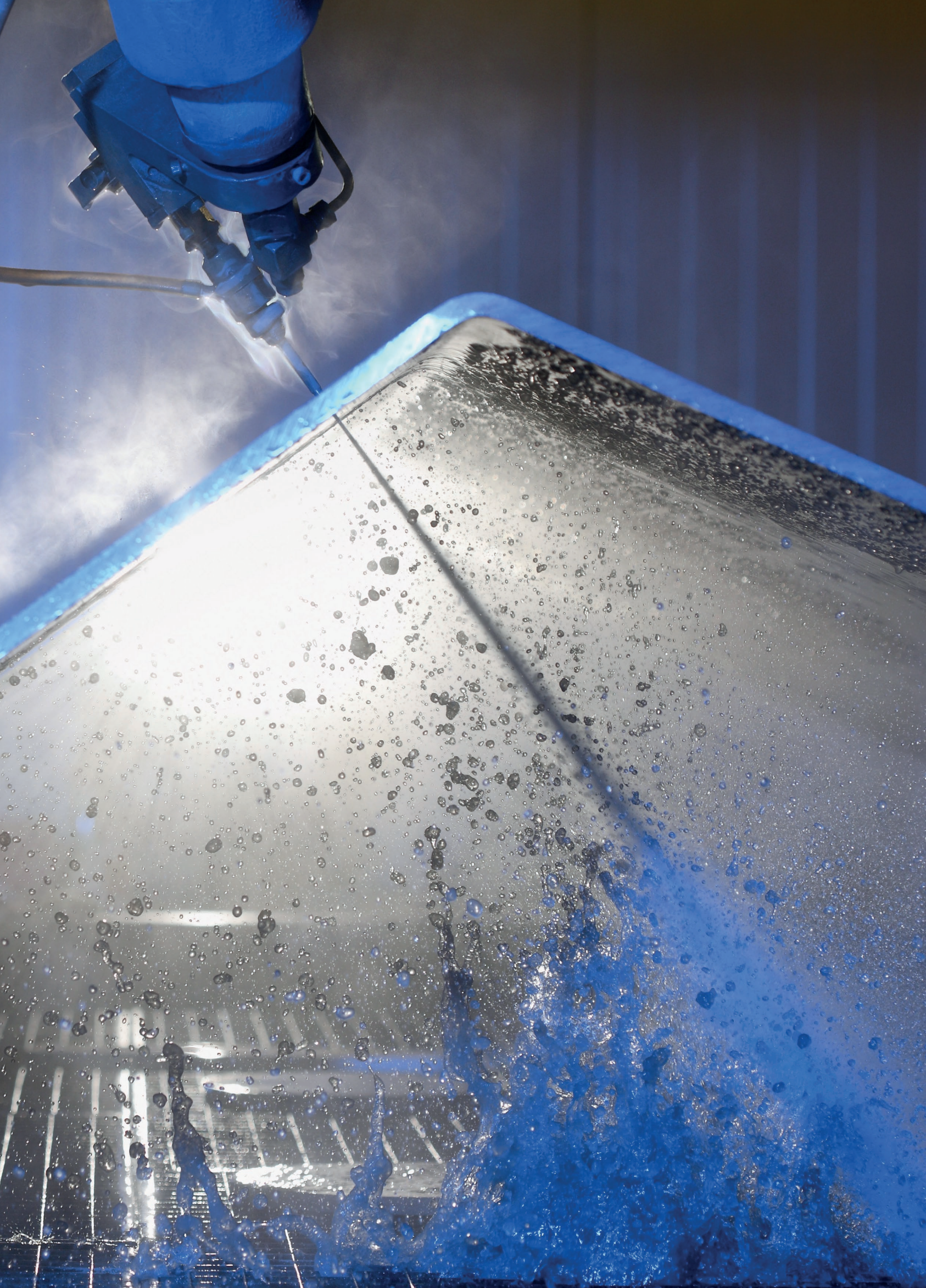
At Waterjet, we cut with the largest 3D water jet cutting machine in Switzerland: 6 x 3 x 1.2 m. In addition to this machine, we operate further 3D machines, one of which is equipped with twin heads and one with a rotation axis.

The cutting heads are integrated in a 3D high gantry. Five simultaneously controlled CNC axes facilitate a perfect three-dimensional cutting process. For complex 3D parts, the jet is stopped by means of a device we developed specifically for this purpose.

The portal is designed as X, Y and Z plus two rotation axes A and B, where A (rotation around Z) has a range of movement of $\pm 360^\circ$ and B (rotation around X) has a range of movement of $\pm 90^\circ$.

Examples of applications in areas where we cut in 3D include mould design and construction, architecture, mechanical and apparatus engineering, model making, turbine technology and plastics engineering. Example, image right: 20 mm special aluminium for the electrical industry.





MIKRO

MICROWATERJET® HAS

REVOLUTIONISED WATER JET CUTTING.

MICRO WATER JET CUTTING

Micro water jet cutting (Microwaterjet®) is a cold, thermo-neutral separation process at the micro level. Micro water jet cutting is used both in pure water jet and abrasive processes.

Micro water jet cutting was developed by company founder Walter Maurer and the team of Waterjet AG. With this innovation, Waterjet AG responded to customer requirements and the economic crisis at the start of the millennium. Conventional macro water jet cutting lost

market shares as the high-tech industry demanded finer structures and parts. Our objective is to improve the state of the art waterjet process. Width of cut by a factor of 5 and accuracy by a factor of 10.

To achieve this, we developed a new technology, AW-Jmm® (abrasive water jet micro machining). In addition, we developed a new generation of water jet machines, which are constructed on a 6 ton machine bed with a state-of-the-art measurement system that offers a scale resolution to 10 nanometres. This way we achieve a precision of positioning of 0.5 μ . With this machine concept and the patented clamping system, we have been setting standards to date and thus established the Microwaterjet® process.

ADVANCEMENT THROUGH TECHNOLOGY

In the pure water process we reduced the kerf, to 80 μ m and in the abrasive process to 200 μ m. We are able to achieve a surface quality $< Ra 1.6$. Continuous optimization and development in the laboratory enhanced the process-capable cutting jet. Under laboratory conditions, we are already cutting significantly below the values mentioned above.

Due to this new technology, we gained new customers from the following segments: Mechatronics, measurement and control technology, aeronautics, medical industry and the watchmaking industry. This industry sector requires more finely crafted components made of special materials, composites and other materials.





highspeed
waterjet

μ^2

BALLUFF
Order Code BC80001
DC 24V/0.1A/500mA/500V
IP67
100% Dustproof
100% Oilproof
100% Shockproof
100% Vibrationproof

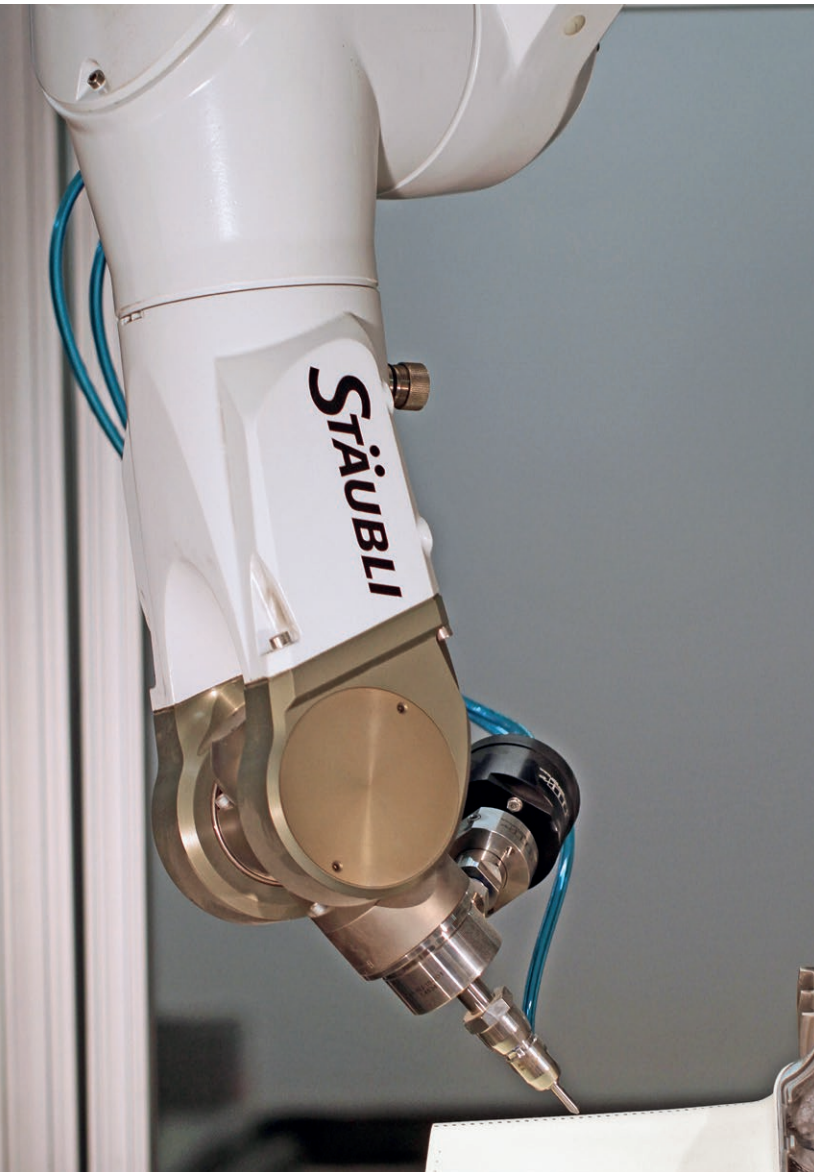
PROCESS OPTIMIZATION

FULLY AUTOMATIC

AUTOMATION

Automated production means fully automatic in un-manned (to some extent 24h) operation or semi-automatic. This enables us to reduce the production costs and reliably produce large quantities within a short period of time. We have two robot applications in place for such orders: A 6-axis high-precision robot with

automatic parts catcher that works according to the principle «robot moves piece» (RMP) with a spiral conveyor, and a 6-axis high-precision robot that works according to the «robot moves tool» (RMT) principle, both of which can be equipped with a loading and unloading system, if required.



WATERJET AS A DEVELOPMENT PARTNER

From simple water jet cutting to complex projects including product development in all five applications, we act as a development partner or general contractor. We conduct feasibility studies and analyse the situation for and with the customer, develop the relevant solutions in the fields of material (procurement and machining), production (cutting processes and supplementary processes) and logistics. On request, we supply our customers with structural components ready for assembly.

PROCESS DEVELOPMENT

Process development is one of our key competencies. Coordinated process development is essential for numerous manufacturing processes. In water jet cutting, process and method development are closely connected and often result in a cutting test or manufacturing of a prototype. We work for numerous certified high-tech companies: automotive manufacturers and suppliers, medical technology companies, the Swiss watchmaking industry and various machine building companies.

Our process development is always two-fold: on the one hand we optimise the manufacturing process for our clients, while on the other hand we optimize our internal processes at the same time. On this basis, we have reached international standards in «lean production» through to remote-controlled unmanned 24h-production.



RESEARCH AND DEVELOPMENT

TIME AND WATERJET AG

DO NOT STAND STILL

INFRASTRUCTURE / LABORATORY

The Swiss Competence Centre of Water Jet Technology, which is located at Waterjet AG in Aarwangen, accommodates high-pressure systems that feed media to the cutting system at a pressure between 25 bar and 10,000 bar.

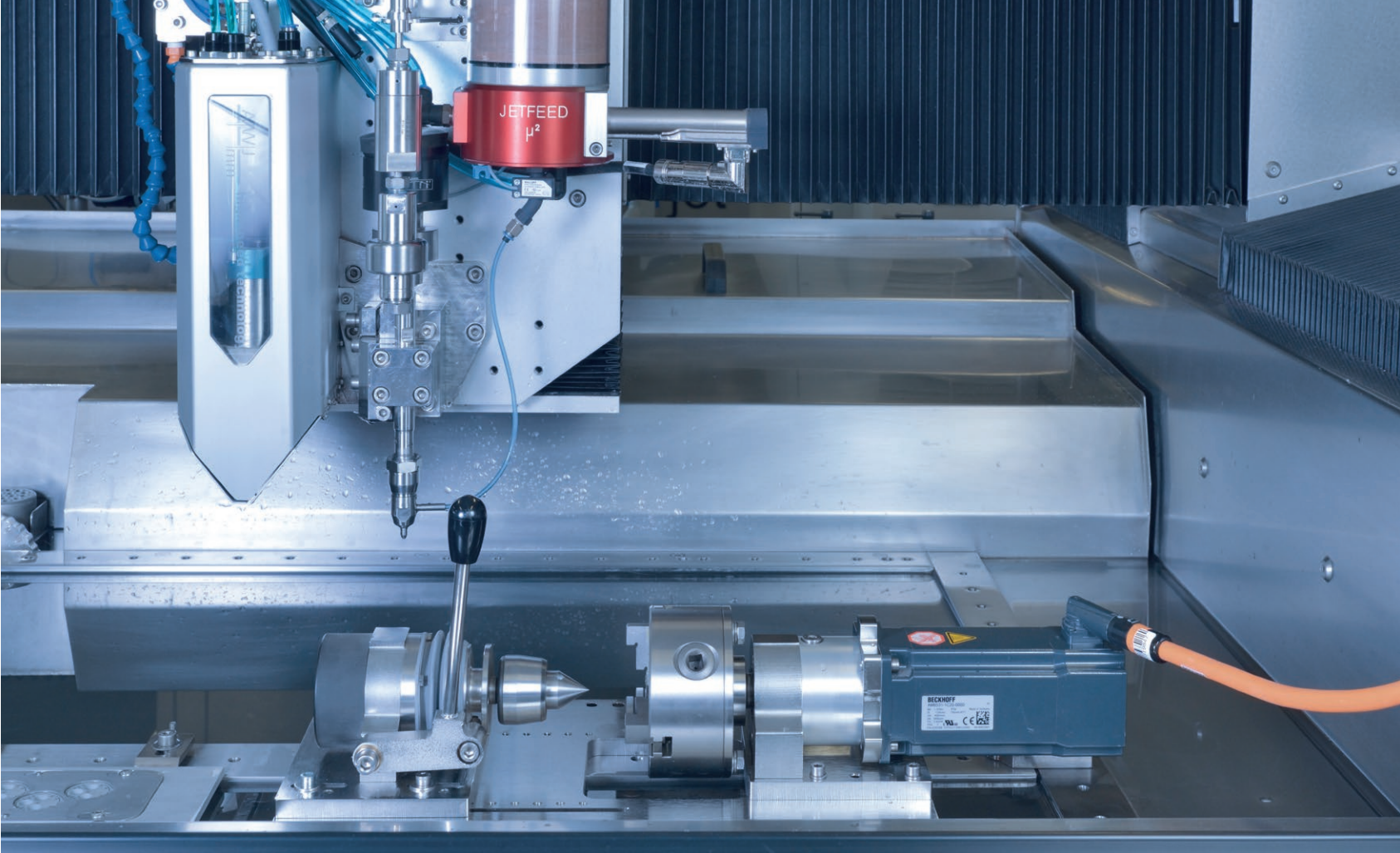
In the laboratory, three engineers develop and improve processes, components and software, and conduct feasibility studies. In addition to state-of-the-art measurement and analysis technology, the engineers have two high-precision water jet machines at their disposal.

CUTTING SYSTEM

Among other things, the key element of micro water jet cutting is, the cutting system. Through optimization and redevelopment of the components, we continuously improve and scale down the system.

The following brands are trademarked: Jetfeed μ^2 , awjmm highspeed technology, waterjet, microwaterjet, awjmm, conformjet, awjm, awjd.





OTHER IMPORTANT COMPONENTS / DEVELOPMENTS OF **WATERJET AG:**

ABRASIVE DOSING SYSTEM

Our «jetfeed μ^2 » particle dosing system continuously and precisely feeds between 3 and 300 grams of functional particles per minute to the cutting system.

HIGH-SPEED DRILLING AXIS

The «AMJmm highspeed technology» electric high-precision drilling axis continuously powers diamond or carbide tools for milling and drilling with 100 to 50,000 rpm.

MULTI-HEAD MACHINE

With a suitable geometry and large quantities, we can also employ twin or multiple heads for cutting at the micro cutting level.

SOFTWARE

In addition to the AWJmm® (abrasive water jet micro machining) technology, Microwaterjet® also uses software for process optimisation, the Microwaterjet® tool, which we developed in-house. We use this tool to design processes even more efficiently and achieve even better results.

ROTATION AXIS

CNC rotation axis synchronously controlled and a backing device.

ROTATION DEVICE

Rotation device with an infinitely variable drive for machining rotating parts («water jet lathe»).

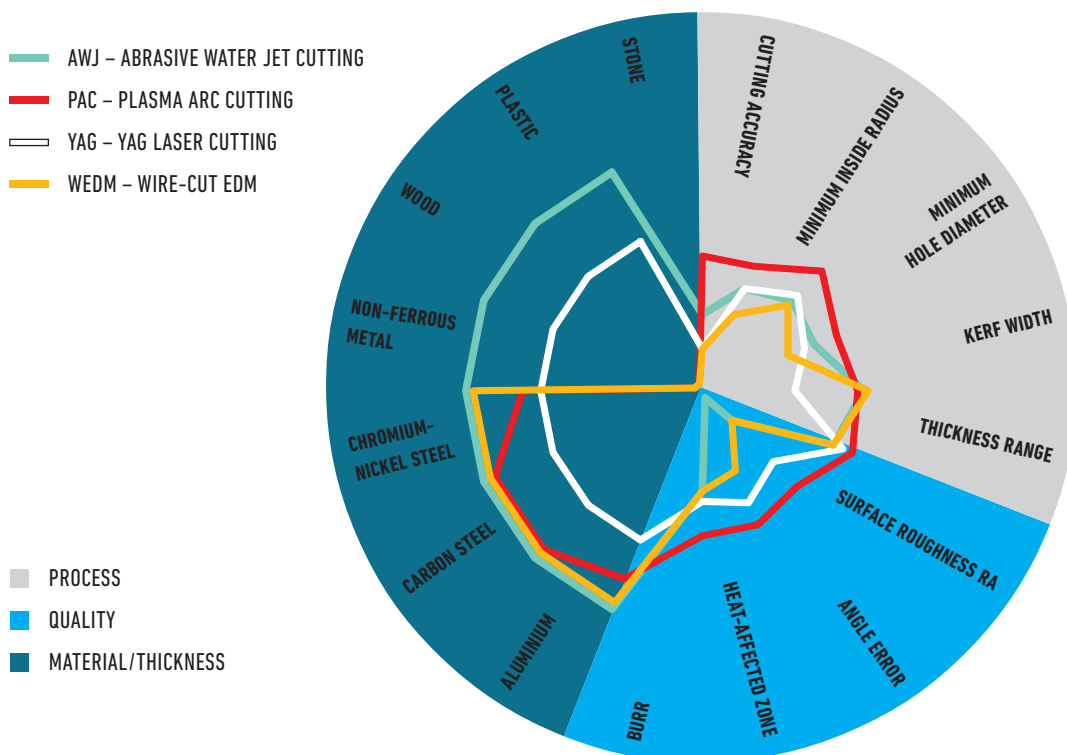
MATERIAL

WATER JET CUTS ALL MATERIALS.

A FOR ARAMID. Z FOR ZIRCONIUM.

Material thicknesses of 150 mm and more (micro method up to 50mm) pose no problems for water jet cutting. The water jet achieves best cutting edge qualities both with simple as well as highly complex contours.

Any kind of material can be cut with water jet (pure or abrasive): Steel (unalloyed up to high-alloyed), all forms of non-ferrous metals such as the heavy metals zirconium and copper as well as light metals as titanium and aluminum and their alloying. In addition to the metals ceramic, plastics, wood, stone, felt even composites as carbon and aramids (Kevlar) can be cut with a water jet.



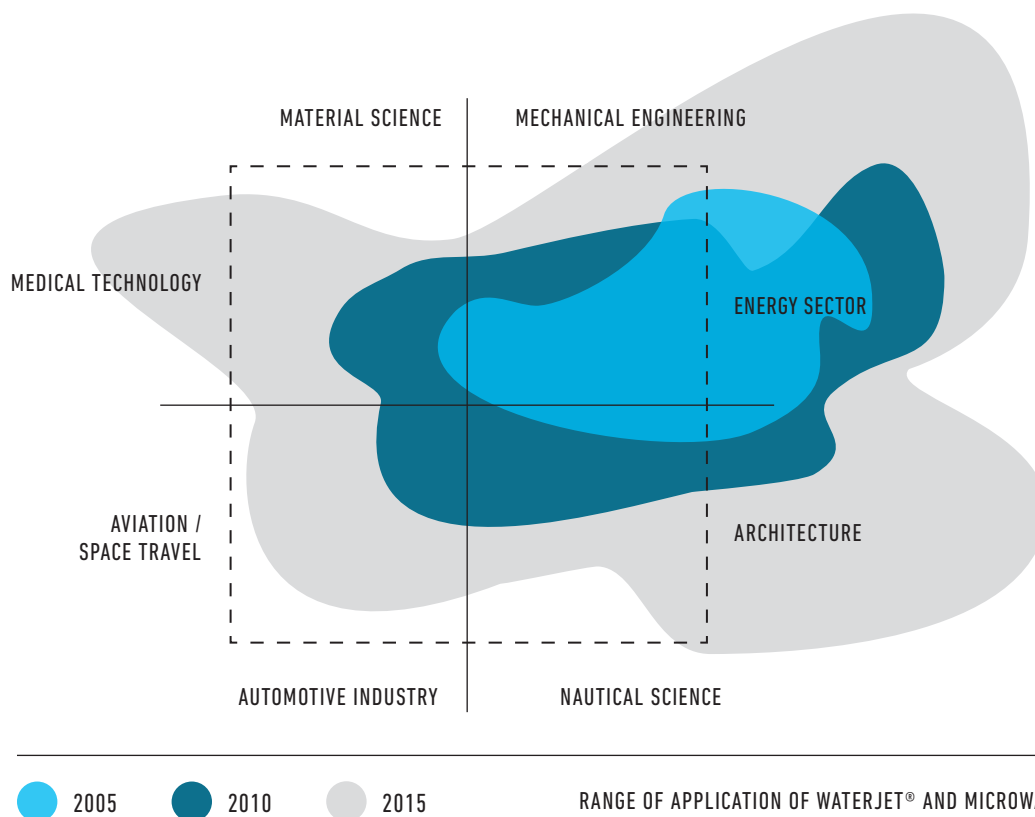
INDUSTRIES

WATER JET CUTS FOR ALL INDUSTRIAL SECTORS.

ONE CUTTING PROCESS FOR MANY APPLICATIONS

We apply water jet cutting – no matter if in the macro area or in the micro area with our newly developed precision water jet technology AWJmm® – for a variety of industrial areas. The capabilities range from cutting up to complex complete solutions with milling, abrading, drilling, reaming, grinding, barrel finishing (rotofinishing).

In doing so, we offer our customers the advantage of appearing as a general contractor and therefore, we procure materials, process them and take over their manufacturing (welding, assembly).





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microwaterjet®

HISTORY

PHASE IV: DEVELOPPING NEW TECHNOLOGY

2014

Expansion of Microwaterjet which is now operating 17 machining centres
25 year jubilee of Waterjet AG

PHASE III: MAKING TECHNOLOGY

2013

Waterjet AG has around 40 employees and operates 30 water jet devices.

2009

Microwaterjet expanding and operating 13 machining centres

2006

The constitution of a competence centre for water jet technology was started.

2004

The research and development laboratory for abrasive water jet micro technology was established.

PHASE II: TECHNOLOGY PARTNERS

2003

The offices were reconstructed and expanded and one of 100m² was reconstructed for Micromachining AG.

1999

The subsidiaries in the area water jet technology and accessories were established.

1994

Walter Maurer assumes the overall operational management of Waterjet AG. New establishment of Waterjet Holding AG.

1992

The limited partnership is converted into Waterjet AG.

PHASE I: BUYING TECHNOLOGY

1991

The company moves to Aarwangen. The operation is expanded to 4 water jet cutting devices.

1989

Walter Maurer and René Affentranger establish the limited partnership «Maurer und Affentranger, Waterjet» in Langenthal.



HEADQUARTERS

Waterjet AG

Mittelstrasse 8

CH-4912 Aarwangen

Fon: +41 62 919 42 82

Fax: +41 62 919 42 83

info@waterjet.ch

www.waterjet.ch

OTHER LOCATIONS

EASTERN SWITZERLAND

Waterjet AG

Industriestrasse 15

CH-9015 St. Gallen

Fon: +41 71 311 56 66

ostschweiz@waterjet.ch

FRANCH-SPEAKING SWITZERLAND

Waterjet AG

Beundenweg 24

CH-2503 Biel/Bienne

Mob.: +41 79 102 86 42

p.messerli@microwaterjet.ch

CERTIFICATES

