

MICRO WATER JET CUTTING

ORIGIN AND APPLICATIONS.

Micro water jet cutting technology is no different from normal water jet cutting. Micro water jet cutting is a cold, thermo-neutral separation process (pure water jet and abrasive processes) that manufacturers use at the micro level. The differences lie in the size of the cutting head and, with abrasive processes, in the size of the mixing chamber for the garnet sand.

Micro water jet cutting was developed by Walter Maurer and the Waterjet AG team. The method combines the advantages of laser cutting precision with those of water: There are no thermal stresses in the material, and the microstructure of the material and its material strength are maintained.

The development of micro water jet cutting was driven by demand. The trend in precision-engineered components is towards miniaturisation and the use of sophisticated materials. Mechatronics, measurement and control technology, aerospace, medical technology and the watch industry require more finely crafted components made of special materials or composites.



MICRO WATER JET CUTTING: THE ADVANTAGES

MICRO WATER JET CUTTING: THE PROCESS

The micro water jet cutting process is hardly different from the process applied at macro level. As a rule, a CAD drawing and the parameters of material, thickness and cut quality are enough to start the work process. Through ongoing optimisation and further development, the cutting jet (4000 bar, 3 times the speed of sound) could be reduced to 0.2 mm. The positioning accuracy is less than 1 μ -metres.

The cutting width of work pieces, with a maximum size of 600 x 1000 mm, is significantly reduced. In pure water processes (for soft materials such as wood and plastic), the average width is reduced to 0.025 mm, and in abrasive processes (for hard materials such as steel and glass) it is reduced to 0.03 mm. At the same time, the rotating bore of the penetrating water jet can be maintained – a key consideration for cutting precision.

The precision depends on the cutting process and machine guidance. Precise cutting was increased by a process analysis, so that the water jet is newly round and the application of the abrasive can be dosed more accurately.



ECONOMICAL

Micro water jet cutting is resource and cost saving. Water and abrasive material consumption falls from 0.4 l/min to 0.17 l/min and from 60 g/min to 16 g/min respectively. The energy required for generating a pressure of 4000 bar is reduced by half, to 3 KW. Since work is carried out without tools, even very small series can be cut with no set up time.

PRECISE

Precision in micro water jet cutting is often more important than its small size, meaning a process capability of up to 0.3 mm in micro water jets. By eliminating the existing cutting cone, wing parts can be cut without angle errors. Accuracy is increased through a pivoting head system.

GENTLE ON MATERIALS

Micro water jet cutting also enables gentle cutting in the micron range of thermally sensitive materials, special materials and exotic alloys, as well as of standard materials.

MINIMAL STRESS - NO POST-PROCESSING

The mechanical stress of the material is very low. Costly setups can be avoided. Tension-free cutting prevents structural changes in the work piece and allows small kerf widths. Also, textured surfaces and engravings can be cut with a surface quality up to Ra = 0.8 microns, burr free and without requiring finishing.