CASE STUDY
ONE SINGLE PROCESS "MICRO EDM DRILLING AND MICRO EDM MILLING" FOR MULTI-FIBER TITANIUM FERRULES

THE BENEFITS OF µEDM

SARIX offers automated industrial turn-key µEDM equipment, that compete with traditional process, while having all the advantages of the Micro EDM Machining. SARIX MICRO EDM machines demand that the operator define the work piece material, electrode material and hole depth. Once it has been set up the machine controls and optimises the process automatically. The permanent presence of an operator is not needed and the machine can work as an autonomous production cell. Parts machining through the µEDM process can be immediately used with no additional finishing.

OBJECTIVE AND SPECIFICATION

One of the challenge of Diamond SA have been to achieve multi-fiber optical connectors for NASA. In this case several fibers were used for a hyper spectral imaging meant to be used on Mars. The multi-fiber ferrule needed to be within a tight position within precision of 2 micron or less. Complex pattern cavities or ultra small single holes (ca. 50um) are all subject to a very high machining precision. An other major concern was also to provide a high precision vertical structure (better than a couple of microns) for the complete pattern. Their machining choice was immediately aimed to the Micro EDM Drilling associated to the Micro EDM Milling capability. “We need to have a one step machining process creating the whole pattern or structure. The machining lead time and obviously the repeatability on the ferrules on the titanium alloy used is the key for this project” Diamond project manager

SOLUTION IMPLEMENTED

Understand clearly the importance of the technical facts, SARIX offered its latest 3D Micro EDM Milling Technology. Using a 60 microns solid carbide electrode, the requested cavities could be realized within very tight precision of 0.001 mm including the very accurate position and concentricity of the cavity to the body of the ferrule. The constant electrode wear compensation control together with the continuous automatic electrode re-feeding allowed to complete the structure in one machining program. The slit and the structure were produced to specification. This “one setup Micro EDM machining” has been successfully applied to several other custom pattern ferrules and has been delivered by Diamond SA to the Photonics Team at Goddard Space and Flight Center – NASA.

SUMMARY OF CURRENT ISSUE

Dear Readers,

The interest in Micro-machining grows constantly and we discover applications in many fields. In this issue we are proud to present the Micro EDM machining versatility where products machined on SARIX leaves the earth.

SARIX Micro-Millling

The basic SX machines combined with the SX-3D µEDM-Milling-CAM software package offers the possibility to produce high quality freeform microstructures, including geometries in “sub-micron” tolerances within surface finishing down to 50 Nano Ro 0.05 microns.

With the 3D Micro EDM Milling, cavity and micro parts can be directly machined in one single set-up eliminating the need to manufacture complex electrodes from roughing to fine finishing. The entire machining part can take place in a single set-up without intervention.

ABOUT SARIX SA

SARIX designs, manufactures and makes the highly efficient Micro EDM Equipment typically used in many industries such as: die-making, micro-electronics, medical, machining and aerospace as well as research centres and universities. The SARIX SX-100 and SX-200 product line is designed for use in various 3D Micro EDM Machining modes offering users the highest level of flexibility including Micro-Drilling, 3D Micro-Milling and Micro-Sinking.

MACHINING VERSATILITY

Single machine setup is good enough for full 3D Micro EDM Milling of complex parts!

SARIX machines are well known for their extreme modularity. The reason of offering a combination of micro-machining capabilities in a modular concept is to achieve a high precision level of producing entire cavity or even a set of various cavities in just a single setup. Starting from a basic high precision Micro drilling configuration, the machine can be extended at any time to perform very accurate small-scale complex 3D structures.

The attraction key is the great flexibility of these “built-in” multi-processes: Micro Drilling, Micro Sinking, 3D Milling, Micro Electrode shaping, machining measurement and 3D Scope surface scanning.

The beauty of the versatility of the SARIX µEDM system has reached now tremendous effective performance on production and also on mass-production as Automotive, Medical, Watch-maker, Micro-electronic and most of it Aerospace.

µEDM DRILLING

As world market leader on high precision µEDM DRILLING, SARIX provides attractive and competitive solutions for very accurate, smaller and deeper holes in carbide hardened steel advanced alloys. Nowadays, the extremely high accuracy and precision requirements on micro holes bring forward the Micro Drilling technology to new machining factors much more important than they would be in conventional drilling conditions.

The strong interactions between diameter, depth and tolerances have been now taken over through the latest SX-SLS-DT “Self Learning Software” for the drilling technology.

3D µEDM MILLING

3D µEDM MILLING
The Twin Spindle provides machine users additional improvements to increase the productivity by reducing the machining time of the Micro EDM Drilling and the Micro EDM Milling.

As for conventional mechanical Milling, the 3D Micro EDM Milling process needs also different sizes of electrode tool to produce the whole micro cavities. The roughing operation is used with larger electrode size.

**FEATURES & BENEFITS**
- Cycle time reduction up to 50%
- Productivity and machining autonomy
- Double electrode size down to 45 microns

**WHY MEASURING?**
All EDM machining needs to be measured, the better way is to have it included in the machine. The electrical touch measurement with the electrode at any machining step can reach on the SARIX machine an accuracy of about 3 microns. However, the needs of certain manufacturers are nowadays higher. In between machining step process hole size, roughness, size, structure heights are important before the final execution or for certification.

**MEASURING CONCEPT**
The SX-3D Scope is a non contact white confocal light microscope type enabling to scan whole machined cavity. The resolution of the measured distance between the scanning head and the work piece surface is +/- 0.1 micron where the XY relies to the machine accuracy.

The further use of the SX-3D Scope helps to check either surface finish or dimensions. Modelling pre-machined solid piece can be scanned and checked with the machining interface program to the SX-3D µEDM-Milling-CAM software.

- "in process" 3D surface and cavity measurement
- Roughness measurement down to Ra 0.05 microns
- Height profile and structures evaluation
- Reconstruction of surface models and CAM import files
- Topographic view and profil of resolution of +/- 0.1 micron

**FEATURES OF THE SX-ARIANNE**
- Superior mechanical and thermal stability with precise spooling control of the wire avoiding any jerks.
- Automation control of the wire tension minimizing wire vibration.
- Choice between "Micro-Touch" or Laser measurement device (option)
- Electrode run out check and electrode profiling software (option)
- Accuracy +/- 0.15 microns

The SX-ARIANNE is fully compatible with the existing SX-100 or the SX-200 machines. The Laser unit is also available as stand alone unit, not combined with the Wire Dress Unit.