

Sink and Drill in One



As workpiece size and tolerance requirements continue to shrink, shops often face the tough challenge of wire EDMing extremely small holes in such components — holes that must be precisely located, perfectly round and have superior surface finishes. However, current holemaking technologies can fall short when it comes to accurately producing hole diameters down around 0.002 in.

The most common application for small holes is for wire EDM start holes, and the smaller the diameter wire to be used, the more precise in location, dimension, cylindricity, straightness and surface finish the start hole has to be. Most shops will use a hole popper machine to create start holes, but those machines have their limitations as far as their electrode sizes and overall hole quality are concerned.

The trend today is to EDM small-diameter holes using diesinking EDMs equipped with fine-hole drilling modules/fixtures. These systems are basically two machines in one that allow shops to run normal die sinking work and, on the same machine, generate extremely small, near perfect holes with tolerances of 0.0004 inch and surface finishes as good as 0.10 Ra.

One such fine-hole drilling fixture is the Fine Drill module from GF AgieCharmilles for the company's Form 20 die sinking EDM. The module's arm and guide structures support small-diameter electrodes as a System 3R high-speed rotation spindle spins them at speeds between 60 rpm and 2,000 rpm to ensure positioning and roundness accuracy. High flushing pressure up to 80 bar integrated in the die sinking machine's dielectric circuit maintains clean spark gaps.

The Fine Drill module can run electrode diameters measuring from 0.004 inch and smaller. And the module is an option that can be added to the Form 20 at the customer side. GF AgieCharmilles has also integrated special software features and technology parameters for the Fine Drill module into the Form 20's CNC.

In addition, GF AgieCharmilles offers an electrode-manufacturing accessory for the Fine Drill module. This special accessory manufactures electrodes using electroerosion and, again, does so on the same Form 20 die sinking machine.

The accessory eliminates the need for a wire draw-off system by incorporating two spools, one of which winds up used wire. Wire can be used several times because there is limited wear.

Shops gain the flexibility to manufacture fine-hole electrodes to exact required sizes and tailored to their specific application requirements with the electrode-making accessory. The accessory offers an increased level of automation when making electrodes, and the Fine Drill module secures electrodes while they are being machined. It then allows shops to easily and efficiently handle finished electrodes with diameters as small as 0.0008 inch.

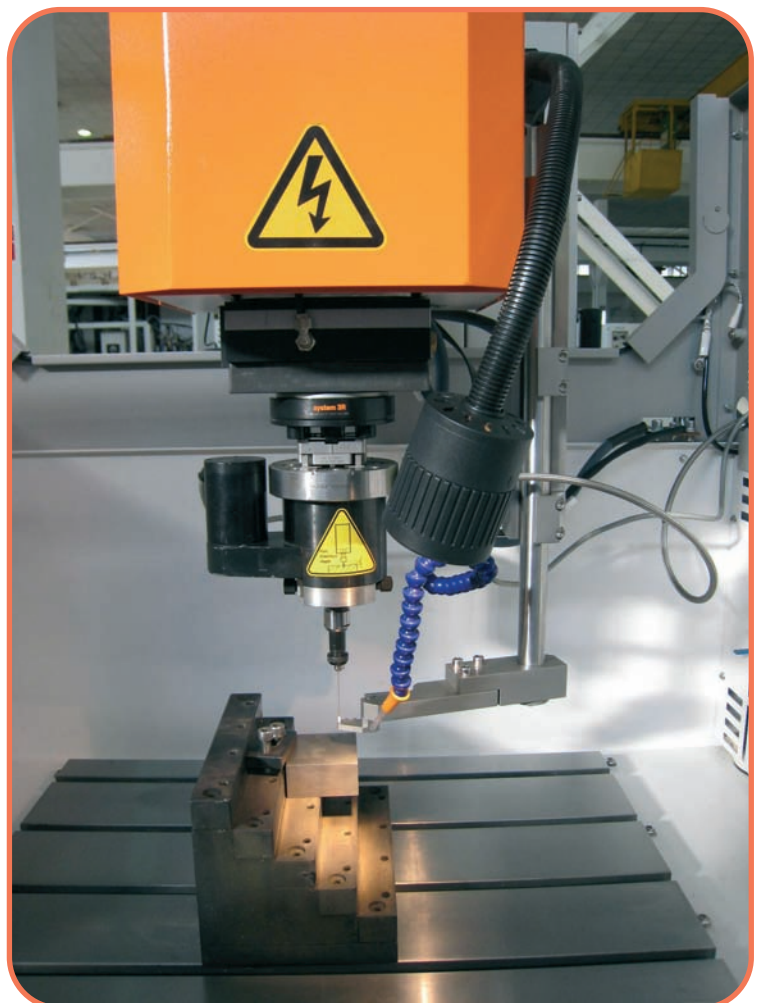
In one application, the Fine Drill module machined 0.004-inch-diameter holes into 0.060-inch-thick plate using a 0.003-inch-diameter carbide electrode. The module was so precise that half of each hole was able to be drilled from one side of the part, then the other half from the other side in about four minutes per side.



In another application, the GF AgieCharilles Fine Drill module EDMed four 0.002-inch-diameter holes and one 0.004-inch-diameter hole into a 0.010-inch-thick plate. A 0.003-inch-diameter carbide electrode was used for the 0.004-inch-diameter hole, then the same electrode burned the 0.002-inch-diameter holes after its diameter was reduced to 0.001 inch using a reverse erosion process. Reverse erosion involves machining an electrode against a carbide rod with inverted polarity. This electrode prep time took about four minutes.

During an in-house test, GF AgieCharmilles technicians further explored the Form 20's fine-hole drilling capability by EDMing several 0.005-inch-diameter holes in a 0.040-inch-thick piece of Neodymium Iron Boron. The cuts were done without flushing through the electrode, which makes it more difficult to machine deeper holes and maintain required tolerances. The cut speed also decreases significantly the deeper the cut.

Burn times for the holes were between 100 seconds and 140 seconds with electrode wear varying from 62 to 75% and average hole sizes measuring 0.0044 inch. This average hole size includes measurements taken at the tops and bottoms of holes, and final hole sizes ended up at 0.0045 inch in diameter.





THE FORM 20

Constructed with an ultra rigid cast iron C-frame and cross-table design, the Form 20 guarantees stiffness and withstands the temperature fluctuations found in most workshop environments. GF AgieCharmilles designed the machine with an integrated tool capacity for four to six positions, as well as glass scales on all axes that continuously measure axis positions to ensure the highest level of positioning and cutting accuracy.

The Form 20 is also equipped with GF AgieCharmilles' intuitive HMI (human-machine interface), which is built on a Windows XP platform and designed with 'non-EDM experts' in mind. Machine operators with minimal experience can programme a job and quickly yield desired geometrical and surface finish results.

The machine easily integrates into data networks via LAN for remote monitoring and data management. Adding to the smart design of the machine's control is the proven performance of the Advanced Power Generator (APG), a high-efficiency, high-output 72/103 Amp generator that delivers high speed, consistent surface finish quality, precision, low wear and high material removal rates.

Agie Charmilles is the North American leading supplier of wire EDM, CNC and manual diesinking systems and high speed/performance and 5-axis CNC milling machines.

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