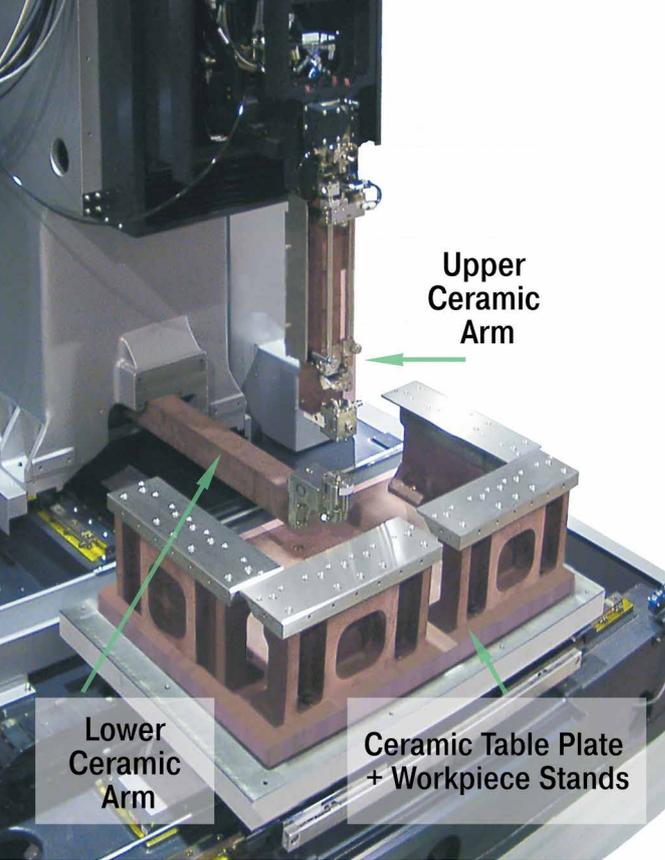


Canonic Material for Geometrically Accurate Electric Discharge Machine tools



The industry's only EDMs with ceramic work zone constructions!

Electric discharge machining is simultaneously an electrical and thermal processes.

On the one hand, **EDMing is a thermal process.**

High temperatures in the EDM gap are unevenly transmitted through the workpiece, table, wire and guide blocks to the bearing structures, causing them to deform. The geometric accuracy is lost, which results in defects and spoilages.

On the other hand, **EDMing is an electrical process.**

The instruments in EDM process are electric sparks of different power and frequency that erode metal. The work area must be completely electrically insulated from the rest of the machine structure, and parts of the work area – from each other.

HENCE THIS INFERS:

Only electrical insulators with very low thermal expansion are ideal materials for the EDM work zone.

And for the water Wire-cut EDMs **chemical and corrosion resistance is also required**

Sodick's flawless and uncompromising solution

Sodick found an ingenious solution to the problems of thermal stability of EDMing back in the 80s.

Since then, Sodick is the world's first and only manufacturer of EDMs with fundamentally new proprietary materials in the work (EDMing) zone. These fine ceramic materials have been developed by Sodick over many years of research and are known as FineXCera®. More often, these materials are referred to simply as "Sodick ceramics".

Complete galvanic isolation

In Sodick EDMs the workpiece and the electrode are completely isolated from all machine structures and from each other..

Complete galvanic isolation – the workpiece does not "rest" on earth (connected to machine tool body)!

Complete electrical insulation of parts of the work area makes it possible to generate specific and unique spark pulses, which are impossible on EDMs with metal table, where the workpiece "rests" on the body (earth). In effect generation of bipolar pulses and pulses of a special waveform is facilitated.

As an additional result of perfect electrical insulation – loss of cutting-speed (productivity) over the years of operation of the "ceramic" Sodick EDMs is 3 to 4 times less than that of the "metal-plastic" EDMs.

In fighting with Physics the winner is Physics!

1 CERAMIC WORK ZONE EDW = 1,5 CONVENTIONAL EDWs

(In terms of productivity 1 ceramic work zone Wire-Cut EDM = 1,5 conventional EDWs with metal-plastic work zone constructions)

Ceramic Work Zone: Active Longevity of Sodick Wire-Cut EDMing

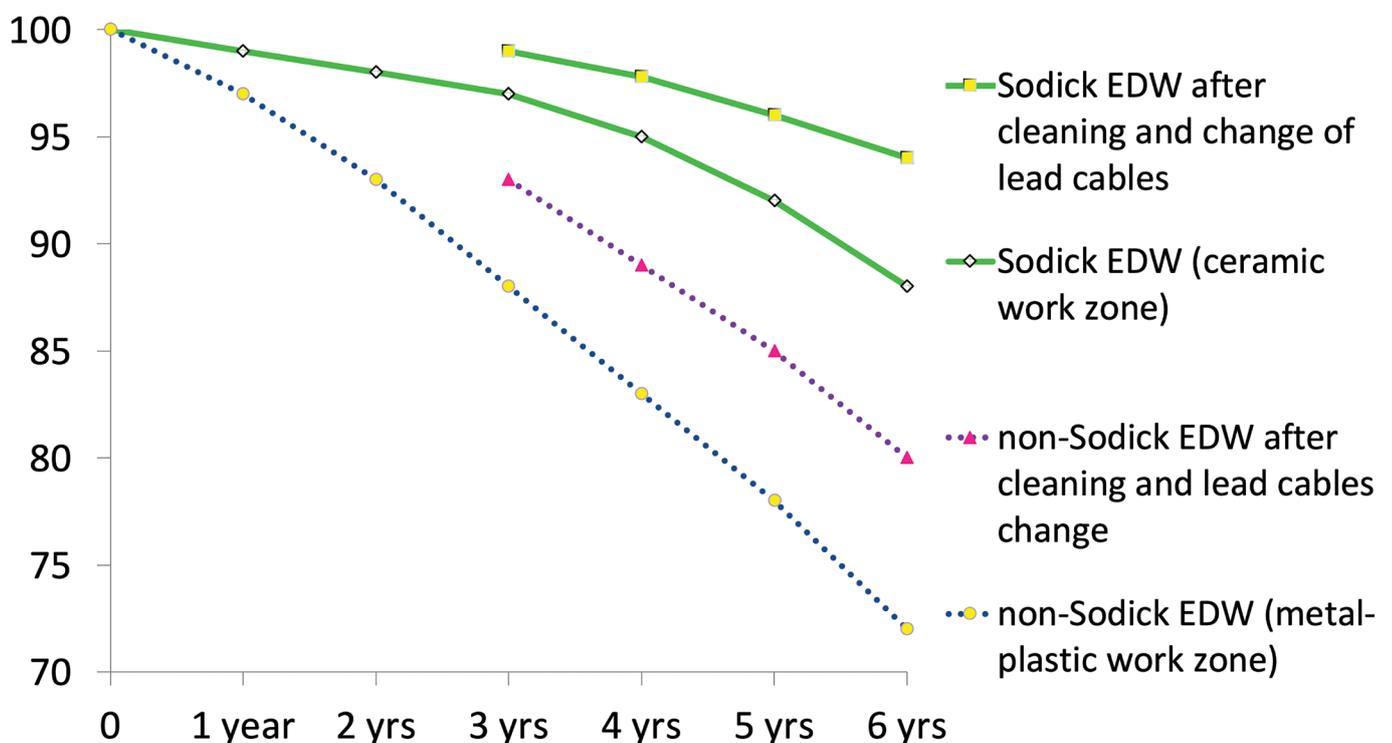
Experienced operators know well after a year or two since the start of operation, the cutting speed of wire EDM machines decreases. This occurs as a result of a decrease in the quality of insulation of electrical insulators due to the deposition of conductive sludge and chips on the plastic insulator surfaces.

In ceramic machines, the decline also takes place, but considerably – 3 times – slower. Both quality and area of electrical insulation is incomparably higher and larger than in metal-plastic machines!

A ceramic machine not only lives longer, but also outputs more products within its life-span.

A ceramic machine costs almost the same as a metal-plastic one, but it lives longer and brings much more profit to its owner!

Wire EDM cutting speed (productivity) loss (%) within first 6 years of operation



In metal-plastic machines (non-Sodick), the surface area of insulators is small. In machining, the exuded and excreted EDM chips (sludge) deposit on the plastic surfaces and are absorbed by the insulators themselves. Chips are an unavoidable by-product of EDM machining. The quality of electrical insulation degrades with time, and degrades very quickly: in 6 years of operation, a metal-plastic Wire-Cut EDM loses up to 30% of productivity (cutting speed). Chips settle on ceramic structures of the Sodick ceramic Wire-Cut EDMs just as well. But, firstly, the area and volume of electrical insulation in Sodick ceramic machines are incomparably much larger – the supporting structures themselves are insulators! And they are in fact high quality, high voltage insulators $\rightarrow 10^{14}$ Ohm \cdot cm. Secondly, Sodick ceramics have an exceedingly higher chemical resistance!

Even if the initial performance of a Sodick Wire EDM is the same as competing non-Sodick machines, in a few years a non-Sodick machine will be significantly inferior to a Sodick EDW machine.

Non-Sodick metal-plastic Wire-Cut EDMs lose their cutting-speed 2.5 to 3 times faster than Sodick Wire-Cut Electrical Discharge Machines with ceramic work zone bearing constructions.

Robust & Durable Sodick Ceramics:

ultra-low thermal expansion - 3 to 4 times less than that of steel

ideal electrical insulators - $> 10^{14}$ Ohm * cm

low specific gravity - 2.5 times lighter than steel

supreme chemical and corrosion resistance

	SA610 Ceramics (Al ₂ O ₃ based)	GRANITE	Meehanite Cast Iron FC25	Stainless Steel
Thermal Expansion Coefficient (x 10 ⁻⁶ /°C)	4,5	8	11	15 ~ 18
Bending Strength (kg/cm ²)	3000	300 - 500	4000	depends on sort
Young Modulus (x 10 ⁶ kgf/cm ²)	2,7	0,3 ~ 0,9	1,1	2,0 ~ 2,2
Vickers Hardness (500 g load)	1300	590 ~ 1000	620	---
Specific Gravity (g/cm ³)	3,5	3,0	7,8	7,7 ~ 7,9
Specific Electric Resistivity	>10¹⁴ Ohm*cm	---	electric conductor	electric conductor



Ceramics is the guarantee of accuracy in EDMing and not glut & luxury!

SN610 ceramics is used for manufacturing load-bearing parts that determine the geometric accuracy of the electric discharge work zone:

table plate, table (workpiece) stands, upper and lower arms (Wire EDMs); table plate and electrode plate, Z axis carriage (Sinking EDMs);

Zirconium oxide ceramics:

unwearable parts of the wire feed mechanism (Wire EDMs)

*Workpiece on the AG60 ceramic table.
Above is the ceramic electrode plate*



керамический
верхний
кронштейн
ALC800GH

What materials are used to build the work zone of conventional non-Sodick EDMs?

Steel is a rigid and durable material, but it has a high thermal expansion coefficient and low corrosion and chemical resistance, and is also an electrical conductor;

here are 4 flaws that make steel as it is unsuitable for the working area of ED machines..

Electric insulating plastics are as a material not rigid enough. You can't use plastic to make supports and arms for a wire-cut EDM. Plastic is only used as an insulator to insulate steel supports and arms.

Non-Sodick EDM designs are "sandwiches" made of materials unsuitable for the EDM work zone!

The worst, but inexpensive engineering solution, contrived and adjusted to the Laws of Physics!

With one and the same heat influence ceramic load-bearing structures in the EDM work zone of Sodick "play" 3 - 4 times less than steel structures with plastic insulators of the conventional EDM.

Accordingly, the geometrical losses of the relative position of the electrode and the workpiece is 3 to 4 times lower.

No matter how accurate is the design of the EDM itself, if parts of the electric discharge zone "play" when heated, precise machining (precision on the workpiece) is next to impossible.

It is generally known that the bearing parts (tables, columns) of the best measuring machines are made of granite. But the thermal expansion of granite is 2 times more than that of Sodick's ceramics!

Hence, **Sodick customers acquire machine tools with work zone quality higher than that of the best measuring machines.**