

# UTS2



son ( > < )  
ultrasonic precision

UTS2  
Made in Germany

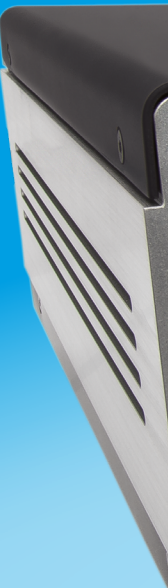
# UTS2

## The Ultrasonic Tooling System

The new 100-kHz Ultrasonic Tooling System UTS2 developed by the company son-x GmbH allows direct ultra-precision machining of stainless steel without geometric constraints and with maximum efficiency. The UTS2 operates with a unique frequency of 100 kHz enhancing cost effectiveness with ultra precision.

This innovative process allows direct machining of steel-, titanium-, nickel-alloys and some glass types in highest quality ( $R_a < 3\text{nm}$ ,  $PV < 150\text{nm}$ ). The typical application is mould insert manufacturing for plastic and glass optics replication.

As a technology leader son-x provides its customers the UTS2 as a machine add-on. Furthermore we offer contract based manufacturing, supplying ultra precise mould inserts and components.



Designed, manufactured and assembled  
in Germany

# Ultrasonic Precision



# UTS2

## Product description

The UTS2 enables ultra precision machining of stainless steel and other difficult to cut materials with single crystal diamond tools. Achieving a surface quality Ra of around 1 nm and a dimensional accuracy PV of 100 nm is feasible. The UTS2 operates at a unique frequency of 100 kHz, combining maximum efficiency with precision.

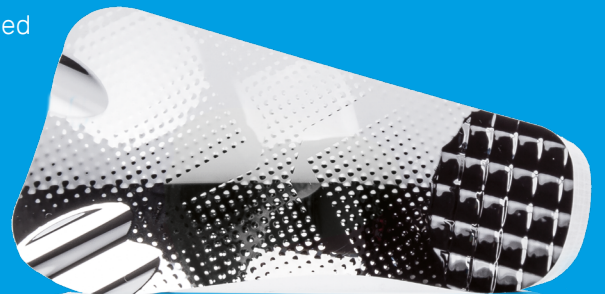
Due to its compact design the UTS2 can be integrated into commercial precision and ultra precision machines. It can be equipped with a micro height adjustment for machines without a vertical axis. The simple and clear handling of the system ("Plug&Play") ensures an immediate and efficient use of the technology.

## Advantages

The primary advantage of the UTS2 is the tool wear reduction when machining steel for optical insert manufacturing.

Especially when manufacturing optical inserts directly in hardened steel...  
...the time consuming and costly nickel-phosphorus plating process is eliminated,  
...the manufacturing time and costs are significantly reduced,  
...the inserts have a longer life time and are scratch resistant,  
...the inserts can be repaired efficiently and without additional coating steps.

The technology makes the user independent from the nickel-phosphorus coating process and it gives a much more durable mould inserts for injection moulding. The entire cycle time starting from the optics design up to the replication process is reduced significantly.





#### TECHNICAL SPECIFICATIONS:

Vibration frequency	100 000 Hz
Vibration amplitude	0.1 – 2 µm
Tool holder size W/D/H	79/160/107 (mm)
Generator size W/D/H	365/390/135 (mm)
Tool holder weight	1.2 kg
Tool overhang (geometrical freedom in Z)	52 mm, more upon request
Height of diamond tip over bottom plate	21 mm
Electrical requirements	110 – 220 V, <5 A, 50 – 60 Hz
Electrical power	~200 Watt
Recommended lubrication	Mist coolant
Additional system cooling	not required
Optional	Micro height adjustment or interface plate
Typical roughness Ra	~3 nm
Typical form accuracy PV	< 200 nm

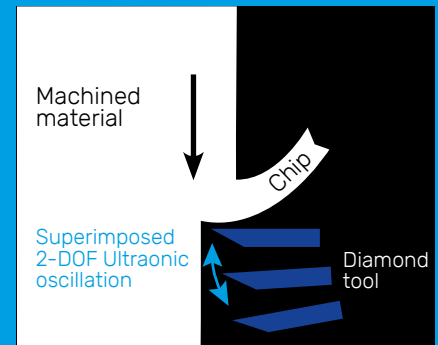
# UTS2

## Technology

The UTS2 works with the functional principle of ultrasonic assisted machining. During this process the diamond tool oscillates linearly in cutting direction with a frequency of 100 000 Hz.

The highly frequent oscillation of the tool in cutting direction leads to an intermitted contact between the tool and the machined material. The contact time is around 5  $\mu$ s per cycle, which stops the chemical interaction between the machined material and the diamond tool due to the short contact periods.

Several positive effects are realized with the help of this technology. Altogether a significant reduction of the diamond tool wear is realized, which enables the direct machining of hardened steel, Invar, Inconel and some glass types.



## Applications

With the UTS2 the ultra precision machining process can be applied on several materials, which cannot be machined conventionally. Several new applications of the technology are given:

- ➔ Optical insert manufacturing: The main application of the UTS2 is optical mould inserts manufacturing. The inserts are applied for injection or glass moulding of automotive lighting lenses, Camera lenses, Sensor lenses, etc.
- ➔ Barrel PIN manufacturing for mobile phone cameras
- ➔ Fine mechanics: Precision steel, Invar and Inconel parts for fine mechanics, e.g. watch industry or measurement masters.
- ➔ Optics manufacturing: Some glass materials can be machined, e.g. for prototype manufacturing.
- ➔ Plastic prototypes: Direct cutting of polycarbonate and difficult to cut plastics.



# Company Profile

son-x is a dynamic high-tech company with its headquarter in Aachen, Germany. The privately held company was founded in the year 2011 as a spin-off from Fraunhofer. The core of the founding was the commercialization of the ultrasonic assisted diamond turning process. This unique technology has successfully been implemented in industrial environments all over the world, pushing the boundaries in optics production since the beginning. Based on our desire to continuously improve our products and services we now offer several systems based on ultrasonic technology.

Since 2013 we have established a state of the art ultra precision optics manufacturing environment which is continuously growing based on our customer's demands. Next to the systems manufacturing, precision optics production is the second business field of son-x. Our vision is to bundle top level engineering competence to continuously push the limits in optics and their manufacturing.

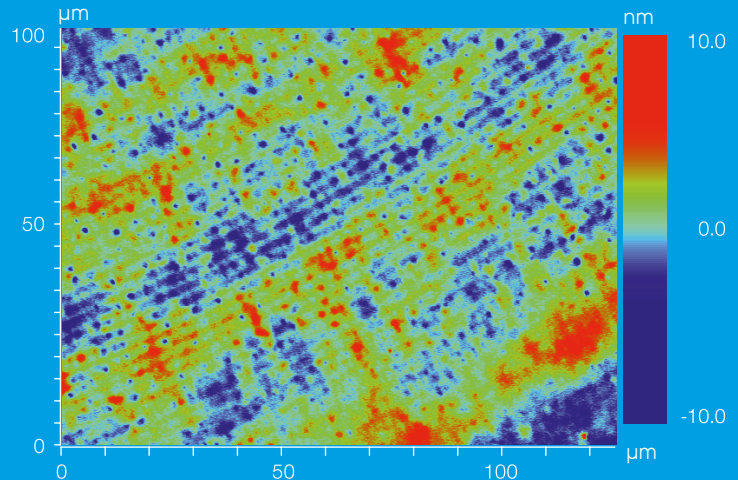
## Our Service

### System components

As a technology leader son-x offers its customers tooling systems for ultra precision machining of steel. Furthermore we develop other innovative equipment for mechanical finishing operations.

### Ultra precision manufacturing

Accurate manufacturing of optical components from design to verification is the focus of the versatile manufacturing environment of son-x, which is the second business area of the company. Several ultra precision machines form the heart of our production chain for ultra high precision optical components and sub systems. We are specialized in high precision mirrors for space and semiconductor applications. Additional optical products are prototype plastic lenses and infrared lenses from single piece to large volume.

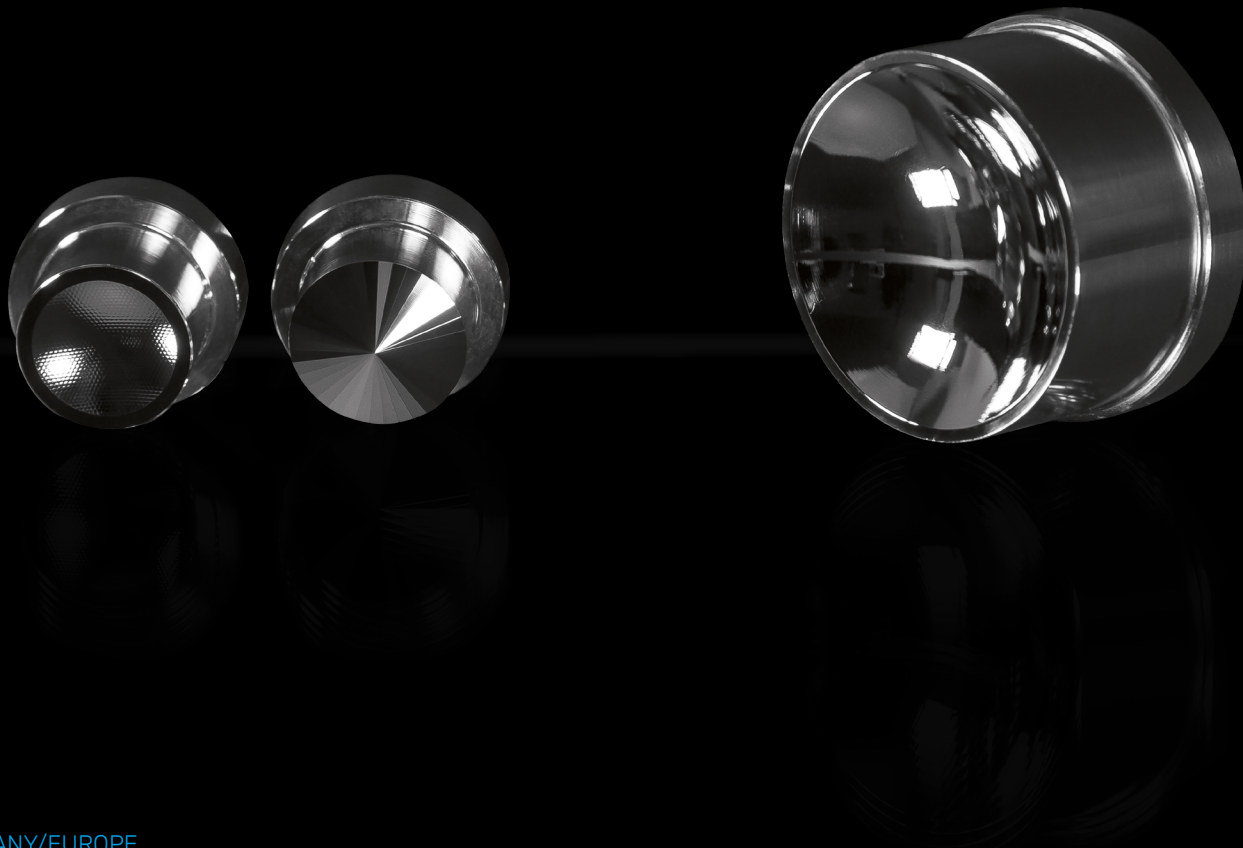


Surface measurement of a steel part, machined with UTS2

**Magnification: 50 x**

Ra = 1.27 nm

Rt = 18.92 nm



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