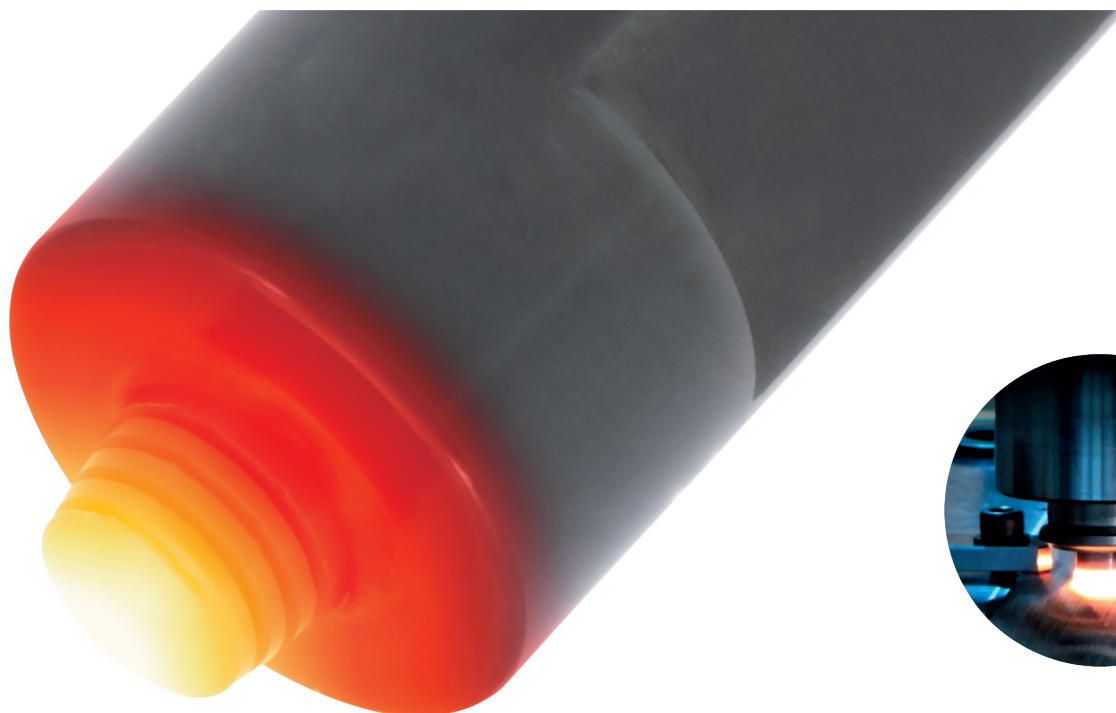


FSW TOOL

Friction stir welding Ceramic tool | Carbide tool



Well, do it 2 new types

Contribute to the practical application of FSW in high softening temperature materials using ceramic materials and advanced technologies.

CERAMIC

CARBIDE



CERtainly | but not only | *CERamics*
Outstanding solutions for demanding applications

Advancements in ceramic technology within the cutting field have reached new heights.

Our commitment is to provide groundbreaking value to the field of FSW.

To meet the demanding requirements of friction stir welding tools, we prioritize high-temperature strength, wear resistance, thermal shock resistance, and low thermal conductivity.

Our approach involves selecting the optimal ceramic material that strikes the best balance among these characteristics, enabling us to achieve both stable welding and reduced production costs.

FSW TOOL

Friction stir welding Ceramic tool | Carbide tool



| Spec

Tool Materials

High Strength SiAlON Ceramics

Fine particle cemented carbide

Shank dia.

φ 8, 10, 12, 16, 20mm

*Availability larger than φ20 mm is available,

*Ferrous metals: steel, stainless steel, copper

For ferrous metals

Ceramic FSW TOOL

High performance in friction stir welding of high-melting point metals, resulting in a substantial cost reduction compared to conventional tools.



Features

- High wear and heat resistance due to the strength of Sialon ceramics.
- Capable of welding thick plates up to 100 mm or more.
- Ceramic tools offer higher cost-efficiency than PcBN tools.

	Tool life	Tool cost
NTK Ceramics	○	◎
PcBN type	◎	×
Carbides	Processing not possible (tool melting)	
HSS	Processing not possible (tool melting)	

Application Fields

- Steel industry : Friction stir welding of thick steel plates
- Automotive : High-tensile strength material increasingly used to reduce vehicle weight and improve safety Steel Plate Welding
- Welding of dissimilar materials such as aluminum alloys and other light metals with ferrous metals



Case study

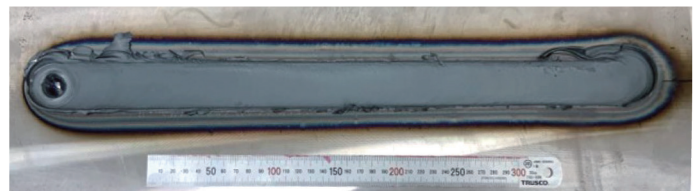
High-tensile steel

Welding method		Line welding
Welding material	Material	SPFC980 (High-tensile980MPa)
	Thickness(mm)	1.2
Tool shape	Shank Dia.(mm)	φ 6
	Shoulder Dia.(mm)	φ 6
	Probe Dia.(mm)	φ 3
	Probe length(mm)	0.9
Welding conditions	Rotation speed(min ⁻¹)	1000
	Welding speed(mm/min)	100
Welding distance(mm)		850

Thick steel plate

Welding method		Line welding
Welding material	Material	Low carbon steel
	Thickness(mm)	15
Tool shape	Shank Dia.(mm)	φ 37.5
	Shoulder Dia.(mm)	φ 37.5
	Probe Dia.(mm)	φ 18.5
	Probe length(mm)	14.7
Welding conditions	Rotation speed(min ⁻¹)	200
	Welding speed(mm/min)	50
Welding distance(mm)		500

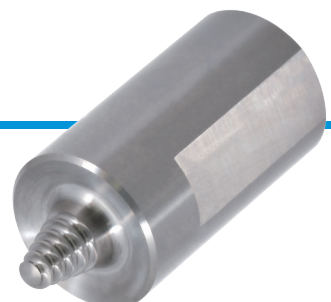
Cutting-edge conditions



For light metals

Carbide FSW TOOL

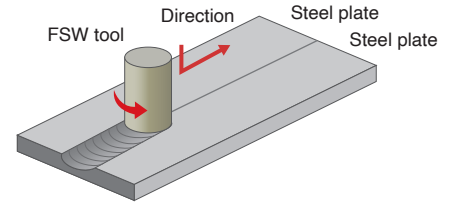
Carbide tools are also available for friction stir welding of low melting point metals.



Line welding Condition guidelines	Rotation speed(min ⁻¹)	1000 - 2000
	Welding speed(mm/min)	1000 - 2000

| What is FSW (friction stir welding)?

FSW stands for Friction Stir Welding, a welding technique developed in the United Kingdom in 1991. A cylindrical tool with a protruding tip is rotated at high speed and pressed against the jointed part of the material to be joined. The frictional heat generated by the tool softens the material to be joined, and the rotation of the tool causes it to flow plastically, resulting in a solid-phase joint. This is a solid-phase welding technique. Unlike arc welding and other forms of fusion welding, the welding process does not melt the materials to be joined. The advantage is that there is less deformation after welding and less strength loss in the joint due to grain refinement in the joint. This has the advantage that the strength of the joint is reduced due to the subdivision of crystal grains in the joint. In addition, the welding process is more energy-efficient than conventional welding methods. The joints can be joined with less energy consumption compared to conventional welding methods.



| FSW Application

Currently, widely adopted welding technologies for aluminum alloys and materials with low softening temperatures are making strides in the manufacturing of vehicles like railroad cars and automobiles. In contrast, when it comes to iron/steel materials with high softening temperatures, the availability of tool materials with excellent high-temperature properties is limited, and existing tools are often very expensive. The scarcity of tool materials with superior high-temperature properties is a notable challenge in working with iron/steel materials with high softening temperatures.

NTK CUTTING TOOLS plays a pivotal role in advancing the practical application of Friction Stir Welding (FSW) to high softening temperature materials, leveraging its unparalleled expertise in ceramic materials and cutting-edge technologies.



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