FSW TOOL

Friction stir welding tool | NTK Ceramics

Member IMC Group
NTK CUTTING TOOLS

Friction Stir Welding by NTK CUTTING TOOLS

Contribute to the practical application of FSW to high softening temperature materials with ceramic materials and technologies.

Advanced ceramic technology in the cutting field has developed further.

Next, we will provide new value in the field of FSW.

High temperature strength, wear, thermal shock resistance, and low thermal conductivity.
These are the four material characteristics required for friction stir welding tools.
We use the material with the best balance of these characteristics from among a number of ceramic materials.
We achieve both stable welding and lower production costs.

FSW TOOL

Friction stir welding tool | NTK Ceramics

FSW TOOL

Ceramic tools for friction stir welding are now available!

High performance in friction stir welding of high-melting point metals.
Achieved significant cost reduction compared to existing tools.

Features

- **High temperature high-strength silicon nitride provides both wear resistance and heat resistance at a high level.**
- **The tool shape design suitable for the material to be welded and the stable balance of material properties enables welding of thick plates of 10 mm or more.**
- **The production technology and manufacturing system based on our experience in cutting tools enable us to achieve reasonable costs compared to PcBN and alloyed material tools.**

	Wear resistance	Heat resistance	Tool cost
High melting point alloy (W, Co, Ni, Pt)	×	○	△
High melting point alloy + Carbide composite	△	△	△
Carbides	△	×	○
HSS	×	×	◎
PcBN	◎	○	×
NTK Ceramics	○	○	○

Expected Application Fields

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

Specification

Tool Materials	High Strength SiAlON Ceramics
Shank dia.	**ϕ8, 10, 12, 16, 20mm** *More than ϕ20 mm can be available, and more than ϕ40 mm has been produced.

Case study

High-tensile steel

Welding method		FSW (Butt joint)
Jointed 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

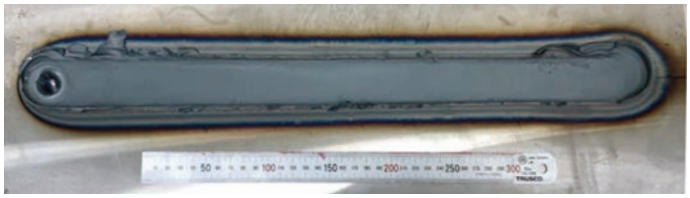
Thick steel plate

Welding method		FSW (Butt joint)
Jointed 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

Tool appearance

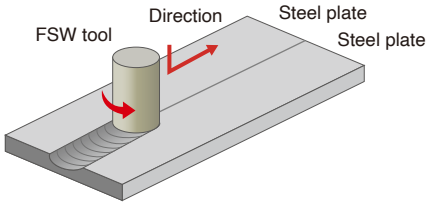
Before used

After (850mm)



What is FSW (friction stir welding)?

FSW stands for Friction Stir Welding, a joining 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 joining process does not melt the materials to be joined. The advantage is that there is less deformation after joining 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 joining process is more energy-efficient than conventional joining methods. The joints can be joined with less energy consumption compared to conventional joining methods.



FSW Application

Currently, joining technologies for aluminum alloys and other materials with low softening temperatures are widely used, and their practical application is progressing in the manufacture of railroad cars, automobiles, and other vehicles. On the other hand, for iron/steel materials such as steel with high softening temperatures, there are few tool materials with excellent high-temperature properties, or existing tools are very expensive. The fact is, however, that tool materials with excellent high-temperature properties are scarce for iron/steel materials with high softening temperatures.

NTK CUTTING TOOLS contributes greatly to the practical application of FSW to high softening temperature materials with ceramic materials and technologies in which the company has the greatest expertise.

Member IMC Group
NTK CUTTING TOOLS

NTK CUTTING TOOLS JAPAN
Iwasaki, Komaki, Aichi 485-8510, Japan

CONTACT www.ntkcuttingtools.com/jp-en/contact/

YouTube Channel www.youtube.com/NTKCUTTINGTOOLS

007-2305K-1(EN)