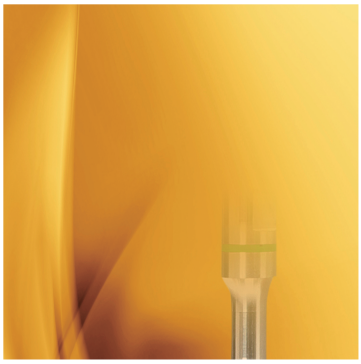
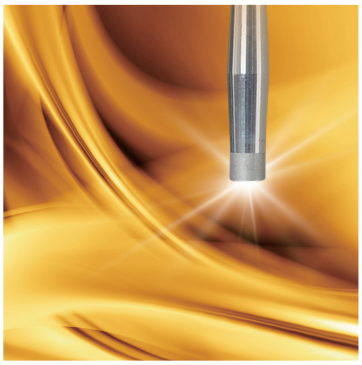
Avio

PRODUCT CATALOG

Ultrasonic Equipment Series





NIPPON AVIONICS CO.,LTD.

What is ultrasonic plastic welding?

It is a joining method in which ultrasonic vibration is transmitted while applying a force to plastic resin (thermoplastic resin) to melt the resin and join it.
It is used in a wide range of fields such automobiles, home appliances, daily necessities, and food packaging, because welding time is short and air tight welding can be easily achieved.

Basic configuration of ultrasonic welder and role of each part

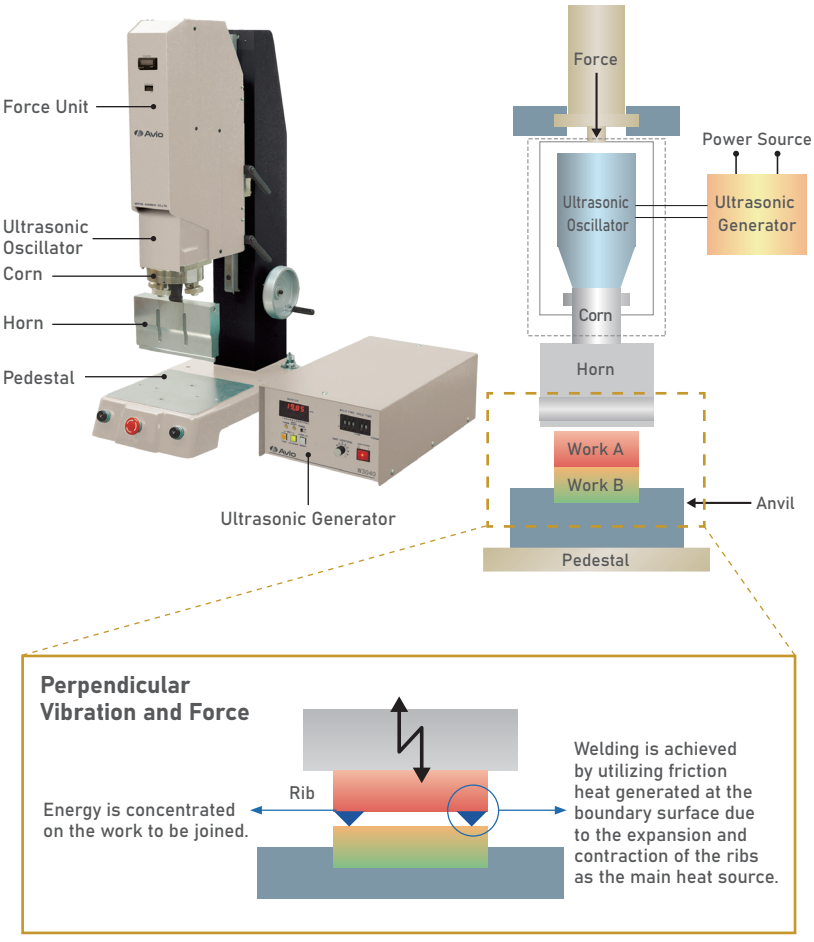
Ultrasonic Generator: converts the commercial power line frequency 50 / 60Hz to the ultrasonic frequency to be used.

Oscillator + Corn: converts electrical frequencies to mechanical vibration frequencies and amplitudes.

Horn: resonates with the vibration of the oscillator, applies vibration and force to objects to be welded.

Anvil: positions and fixes the objects to be welded to prevent vibrational energy from escaping.

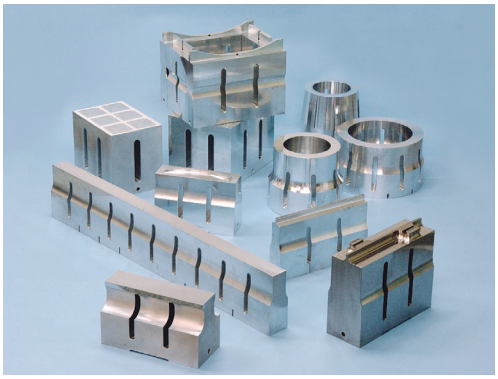
Rib: Concentrates energy on the objects to be welded.



Feature of Avio ultrasonic generator

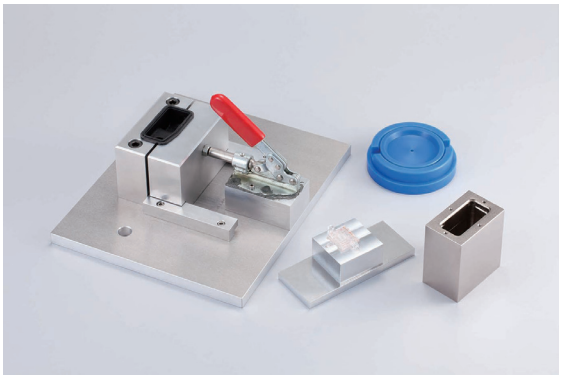
The generator control method is Avio's proprietary frequency automatic tracking method, named ATHMOS (Automatic Tuning Hold Master Oscillator System).

- Fast and smooth start-up of oscillation energy even during heavily loaded situations.
- Automatic frequency tracking is quick and in wide range.
- Stable amplitude (constant amplitude) is maintained over a wide load range.
- Achieves stable welding quality that is resistant to temperature and load fluctuations.



Ultrasonic Horn

Material is selected depending on applications. Aluminum alloy, Titanium alloy, Die steel, and etc., are avairable. Various surface coatings are also available.



Anvil (Support Jig)

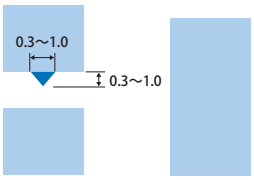
The anvil plays the role of reliably supplying vibration energy to the object to be joined by the work by positioning and fixing it.

Rib Shape and Knurling of Horn

- In order to efficiently generate frictional heat at the welding interface, it is common to provide ribs (protrusion shape) in molded products.
- In case ribs cannot be provided, such as the case of a thin material, knurling may be applied to the horn and/or the anvil instead.

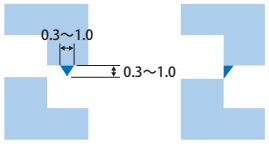
Rib Shape

Standard Type
Most frequently used



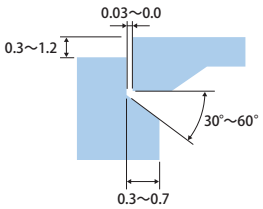
Before Welding | After Welding

Step Joint
Positioning is easy

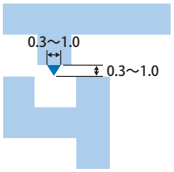


Example 1 | Example 2

Share Joint
For air tight welding of POM, PP, PBT

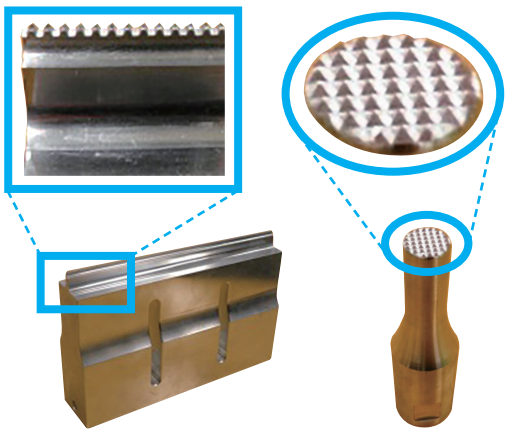


Tank Joint
For preventing burrs from extending out



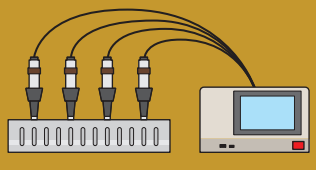
Knurling of Horn

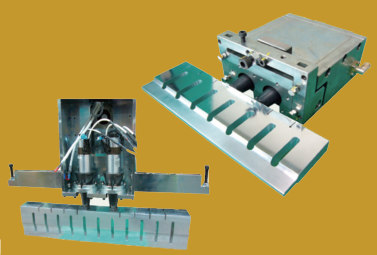
We offer knurling of various shapes in order to achieve the finish according to the purpose of welding strength and design of customer's requirements.



Multi-head Drive

- When multiple oscillators are connected in series, one generator controls resonant frequency and driving power of several oscillators.
- Since it can drive a long and large horn powerfully, it is effective when you want to avoid the dividing groove of the horn.
- It can be used with long horns at high frequencies.
- Adjustment and conditioning are simplified.





Ultrasonic Plastics Welder

SW-D series

A model for installing automatic machines equipped with various control and monitoring functions

- **Various control modes**
  Peak power, Energy, Timer, Continuous oscillation, External sensor (Displacement, Temperature, etc.) control
- **Controller type that is easy to install in automatic machines**
- **Real-time monitoring function**
  Peak power value, Energy value, Frequency, Oscillation time, External sensor value (3ch)
- **Fully enhanced interface**
  Ethernet, RS-232C, external analog, I / O, and CF card
- **AC100 / 200V compatible**
- **LED display**

Dedicated controller
UA-C01

Items	SW-D900S-20	SW-D900S-27	SW-D900S-39	SW-D600S-39	SW-D600S-48
Rated Output	900W			600W	
Continuous Output	400W			300W	
Frequency	20kHz	27kHz	39kHz	39kHz	48kHz
Oscillation Method	Automatic frequency tracking method (Digital ATHMOS)				
Amplitude Adjustment	30-100% (1% step)				
Oscillation Control Mode	Timer / Energy / Peak Power / External Sensor / Continous				
Monitor Function (OK/NG judgment)	Frequency / Oscillation Time / Energy / Peak Power / External Sensor				
Work Type Condition Storage	31 types				
Interface	Control I/O, Analog monitnor input/output, RS-232C, Ethernet, CF card				
Power Supply Voltage	AC100-120V/200-240V±10% 50/60Hz				
Power Requirements	1350VA			900VA	
Operating Temperature	5-50°C (No freezing)				
Operating Humidity	90% or less (No condensation)				
External Dimensions (mm)	W150 × D370 × H310(Including protrusions)				
Weight	≒8.5kg				

Items	UA-C01
Screen	Touch panel color LCD W240 × H320 pixels
Operating Sound	Yes
Power Supply	Power supply from the generator
Cable Length	1.5m (Option: 5m cable)
External Dimensions (mm)	W85 × D125 × H40
Weight	≒250g

A small desktop press unit can also be connected

Items	Portable Tabletop Press Machine
Pressure Method	Air cylinder method
Maximum Pressure	250N
Required Pressure Air Source	Dry air (0.06 - 0.5MPa)
Horn Stroke	75mm (ϕ25mm Air cylinder)
External Dimensions (mm)	W320 × D380 × H710
Weight	≒30 kg

*Applicable models: SW-D900S-27, SW-D900-39, SW-D600S-39

- **Various control modes**
  Peak power, Energy, Timer, Continuous oscillation
- **Welding result display**
  Frequency, Oscillation time, Energy, Peak power
- **Error code display**
- **External output of welding results**
- **For calking of small diameter boss**
  60 kHz frequency model is available*
- **Variable amplitude function (30 to 100%)***
- **AC100/200V compatible*.**

* High-end models only

Ultrasonic Handheld Welder

HW-D series

Peak power control is equipped
Easy-to-operate ultrasonic handheld welder

Items	High-End Model			Standard Model	
	HW-D250H-28	HW-D250H-40	HW-D200H-60	HW-D250S-28	HW-D250S-40
Rated Output	250W		200W	250W	
Continuous Output	180W		140W	180W	
Frequency	28kHz	40kHz	60kHz	28kHz	40kHz
Oscillation Method	Automatic frequency tracking method (Digital ATHMOS)				
Amplitude Adjustment	30 - 100%(5% step)			100% fixed	
Oscillation Control Mode	Timer / Energy / Peak Power / External Sensor / Continous				
Monitor Function (OK/NG judgment)	Frequency / Oscillation Time / Energy / Peak Power				
Interface	Control I/O, Analog monitnor output				
Power Supply Voltage	AC100-120V/200-240V±10% 50/60Hz			AC100V±10% 50/60Hz	
Power Requirements	580VA		460VA	580VA	
Operating Temperature	5-40°C (No freezing)				
Operating Humidity	30 - 85% or less (No condensation)				
External Dimensions (mm)	W100 × D244 × H230 (Including protrusions)				
Weight	≒2.5kg				

Handheld unit

Model	W2005-28-HP-P	W2005-28-HP-AL	W2005-40-HP-AL	MA1P200-60
Frequency	28kHz		40kHz	60kHz
Oscillation Trigger Switch	Push button style			
Housing Case	Plastic	Aluminum		
Hanging Hook	Yes	N/A		
Oscillator Cooling Joint	Yes	N/A		Yes
Output Cable Length	2.5m			
External Dimansion of the Grip	ϕ37mm			ϕ31mm
Weight	≒350g			≒250g

Combination with a small tabletop simple type press machine

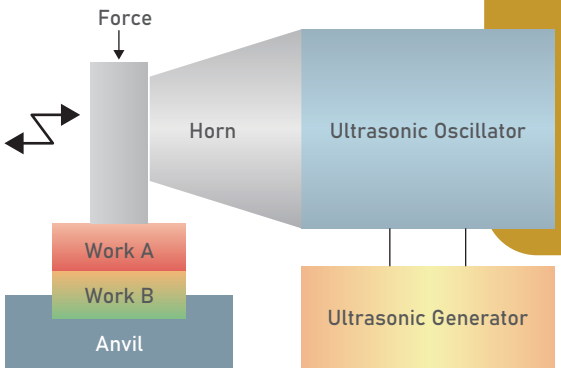
What is ultrasonic metal welding?

Ultrasonic metal welding is a joining method in which ultrasonic vibrations are applied to metals to destroy and disperse the oxide film that exist at the bonding surface, causing the metals in intimate contact to each other through plastic deformation, which results in joining due to interatomic forces.
This method is classified as solid-phase joining, which is different from fusion joining as typified by resistance welding in that the joining is done in the solid state, and is less affected by heat.

- **Since welding temperature is low, thermal effect is minimalized.**
  Base material degradation is suppressed. Temperature rise in surrounding area is reduced.
- **Welding of non-ferrous metals (copper, aluminum) is available.**
  Thin plates, laminated foils, harnesses, bus bars, etc.
- **Welding of dissimilar metals is available.**
  Copper × Aluminum, Copper × Nickel, and etc.
- **Short welding time for excellent mass productivity**
  Welding time: less than 1sec.

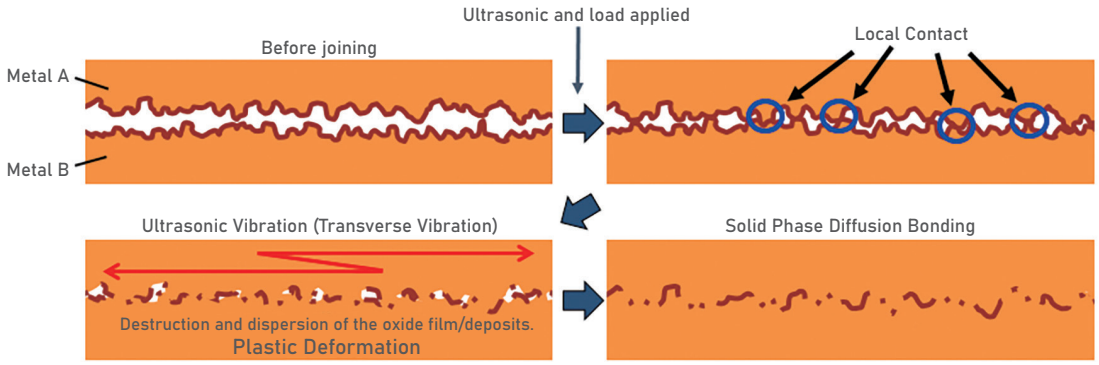
Basic Configuration

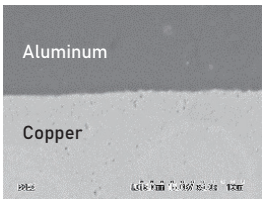
- The ultrasonic generator generates high-frequency alternating current, which is supplied to the oscillator as electrical energy and converted into mechanical vibration (ultrasonic energy).
- The ultrasonic energy of the oscillator propagates through the horn. It vibrates perpendicular to the pressure direction (transverse vibration) at the tip of the horn
- By applying a head load and ultrasonic vibration to the workpiece (object to be joined), metal joining can be performed.



Joining Process

- When metals come into contact with each other, local contact occurs at the boundary surface.
- The ultrasonic vibration and head pressure cause the boundary surfaces of the metals to rub against each other starting from the local contact point, destroying and dispersing the oxidized film, and exposing the clean metal surface.
- Plastic deformation of the surface microbumps is accelerated, and metal-to-metal proximity causes inter metal-atom attraction, resulting in joining in the solid state (below the melting point of the base material).



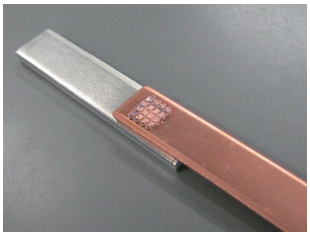


Cross-sectional view of joining dissimilar metals

Joining Examples

Fine diameter
Aluminum stranded wire ×
Copper stranded wire

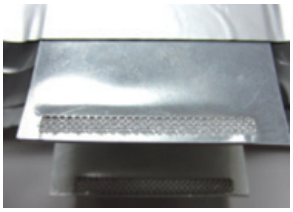
Thick diameter
Copper stranded wire



Aluminum bus bar × Copper bus bar

Copper Foil × Nickel Tab

Laminated Aluminum foil ×
Aluminum tab



Aluminum tabs ×
Nickel plated Copper tabs

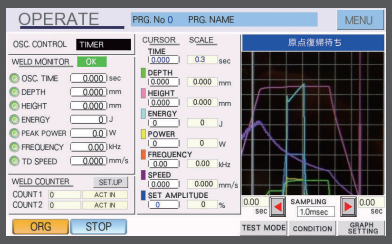
Ultrasonic Metal Welder

SW-3500-20/SH-H3K7

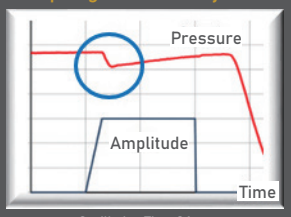
**High pressure model for large workpieces
Ideal for joining non-ferrous metals and dissimilar materials such as copper and aluminum laminated foils, stranded wires, and bus bars.**

- **Spring pressure tracking mechanism**
  A spring with excellent pressure response is installed to compensate for the tracking of the applied pressure and reduce the variability of the joining performance.
- **High rigidity pressure mechanism**
  The structure of the joining mechanism and the pressure axis are aligned, which reduces deflection and variation of joining.
- **Stable oscillation**
  Avio original automatic frequency tracking system enables stable oscillation even under high load conditions.
- **High-performance depth control**
  Equipped with a linear scale with a resolution of 1 µm
- **Four types of oscillation control methods**
  Timer, Depth, Height, Energy
- **Easy management with graphic monitor function**
  Oscillation Time, Peak Power, Energy, Depth, Height, Frequency, Descent Speed
- **OK/NG judgement of joint quality by monitoring**

Operation Screen

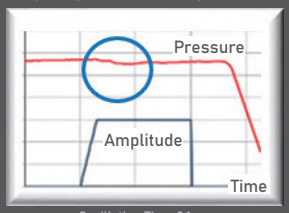


Without Spring Pressure Sync Function



Oscillation Time 0.1sec

With Spring Pressure Sync Function



Oscillation Time 0.1sec

Generator

Items		SW-3500-20
Rated Output		3500W
Frequency		20kHz
Power Supply Voltage		3-phase AC200V±10% 50/60Hz
Power Requirements		5000VA
Oscillation Method		Automatic frequency tracking method (ATHMOS)
Oscillation Control Mode		Timer / Depth / Hight / Energy
Display Function		Waveform parameter display, Weld condition data recording
Interface		External I/O, RS-232C
Setting Range	Amplitude Adjustment	30 - 100%(1% step)
	Delayed Start	Variable
External Dimensions (mm)		W250 × D450 × H375
Weight		≒20kg

Ultrasonic weld head

Items	SH-H3K7
Pressure Methed	Spring + Air cylinder method
Minimup Pressure	1700N
Maximum Pressure	3700N
Method of length measurement	Lenear scale (0.001mm resolution)
Required air pressure soure	Dry air (0.06 - 0.5MPa)
Horn stroke	50mm(ϕ100mm Air cylinder)
External Dimensions (mm)	W380 × D600 × H935
Weight	≒102kg

Various models of ultrasonic metal welder

High-end model

Capable of handling wide range of work

Items	Specifications
Rated Output	3500W
Frequency	20kHz
Oscillation Control Mode	Timer / Depth / Hight / Energy
Oscillation Method	Automatic Frequency Tracking Method (ATHMOS)
Pressure Methed	Low frection cylinder drive head
Maximum Pressure	1600N
External Dimensions (mm)	W310 × D600 × H776
Weight	≒110kg

Compact high-end model

For battery foil, small diameter harness

Items	Specifications
Rated Output	600W
Frequency	48kHz
Oscillation Control Mode	Timer / Peak Power / Depth / Energy
Oscillation Method	Automatic Frequency Tracking Method (ATHMOS)
Pressure Methed	Electric slider drive head
Maximum Pressure	350N
External Dimensions (mm)	W227 × D300 × H585
Weight	≒35kg

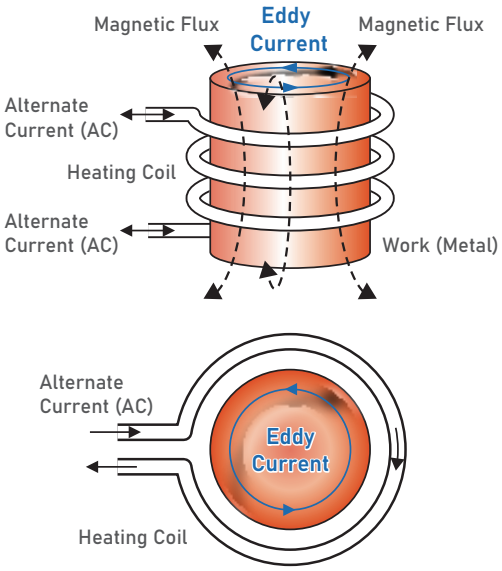
Compact standard model

For space-saving installation

Items	Specifications
Rated Output	600W
Frequency	48kHz
Oscillation Control Mode	Timer / Peak Power / Depth / Energy
Oscillation Method	Automatic frequency tracking method (Digital ATHMOS)
Pressure Method	Compact and lightweight cylinder drive head
Maximum Pressure	250N
External Dimensions (mm)	W201 × D250 × H234
Weight	≒10kg

What is High-Frequency Induction Heating?

Electromagnetic induction is used to heat metals by self-heating.
It is used to press-fit nuts and screws into plastic parts, and to press-fit metal parts.



Principle of high-frequency induction heating

When an alternating current is applied to a coil with a metal object inside or held nearby, the current flowing through the coil generates a magnetic field, which causes induction loss (hysteresis loss) resulting in heat generation.*1

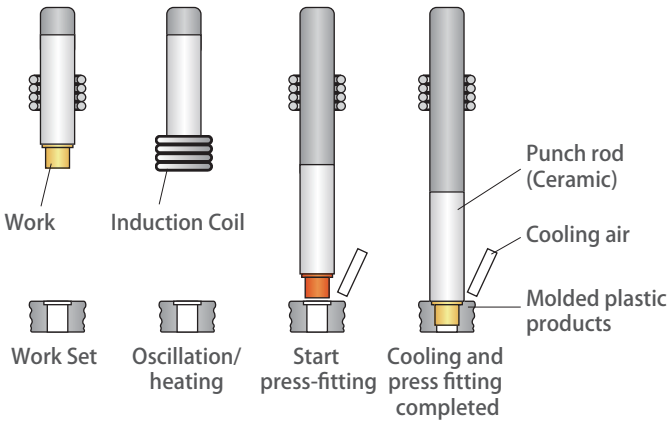
At the same time, eddy currents are generated in the magnetic field due to electromagnetic induction that is changed by the alternating current. This eddy current generates Joule heat, which causes heat loss of electromagnetic energy (eddy current loss).*2

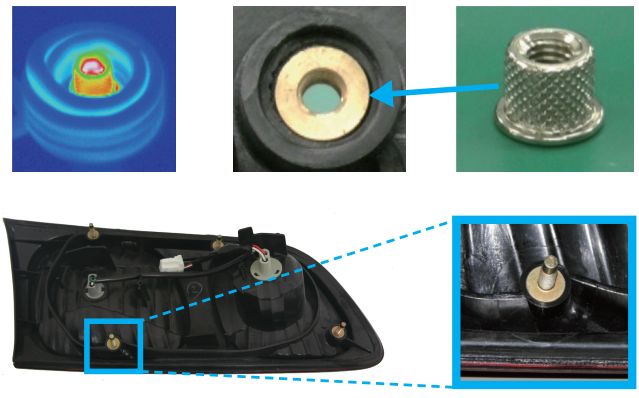
High-frequency induction heating systems use two heating principles, hysteresis loss and eddy current loss, to perform heating.

*1: Hysteresis loss occurs only when the object to be heated is a magnetic material.
*2: Eddy current loss occurs both when the material to be heated is magnetic or non-magnetic.

Nut Insert

- Metal nuts and bolts are heated by electromagnetic induction and press-fitted into plastic parts.
- The metal parts to be inserted can be heated and expanded to press-fit.





High-frequency induction heating equipment

UI series

- Steel and non-magnetic metals such as brass can also be heated.
- Suitable for workpieces with a diameter of 4 to 30 mm
- Unlike the heater method, the heat can be generated instantly, eliminating the need for preheating time.
- Air-cooled design for cooling the equipment
  No water cooling system required
- Compact size and light weight due to integrated high efficiency design
  Easy to mount on automatic machines

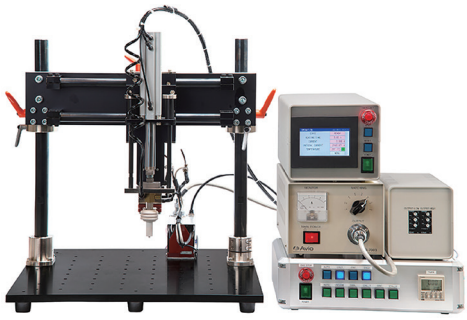
Induction coils

A wide variety of coils are available to meet the needs of customers.

The coil can be replaced by the customers.

Punch rod (ceramic)

The punch rod is equipped with several suction holes to suction and clamp nuts and bolts by air inhalation.



Desktop type high frequency induction heating nut insert machine

Press mechanisms can be manufactured to order.
(Available in Japan)

	Items	UI-3002	UI-7003		UI-9001
Induction heating equipment	Model	UI-3002-OSC	UI-7003-OSC2	UI-7003-OSC	UI-9001-OSC
	Output	400W	800W		1000W
	Frequency	30kHz	60kHz		
	Power Supply Voltage	AC100V±10% 50/60Hz	3-phase AC200V±10% 50/60Hz		
	Power Requirements	600VA	1800VA		2100VA
	Oscillation Method	Vibration feedback method	Automatic frequency tracking method (Digital ATHMOS)		
	Setting Range	3 levels	8 levels		
	Cooling Method	N/A		Air cooling (Dry air)	
	External Dimensions (mm)	W155 × D265 × H200	W184 × D345 × H153		
	Weight	≒3kg	≒4.5kg		
Matching Box	Model	FC-6	FC-6A	FC-6B	FC-6C
	Cooling Method	N/A		Air cooling (Dry air)	
	External Dimensions (mm)	W110 × D126 × H55	W55 × D145 × H60	W80 × D185 × H63	W80 × D185 × H63
	Weight	≒1.0kg	≒0.7kg	≒1.1kg	≒1.1kg

*1 A power supply (24 VDC) is required to drive the cooling fan.

Information on sample test

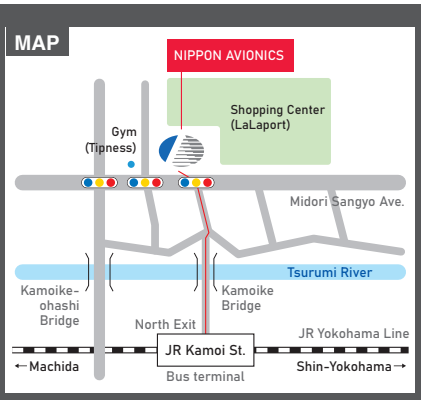
Avio laboratory offers you to perform sample test using actual equipment for welding evaluation and model selection. We also support remote sample test using web conferencing tools. It is also possible to make a test with samples you send, and we return them after the test. Please see our website for details.

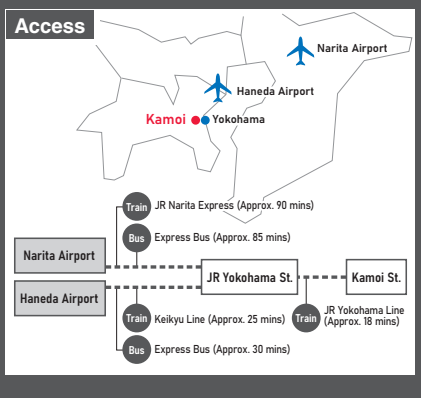
Location of laboratories

Shin-Yokohama Plant

4206, Ikonobe-cho, Tsuzuki-ku, Yokohama,
224-0053, Japan

Access
7 minutes on foot from JR Kamoi station





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⚠CAUTION

To operate a unit correctly, read the operation manual carefully. The unit should be situated away from the place filled with water, moisture, steam, dust or soot, which may cause a fire, an electric shock, troubles etc.

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