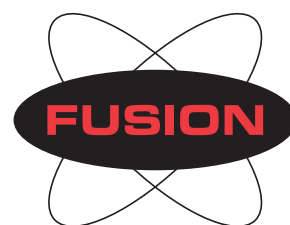
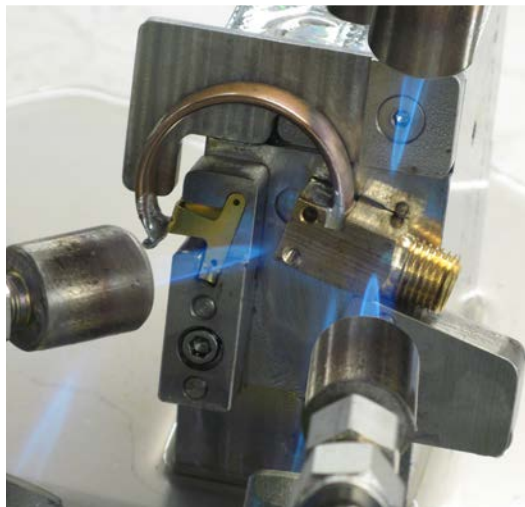




# Brazing & Soldering Automation

Alloys | Applicators | Machines



**FUSION INCORPORATED**





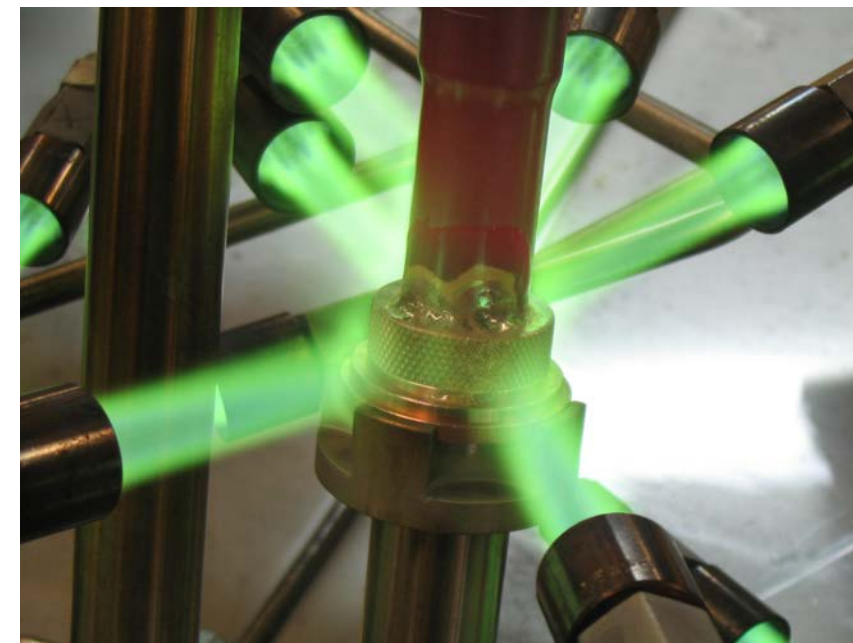
## The Fusion Process

For over 50 years, Fusion has been providing automation solutions for manufacturers engaged in production brazing and soldering. Fusion takes a process approach to automating your application. This process consists of three key ingredients: Paste Alloys, Applicator Equipment, and Automatic Machines. Your operation will be transformed with the overall goal of reducing metal joining costs through increased productivity.

With the Fusion Process, joint quality is virtually guaranteed, due to the elimination of human error. Material costs are controlled, since filler metal and flux are applied in a single step – in just the right amount. Labor costs become insignificant, as one operator turns out hundreds of brazed or soldered assemblies per hour.

## Compare the Fusion Process with Your Brazing or Soldering Operation

- Single-step application of paste alloys means no separate fluxing is required.
- Numerous filler metal/flux combinations are available to suit the specific needs of each application.
- Inventory is reduced since paste alloys adapt to joints regardless of size or dimension.
- Absence of corrosive flux overuse eliminates risks to equipment and personnel.
- Elimination of human error improves joint quality.
- Labor costs are reduced, since typically, one unskilled operator is required to operate machine.
- Fusion machines are generally amortized within 12 – 18 months.



**Top, Right:** Typically, Fusion Machines are designed to function with one operator manually loading and unloading parts. **Middle, Right:** Precision heat pattern distributes brazing filler metal evenly throughout joint area. **Bottom, Right:** Automatic dispenser applies premeasured deposits of Fusion Paste Alloy to aluminum joints.



# Paste Alloys

Fusion Paste Alloys deliver all the ingredients for a strong, void-free brazed or soldered joint in one deposit. Finely-atomized filler metal, proper flux and a neutral binder are blended into a homogeneous mixture. Upon heating, the liquid flux is released first, followed by the filler metal, which melts and flows into the joint area. By permitting automatic, measured dispensing and eliminating separate fluxing, paste alloys offer the optimum in joining economy, quality, and safety.

Every batch of paste alloy is tested and analyzed to ensure it meets both Fusion standards and your specifications. Our Technical Services Group directs paste R & D by modifying existing formulations and developing new products.

## Filler Metal

Inert gas atomization produces filler metals alloyed to exacting standards for composition, melting range, and compatibility with base metals to be joined. In general, Fusion filler metals conform to all accepted industry standards.

## Fluxing Agent

Designed to remove and prevent re-formation of surface oxides during heating. Type and amount are carefully matched to the specific application, ensuring dependable joints with minimal flux residue.

## Neutral Binder

Paste-like binder holds flux and filler metal in stable suspension; prevents filler metal/flux interaction. Controlled consistency ensures error-free application and keeps paste alloy localized in the joint area.



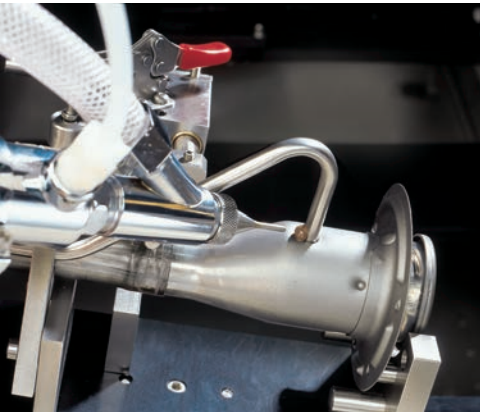
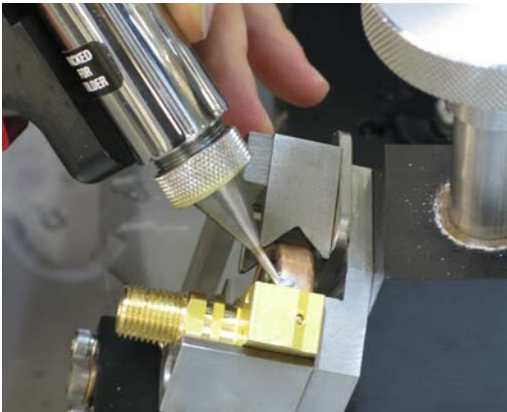
### Standard Fusion Brazing & Soldering Alloys

- Tin/Lead
- Tin/Silver
- Lead – Free
- Silver
- Cadmium – Free Silver
- Phos/Copper
- Copper
- Aluminum
- Nickel
- Gold

### Filler Metal • Fluxing Agent • Neutral Binder



### Model 710 Applicator



# Applicator Systems

Key to the efficient use of Fusion Paste Alloys is a Fusion Automatic Paste Applicator, which provides for accurate, repeatable deposition of paste alloy to joints of virtually any size and shape. Pneumatically and electrically operated, the basic controller is accompanied by an applicator gun and reservoir. Paste stored in the pressurized reservoir is fed to the applicator gun, through the nozzle, and onto the parts in deposit sizes ranging from small dots to continuous stripes.

Typically, a pneumatic cylinder positions the gun near the part, then retracts after paste application. A photo sensor detects each properly fixtured part and ensures that the gun actuates only when paste alloy is required. Applicators can control one or several paste guns, and may be manually operated or integrated into an automatic machine through the PLC. *(See pages 10-11 for a review of proven applicator concepts.)*

### Model 615 Applicator



Middle, left and middle: Hand-held applicator gun dispenses paste automatically as dot or stripe deposits. Middle, right: Slide-mounted applicator gun deposits Fusion Paste Alloy to assembly joint area.

### Model 710 Applicator

Designed for stand-alone, high volume use, the Model 710 controls one or more Fusion FE-Series guns. Adjustable time and pressure controls, quick-disconnects for hose attachment, and choice of limit switch or foot pedal actuation.

**Dimensions:** 14.75"W x 5.75"D x 3.0"H (375mm x 146mm x 76mm) (Note: Reservoir, stand and gun sold separately)

### Model 615 Applicator

The Model 615 is designed to dispense small deposits of paste alloys. Uniform air pressure is introduced to a plastic cartridge, which serves as both paste reservoir and dispenser. Digital timer, programmable feature, footswitch, finger switch, and syringe stand included.

**Dimensions:** 2.9"H x 9.7"W x 7.5"D (73mm x 246mm x 190mm)

Visit [www.fusion-inc.com](http://www.fusion-inc.com) for specs. on Model 615 and 710 Applicators.




# Automatic Machines

Custom built for your application, the Fusion Rotary Index 200 machine is widely used for high volume, automatic brazing and soldering applications. The typical machine sequence begins with manual or automatic loading of parts into stainless steel fixtures. Indexing clockwise, the parts are pasted by one or more automatic applicator guns. These guns, mounted on pneumatic slides, apply a pre-measured deposit of paste alloy to each joint.

After pasting, the parts index again through a series of natural gas/air burners. The burners progressively heat the assembly to the liquidus temperature of the filler metal. Following heating, the part indexes through a series of cooling stations. Both air and water are used to solidify the alloy and bring the part and fixture back to room temperature. The finished part is then automatically ejected or manually unloaded by the operator.

Although most Fusion machines employ open flame heat, alternative heat sources can be used. (see page 12)

Fusion Machines can be built to CE Certification 

## Rotary Index 100

Fusion’s Rotary Index 100 is a smaller-scale version of the Rotary 200 Machine. With a compact footprint of only 36”W x 48”D, this machine is ideal for relatively small assemblies.

### Sequence of Operation:

1. Operator loads assembly into stainless steel fixture.
2. Deposit of paste alloy is applied automatically (or manually) to the joint area.
3. Assembly indexes through a series of natural gas/air heat stations (induction heat optional)
4. Compressed air and water quench cools both the part and fixture for safe operator unloading

**Dimensions:** 36”W x 48”D x 38” load height (914mm x 1219mm x 965mm)

Machine base is T-slotted, aluminum extrusion framework with polycarbonate guarding on three sides.

**Stations:** 6 or 8 stations

**Production Rate:** 100 – 200 parts per hour depending on assembly mass and configuration.



## Rotary Index 200

### Dimensions:

48” x 48”, 72” x 72” or 80” x 80”  
(1219mm x 1219mm,  
1829mm x 1829mm or  
2032mm x 2032mm)

**Stations:** 8 – 24

**Production Rate:** 300 – 1,200 parts per hour.

### Rotary Index 200

#### Standard Features:

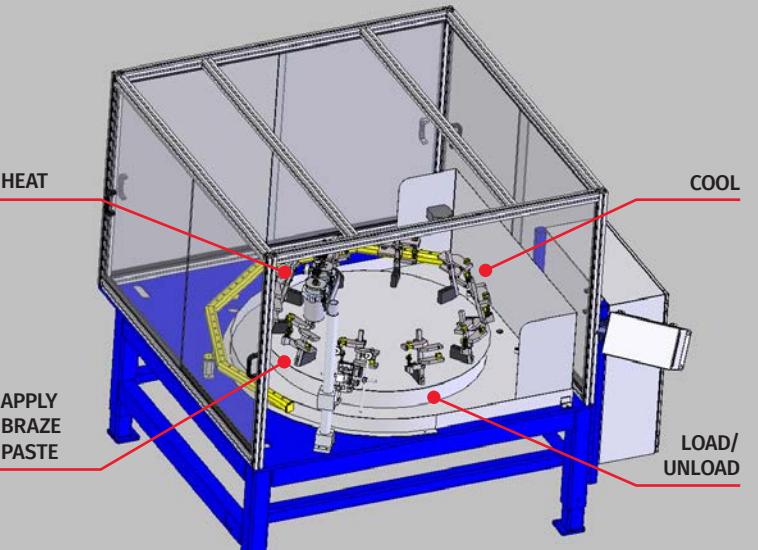
- Welded frame made of 4”x4”x¼” wall steel tubing with a ¾” thick Blanchard ground top plate
- Machine frame is powder coated
- Machine frame has adjustable legs for easy height adjustment plus adjustable leveling feet for fine adjustments.
- Operator Station with PLC Interface makes part changes easy with recipe function while providing machine diagnostics for quick troubleshooting
- Heat manifolds are powder coated
- Gas Flowmeter and Manifold Manometer to verify process settings
- Air and water cooling valve timers adjustable through Operator Interface and are unique to recipe code
- Needle Valves installed on all air and water cooling outlets
- Individual gas cocks installed for each burner allows individual flow adjustments or to turn burners on/off depending on part being processed
- Stainless Steel tubing used for burner pattern provides rigidity
- All utility connections located together
- Color-coded piping for gas lines, air lines, and water lines
- Air dump valve with lockout for main air supply
- Lockable Electrical Panel Disconnect
- Hi/Lo Heat System conserves fuel by switching to low settings when parts are not loaded
- Isolation valves installed on incoming air and fuel source lines
- Cam-Driven Indexer
- 0.75” Thick Aluminum Toolplate
- Stainless Steel Toolplate Cover
- Stainless Steel Water Trough
- Guarding provides safety and process stability by shielding from air currents
- Guarding doors allow for easy maintenance and good visibility
- Safety pressure switches on heat system detect low gas pressure, high gas pressure, and low air pressure
- Proximity switches installed on extend and retract positions of all slides
- Flow Controls installed on all cylinders and slides
- Air dump valves installed on all slides to assist with setups and adjustments
- Paste tanks supplied with quick-release lid clamps
- Paste guns controlled through PLC to allow paste adjustment with PLC recipe feature
- Manual paste purge pushbuttons supplied for each paste gun
- 1 spare paste gun supplied for each paste gun used
- Free servicing of paste guns when Fusion paste products are used
- Allen-Bradley ControlLogix PLC with a PanelView Operator Interface
- 24VDC control voltage
- Quick Disconnects on proximity switches, pressure switches, and solenoid valves to make maintenance quick and simple



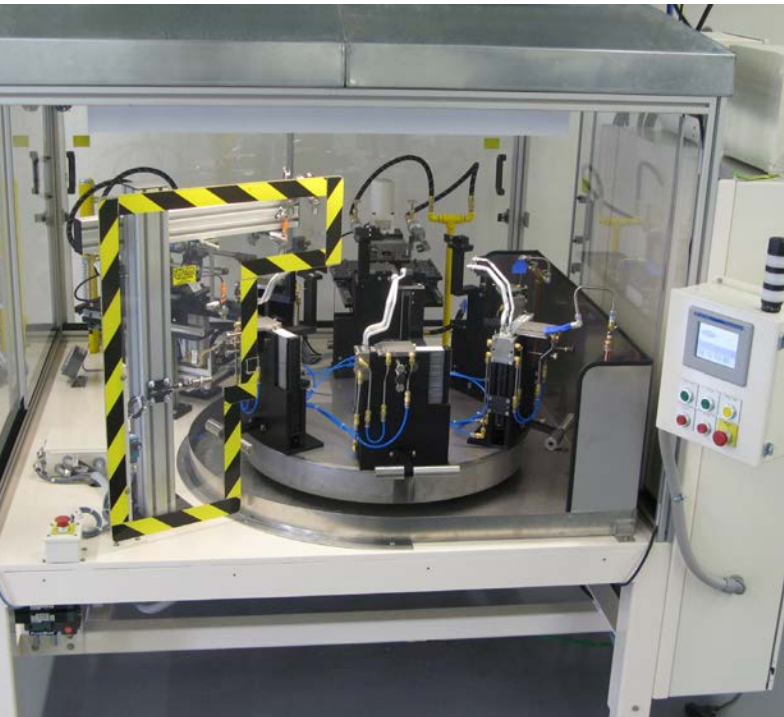
Rotary Index 100



Rotary Index 200



Rotary machine conveys fixtured parts through brazing/soldering alloy application, heating and cooling cycles.





# Fixed Station “Braze Mate”

## Braze Mate 100

### Single Station

The Braze Mate 100 is the ideal brazing/soldering machine for lower volume applications or short runs of various part styles. Heat slide with adjustable stroke oscillates throughout timed heat cycle to eliminate “hot spots” at the assembly joint area.

#### Sequence of Operation:

1. Operator loads assembly into stainless steel fixture.
2. Paste applied (hand-held or slide-mounted) with automatic dispenser gun.
3. Dual, zero-force optical touch buttons to actuate rigid mesh safety screen, followed by automatic, gas/air heating/cooling cycle.
4. Joined assembly unloaded by operator.

**Dimensions:** 36”W x 48”D x 34” load height \*  
(914mm x 1219mm x 864mm)

\* Braze Mate 150 operates identically to the Model 100, however, is 72”W x 56”D to accommodate larger, multiple joint assemblies.

**Production Rate:** 60 parts per hour typical.

## Braze Mate 100 LS

### Dual Station

Same footprint as the Braze Mate 100 with a manually driven, two station indexer. Assemblies are loaded, brazing/soldering alloy is applied, then rotated 180° into the heating and cooling station. Operator loads another assembly on second fixture during heating/cooling cycle. Guarding on the toolplate separates the two fixture stations.

## Braze Mate 200

### Dual Station

The Braze Mate 200 has dual, independently controlled heat stations so different assemblies can be brazed or soldered simultaneously. This machine is ideal for multiple joint assemblies that require “step” brazing.

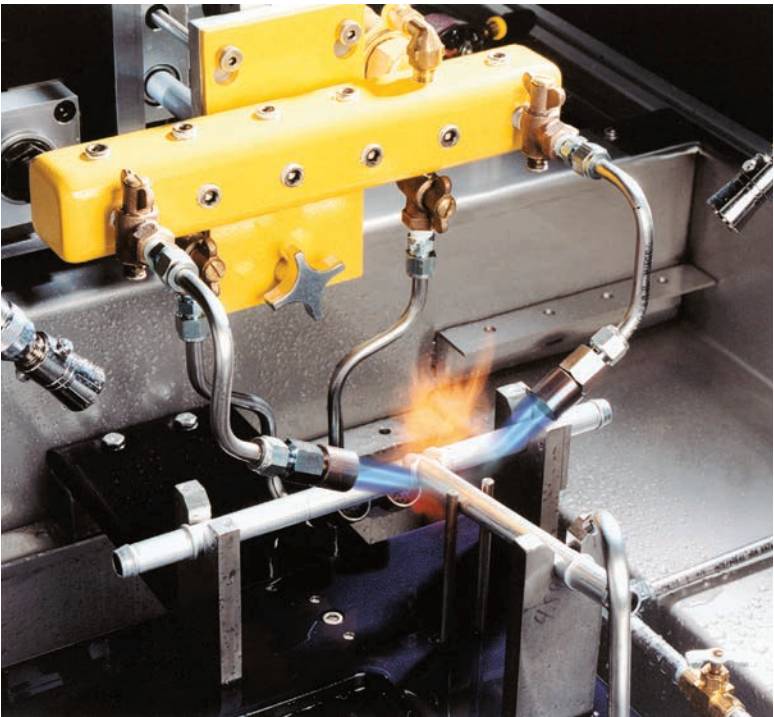
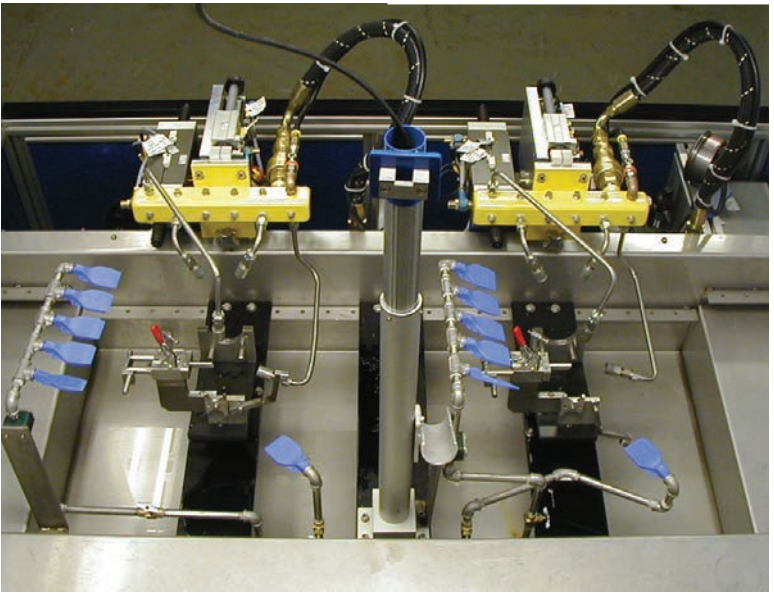
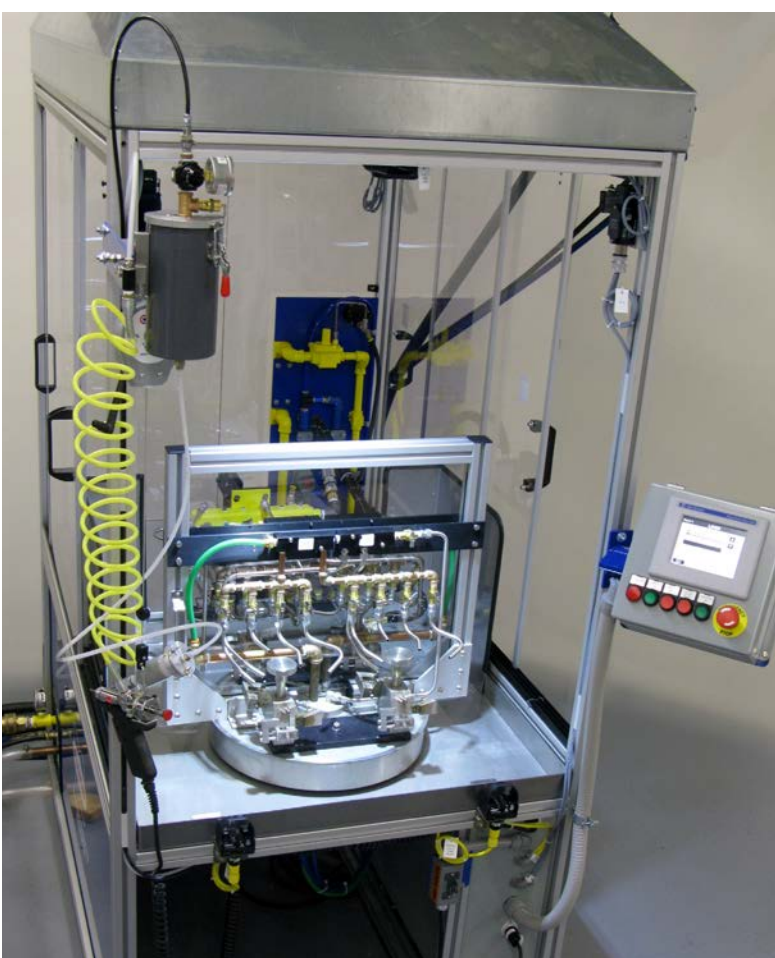
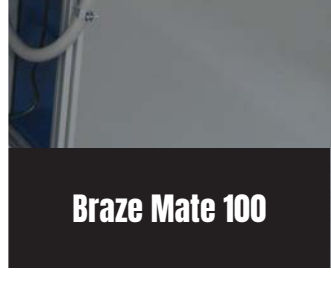
Operation sequence is nearly identical to the Braze Mate 100.

**Dimensions:** 72”W x 56”D x 34” load height  
(1829mm x 1422mm x 864mm)

#### Three paste applicator modes:

1. Fully automatic, slide mounted, in-station.
2. Semi-automatic, fixed position, off-station.
3. Hand-held, automatic, in-station.

**Production Rate:** 120 parts per hour typical.



#### BrazeMate 100/150/200 Standard Features:

- Operator Station with PLC Interface makes part changes quick and easy while providing machine diagnostics for quick troubleshooting
- Overhead lighting keeps things visible for the operator
- Quick-Disconnect manifolds require no tools to change making part changeovers quick and easy
- Heat manifolds are powder coated
- Fully adjustable manifold position makes machine configurable for most applications
- Stepper motor heat slides provide smooth motion with programmable positions in recipe, and include option for oscillation to spread heat throughout the joint area evenly
- Gas Flowmeter and Manifold Manometer to verify process settings
- Heat, Air Cooling, and Water Cooling time adjustable through Operator Interface
- Needle Valves installed on all air and water cooling outlets
- Individual gas cocks installed for each burner to allow individual flow adjustments or to turn burners on and off depending on part being processed
- Stainless Steel tubing used for burner pattern provides rigidity
- Guarding provides safety and process stability by shielding from air currents
- Operator guard door locks in position until cooling process is completed
- Guarding doors allow for easy maintenance and good visibility
- Banner Two-Hand safety switches assure operator is clear of machine
- All utility connections located together
- Color-coded piping for gas lines, air lines, and water lines
- Air dump valve with lockout for main air supply
- Lockable Main Electrical Switch
- Hi/Lo Heat System conserves fuel by switching to low settings between cycles
- Isolation valves installed on incoming air and fuel source lines
- Stainless Steel Water Trough
- Access Door for heat system adjustments
- Safety pressure switches on heat system detect low gas pressure, high gas pressure, and low air pressure
- Proximity switches installed on extend and retract positions of all slides
- Flow Controls installed on all cylinders and slides
- Air dump valves installed on all slides to assist with setups and adjustments
- Paste tanks supplied with quick-release lid clamps
- Paste guns controlled through PLC to allow paste adjustments
- Manual paste purge pushbuttons supplied for each paste gun
- 1 spare paste gun supplied for each paste gun used
- Free servicing of paste guns when Fusion paste products are used
- Allen-Bradley ControlLogix PLC with a PanelView Operator Interface
- 24VDC control voltage
- Quick Disconnect on proximity switches, pressure switches, and solenoid valves to make maintenance quick and simple
- Leveling Feet

#### Additional BrazeMate 150/200 Standard Features:

Heat slides include rotating motion to swing heat pattern into position, while keeping the burners safely away from the operator when retracted.

#### Additional BrazeMate 200 Standard Features:

Two independent heat systems and heat manifold slides allow two completely different assemblies to be processed on the same machine, or one assembly with multiple joints to be processed using different heat pattern in two distinct areas.

**Middle:** Dual heat stations feature independent control and hi/lo flame control to conserve fuel. **Bottom:** Oscillating burners distribute heat evenly throughout joint area; timed air and water sequence cools part and fixture for safe unloading.



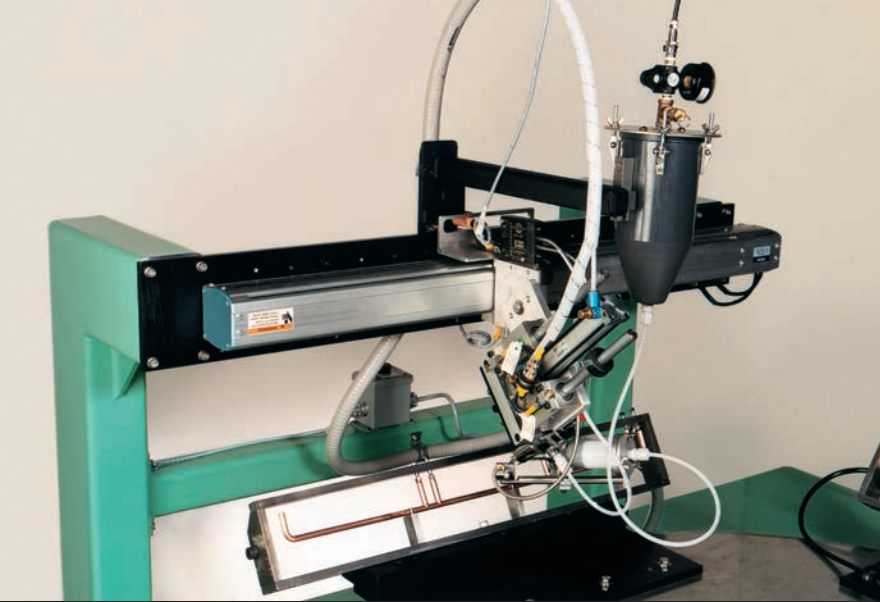
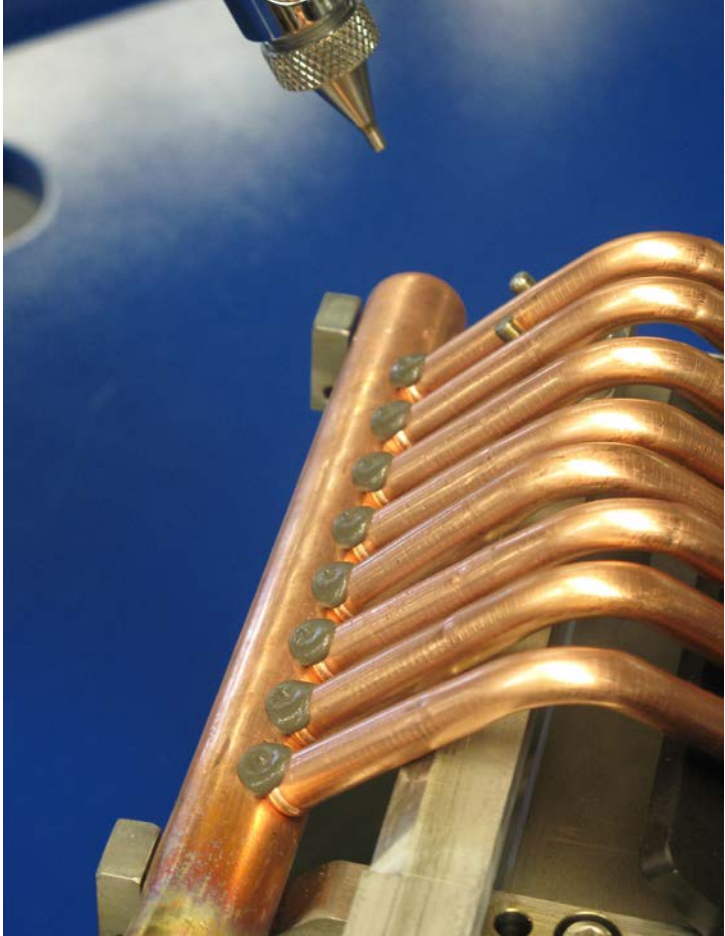
# Paste Applicator Concepts

As noted earlier, an important feature of Fusion Paste Alloys is their adaptability to various joint configurations. In most cases, a single dot of paste is applied to the joint area for distribution during heating by natural forces of capillary attraction. More complex parts may require multiple dots, a stripe, or an intricate combination of the two before parts are loaded onto the primary brazing or soldering machine.

**Satellite Paste Applicators** are designed to complement an existing heat source, such as furnace or induction. These free standing units apply single, multiple, or circular paste deposits onto components. Cycling is automatic, with an operator removing the pasted part, adding other components, and loading into an adjoining heat source.



Silver paste dispensed from cartridge onto electrical contact base prior to induction heating.



Single-Axis Robot

Single-axis robot guides applicator gun to dispense phos/copper paste alloy to header tube joints.

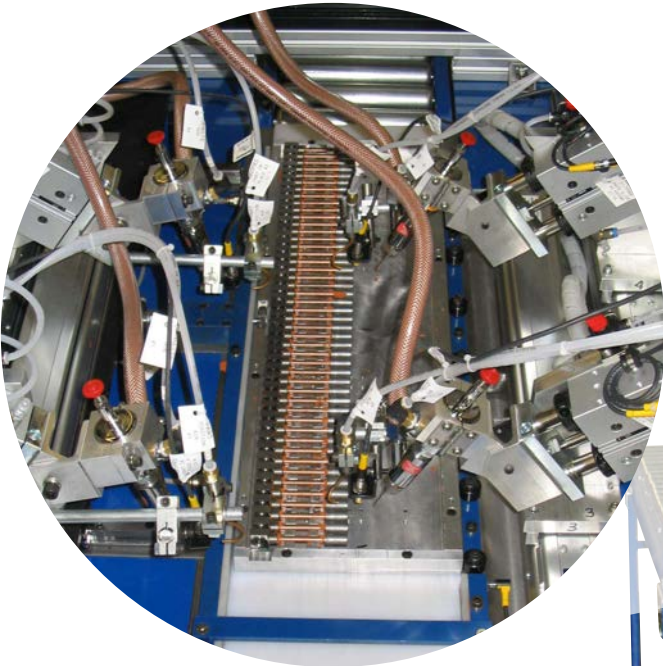
## Single-Axis Robot

For applications with multiple joints – spaced at different intervals on the same axis – Fusion guns can be mounted to a single-axis robot. This stepper motor-driven device guides the gun across the entire component length, depositing paste at programmed points. Program “recipes”, stored in the PLC, are easily called up to changeover between a virtually unlimited number of part styles.

## Multi-Axis Robot

For intricate and complex joint designs, Fusion applicator guns can be mounted to a multi-axis robot. A robot can also be used to move a part underneath a stationary applicator gun.

These robots are ideal for applying paste to multiple joints located in different areas or positions. Pasting locations can be tied to the part recipe to allow pasting of different parts on the same machine. Fusion is an Authorized System Integrator for Fanuc Robots.



Single axis robots guide applicator guns dispense copper paste to tube/fitting joints at 6,200 per hour. After pasting, parts are loaded into an atmosphere brazing furnace.



Multi-Axis Robot





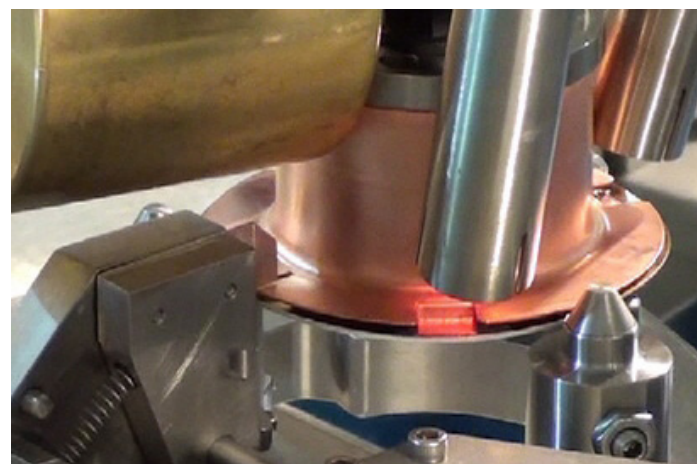
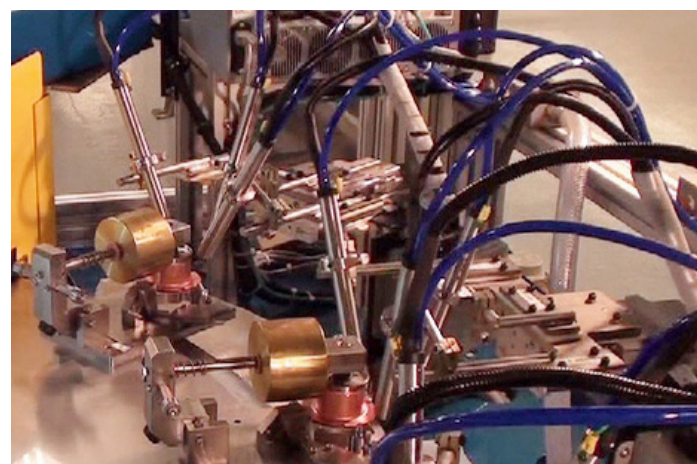


## Heating Concepts

An important aspect of Fusion Brazing and Soldering Machines is their precise control of the heating function. Natural gas is the most common choice of fuels, with compressed air added to promote combustion. Propane, methane, or similar high-energy fuels can also be used. Where more intense heat is required, oxygen can replace compressed air.

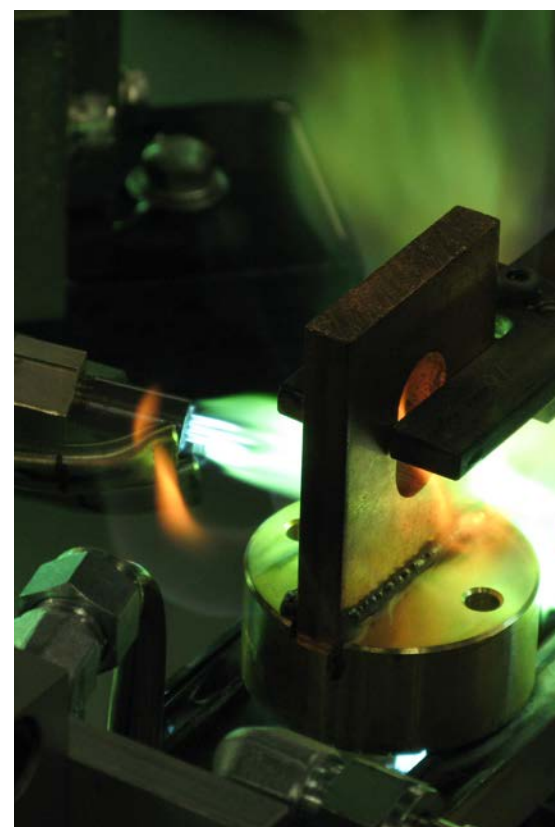
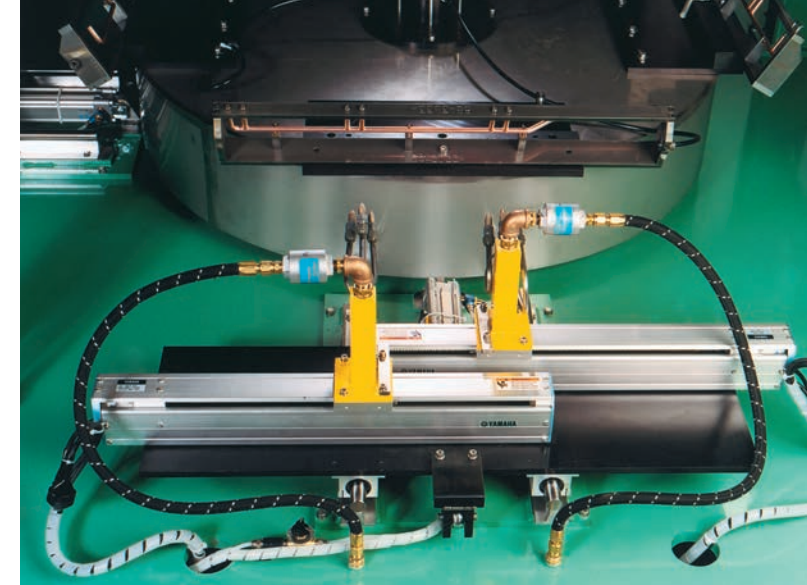
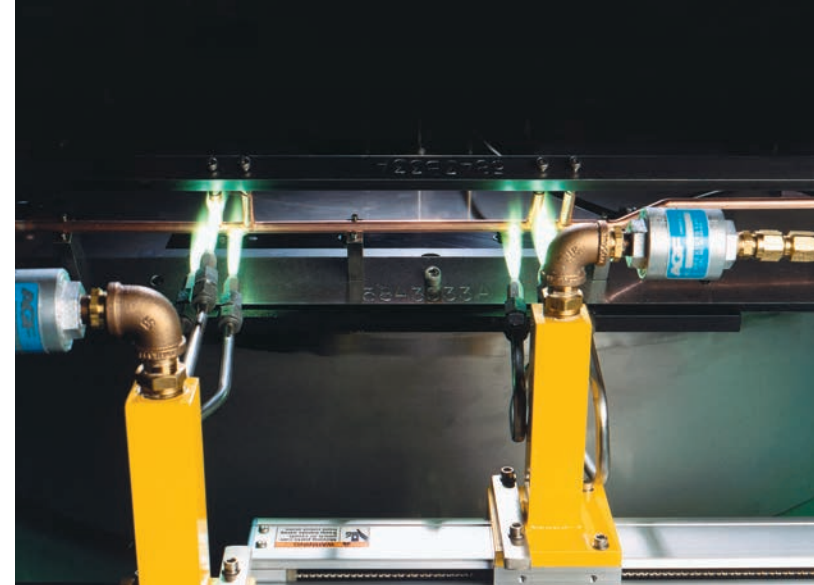
Careful placement of gas/air burners ensures sound joints by bringing each part of the assembly to joining temperature at the same time – even when parts with different masses are being joined. Further refinement of the heating pattern can influence how the molten filler metal is distributed, either keeping it localized to fill a wide joint gap or coaxing it to penetrate deeply into tight-fitting areas.

Where flame is prohibitive, induction heat is a good choice, especially for high mass assemblies that require fast, localized heat. Fusion works with various induction vendors to provide effective heating solutions.



**Left Page, Top:** Precisely positioned gas/air burners are focused on brass assembly joint. **Middle:** Hot air is effective for specific soldering applications. Tubes are temperature controlled for accurate heat output.

**Right Page, Top:** Single-axis robots provide heating flexibility. Burner positions can be easily changed by selecting stored “recipes” through the machine PLC and Panel View Interface. **Middle:** Gas/oxygen heat is ideal for brazing high mass assemblies. **Bottom:** Rapid, localized heat of an induction coil is ideal for applications where flame is prohibitive.





# “Total Responsibility” Philosophy

The obvious compatibility of paste alloys and automation prompted formation of the Fusion Machine Division over 50 years ago. Today, this capable team is devoted to the design and fabrication of equipment for production brazing and soldering. Throughout this time, Fusion’s guiding hand has been its philosophy of “Total Responsibility”. Under this principle, Fusion provides all that is necessary to successfully automate your metals joining operation – from paste alloys to applicators and automatic machines – and guarantees that they will work on the application.

For applications with unusual requirements, we conduct formal Feasibility Testing Programs. Typically, a lab machine is equipped with prototype tooling for your assemblies. Important relationships between paste alloy application, heating, and cooling stations are observed under actual production conditions. Rates and performance data are verified through first-hand experience, and representative sample parts are produced for testing. Based on your input, refinements are made until the process and proposed equipment satisfy the most demanding production standards.

With the data obtained from the feasibility study, the automatic machine is then built. A Fusion field service engineer then installs the machine in your plant and instructs personnel on its operation. Direct factory service and personnel instruction is available for subsequent needs, as well as continued follow-up by your Fusion sales representative to ensure its proper operation for years to come. The result: Total Responsibility for your brazing or soldering operation from one, reliable source.

**Top:** Prototype tooling is mounted on a lab machine to determine paste application method, heat pattern, and production rate achievable. **Middle:** Feasibility testing parameters are designed into the final machine production fixture to maintain brazed/soldered assembly specifications. **Bottom:** Service technician installs brazing machine and instructs personnel in your plant.



## Facilities

**Corporate Headquarters:** Willoughby, Ohio. Located east of Cleveland, This 50,000 sq. ft. plant is home for Fusion’s sales and corporate offices and the Machine Division. In addition, Fusion’s Technical Services Group maintains laboratories here, providing constant input on the chemical and metallurgical aspects of metals joining. New customer applications are placed under the supervision of a professional project team which coordinates these resources for your benefit.

**Willoughby Plant No. 2** has 40,000 sq. ft. devoted exclusively to the production of paste alloys. Operations include a modern, nonferrous facility where pure metals are alloyed and atomized into a wide variety of filler metal powders. These powders are blended with chemical formulations to achieve the dual properties of single-step application and built-in fluxing so popular with Fusion Paste Alloy users.

**Fusion Automation Inc.,** a subsidiary based in Harlow, England also has metal powder and paste manufacturing capability. They coordinate a large network of distributors which brings Fusion paste alloys, applicators, and machines to metalworking manufacturers worldwide.

Fusion is committed to providing the highest quality products and service in the brazing and soldering industry. How can the Fusion Process work for you? Contact us today and we will conduct a no-obligation analysis of your current operation.







*Copper, brass, steel, stainless, carbide, aluminium – any base metal combination is a candidate for the Fusion Process.*



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