SMIC

SENJU METAL INDUSTRY CO., LTD.

SMIC
SOLDERING MATERIALS
CATALOG

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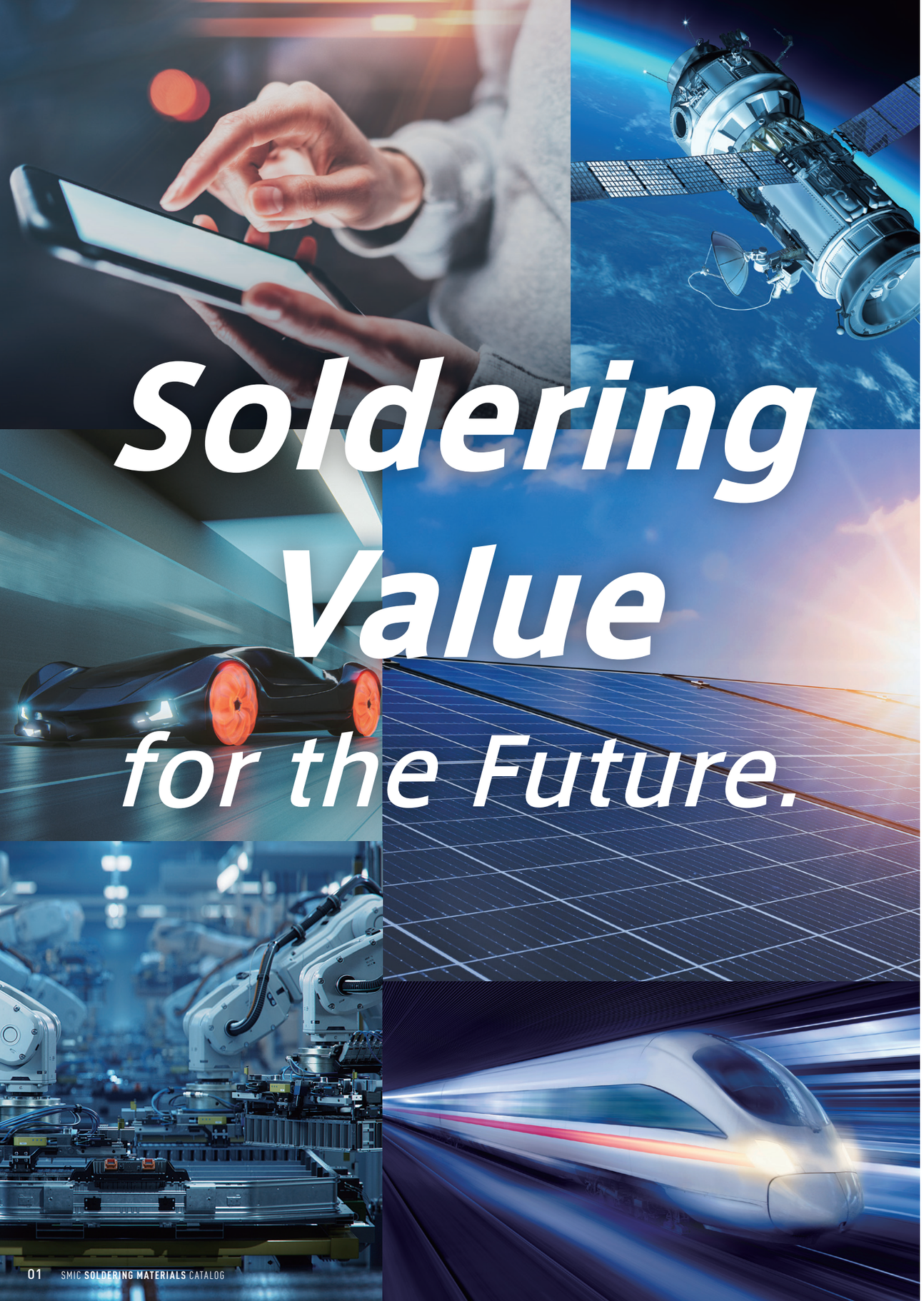
Important Notice Regarding Counterfeit Products:
We have confirmed that various counterfeit soldering products that are imitations of our company's products are being sold primarily outside Japan. Please purchase only from our group companies or authorized dealers.

992E-2602-2000



Senju Metal Industry is about making connections – beyond substrates and components.

Connecting challenge with achievement.
Connecting innovation with peace of mind.
Connecting functions with the environment.
Connecting Japan with the world.

Since our founding in 1938, starting with creating “joints” we have supported the birth of new technologies across all fields — electronic and electrical equipment, semiconductors, automobiles, and more — contributing to the development of industry and society. We continue to challenge ourselves to connect wisdom and technology to create new values.

One such example is our pioneering development of lead-free solder. We initiated research and development early into soldering materials demanded by the needs of the times, providing solutions that provided value to create a better society. These include enhancing reliability, meeting ultra-precision requirements, and offering environmentally conscious products aligned with our carbon neutrality goals.

Moving forward, Senju Metal Industry pledges to continue creating new value essential for next-generation manufacturing — from groundbreaking new bonding materials to high-performance heat dissipation materials — expanding beyond soldering materials alone. We are committed to connecting a comfortable present with a prosperous future.

SMIC SOLDERING MATERIALS CATALOG

We offer a wide range of products
to meet your needs from soldering materials to
high-performance bonding and
heat dissipation materials

Our solder alloy lineup is designed to be
environmentally friendly

SOLDER ALLOY

Solder alloys are developed with global environmental harmony in mind. An extensive lineup enables the selection of the optimal alloy tailored to specific objectives, applications, and performance requirements.

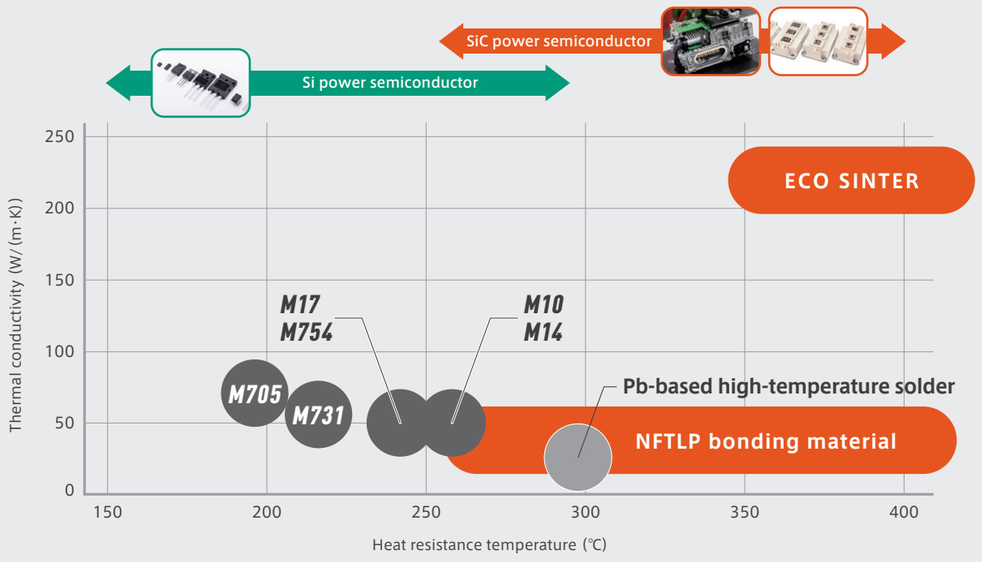
Alloy list

● High performance — For automotive and power semiconductors
● Mainstream — For mobile devices and servers
● Semiconductor — For semiconductors and smart devices
● Carbon neutral — For general household appliances

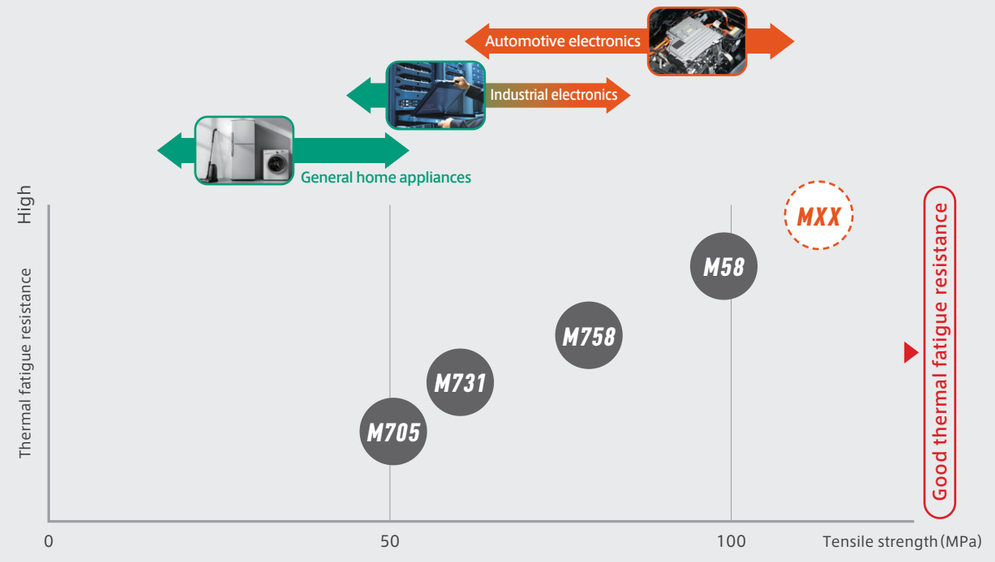
Overview		Alloy composition (wt%)	Melting temperature (℃)			Product shape					Soldering method		
			Solidus	Peak※	Liquidus	Bar	Paste	Flux-cored	Preform	Ball	Wave	Reflow	Hand soldering
General-purpose solder	***M705*** ●●●●	Sn-3.0Ag-0.5Cu	217	219	220	●	●	●	●	●	●	●	●
	M31 ●●●●	Sn-3.5Ag-0.75Cu	217	219	219	●	●	●	●	●	●	●	●
	M714 ●●●●	Sn-3.8Ag-0.7Cu	217	219	220	●	●	●	●	●	●	●	●
	M715 ●●●●	Sn-3.9Ag-0.6Cu	217	219	226	●	●	●	●	●	●	●	●
	M710 ●●●●	Sn-4.0Ag-0.5Cu	217	219	229	●	●	●	●	●	●	●	●
Low-Ag content/ Ag-free solder	***M771*** ●●	Sn-1.0Ag-0.7Cu	217	219	224	●	●	●	●	●	●	●	●
	M35 ●●	Sn-0.3Ag-0.7Cu	217	219	227	●	●	●	●	●	●	●	●
	M20 ●●	Sn-0.75Cu	227	229	229	●	●	●	●	●	●	●	●
	M24MT ●●	Sn-0.7Cu-Ni-P-Ge	228	230	230	●	●	●	●	●	●	●	●
	M24AP ●●	Sn-0.6Cu-Ni-P-Ge	227	228	228	●	●	●	●	●	●	●	●
	M805E ●●	Sn-0.3Bi-0.7Cu-P	225	229	229	●	●	●	●	●	●	●	●
	M40 ●●	Sn-1.0Ag-0.7Cu-Bi-In	211	222	222	●	●	●	●	●		●	●
High-reliability solder	***M814*** ●	Sn-3.4Ag-0.7Cu-Bi-Sb-Ni-Co	201	222	222		●	●	●	●	●	●	●
	M58 ●	Sn-3.4Ag-0.7Cu-Bi-Sb-Fe-Co	210	221	221	●	●	●	●	●	●	●	●
	M731 ●	Sn-3.9Ag-0.6Cu-3.0Sb	221	224	226	●	●	●	●	●	●	●	●
	M758 ●	Sn-3.0Ag-0.8Cu-Bi-Ni	205	215	215		●	●	●	●		●	●
	M725 ●	Sn-0.7Cu-Ni-P	228	230	230		●	●	●	●	●	●	●
Solder for power semiconductors	***M10*** ●●	Sn-5.0Sb	240	243	243	●	●	●	●	●	●	●	●
	M14 ●	Sn-10Sb	245	248	266	●	●	●	●	●	●	●	●
	M17 ●	Sn-10Sb-3Ag-Cu-Ni	226	231	257		●					●	
	M754 ●	Sn-0.6Cu-7Sb	235	239	242	●	●	●	●	●	●	●	●
High-reliability solder for semiconductor PKG	***M770GE*** ●	Sn-2.0Ag-Cu-Ni-Ge	218	220	224	●			●	●	●	●	●
	M850 ●	Sn-3.5Ag-0.8Cu-0.5Bi-Ni-Co-Ge	217	221	221	●			●	●	●	●	●
	M834 ●	Sn-3.0Ag-0.8Cu-3.0Bi-Ni-Ge	205	215	215				●	●		●	●
	M832 ●	Sn-3.5Ag-0.8Cu-4.0Bi-Ni-Ge	203	214	214				●	●		●	●
	M807GE ●	Sn-3.5Ag-0.8Cu-Bi-Ni-Ge	214	219	219				●	●		●	●
Solder for preventing soldering iron tip erosion	***M705RK*** ●●	Sn-3.0Ag-0.5Cu-Fe-Zr	219	221	221			●					●
	M20RK ●●	Sn-0.75Cu-Fe-Zr	227	229	229			●					●
Bonding material for power semiconductors	***NFTLP*** ●		—	—	—		●		●			●	
	ECO SINTER ●		—	—	—		●					●	
Low-temperature solder	***L20*** ●●	Sn-58Bi	139	141	141	●	●	●	●	●	●	●	●
	L23 ●●	Sn-57Bi-1Ag	138	140	204	●	●			●	●	●	
	L27 ●●	Sn-40Bi-Cu-Ni	139	140	174		●			●		●	
	L28 ●●	Sn-35Bi-Cu-Ni	141	143	182		●					●	
	L29 ●●	Sn-58Bi-Sb-Ni	140	145	145		●			●		●	
	L199 ●●	Sn-57.5Bi-Sb-P	140	143	143	●		●			●		●

◎ For alloy compositions and product shapes not listed above, please contact our sales representative or visit our website (www.senju.com/en/).
※ : Peak: Temperature of the maximum endothermic peak on the DSC curve.

Bonding material performance chart
(Selection based on a balance of heat resistance temperature and thermal conductivity)



Solder alloy performance chart
(Selection based on target market, tensile strength, and thermal fatigue resistance)



General-purpose solder alloy

M705/M31

- Sn-Ag-Cu-based solder features an excellent balance of workability and joint reliability.
- Excellent processing capability, suitable for diverse product shapes.
- M705 with extensive proven track record as an industry standard composition.
- M31 originally developed for on-board satellite equipment.
- Lineup also includes M705E and M31E that areeffective for reducing dross in wave soldering.

General-purpose solder alloy

M20

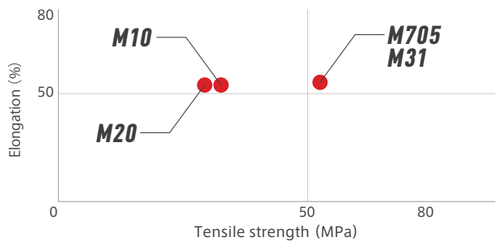
- Sn-Cu-based solder with melting points of 227 to 229°C.
- Simple, Ag-free composition offering excellent cost performance.

General-purpose solder alloy

M10

- Sn-Sb-based solder with melting points of 240 to 243°C.
- Long history of adoption as a high-temperature solder.

■ Tensile strength and elongation correlation chart



High joint reliability solder alloy

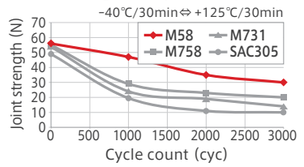
M58/M758/M731

- Latest alloy M58, designed to minimize joint-strength degradation caused by thermal fatigue.
- M758 bump-forming alloy with excellent thermal fatigue resistance.
- M731 thermal fatigue resistant alloy also compatible with wave soldering.

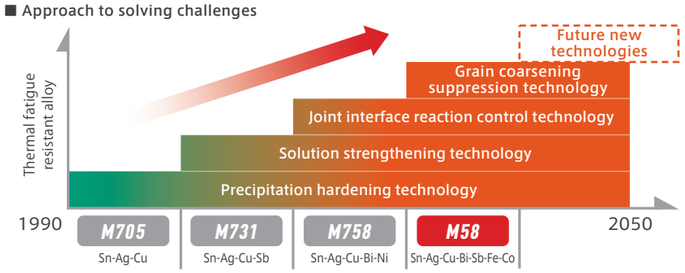
Enhanced thermal fatigue resistance by means of our accumulated technological advancements

Thermal fatigue resistant alloys were created from metal joining mechanisms that we have developed since the 1990s. These solder alloys represent the culmination of Senju Metal Industry's relentless pursuit of technological improvement. We offer a diverse range of thermal fatigue resistant alloys tailored to customer applications and objectives, with next-generation alloys currently under development.

■ Joint strength comparison by alloy



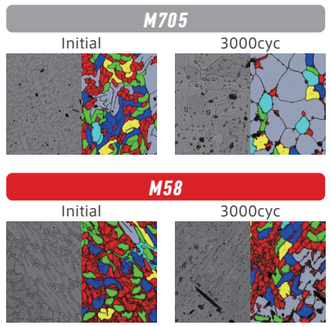
■ Approach to solving challenges



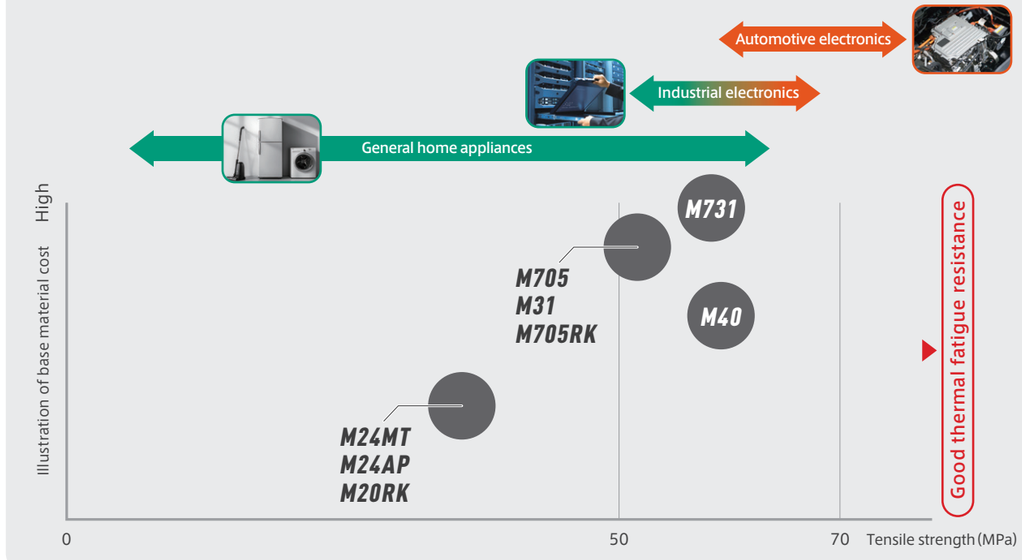
Grain coarsening suppression technology

By suppressing Sn microstructure coarsening after TCT, we expect to prevent strength degradation and crack formation. We aim for even longer service life.

■ Microstructural changes after temperature cycling test



Solder alloy performance chart
(Selection based on cost and thermal fatigue resistance)



Low-silver solder alloy

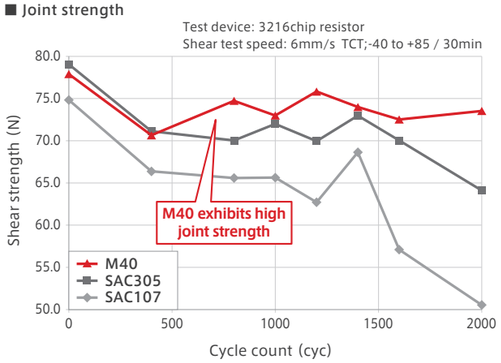
M40

- Ensures equivalent or superior joint reliability to 3% Ag products.
- Assembly is possible using the same temperature profile as M705.
- Reduces voids with LS720V flux (special flux for low-silver/silver-free alloys).

High joint strength achieved by means of solid solution strengthening

M40 is enhanced with solid solution strengthening technology and exhibits higher joint strength than 3% Ag M705 despite containing only 1% Ag. Compared to 1% Ag SAC107, M40 exhibits significantly improved strength.

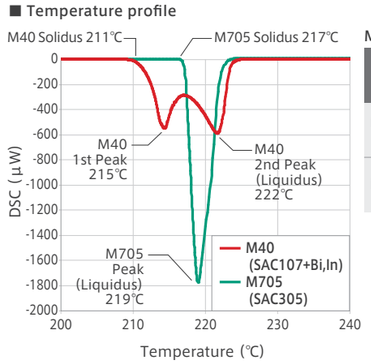
■ Joint strength



M40 can be assembled using the same temperature profile as M705

By aligning its melting temperature range with that of M705, it enables assembly using the same profile.

■ Temperature profile



Melting Point

Alloy	Solidus / Liquidus
M705 (SAC305)	217℃ / 220℃
M40	211℃ / 222℃

Silver-free wave solder alloy

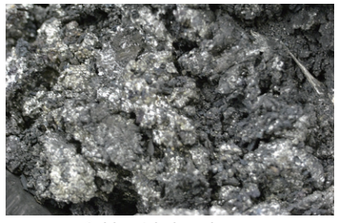
M24MT/M24AP

- Silver-free solder alloy which incorporates additive elements (P, Ge) that are effective for reducing dross formation.
- Contributes to reduced maintenance time by converting dross into a powder form.
- No effect on thermal fatigue resistance due to the additive element (P).

P+Ge effect

By suppressing dross formation by up to 70%, this alloy improves production efficiency and achieves an approx. 46% reduction in solder material costs compared to conventional products (Sn-Cu-Ni). Furthermore, since dross becomes powdery, this alloy shortens dross separation time at production sites and significantly reduces the volume of solder waste.

Sn-Cu-Ni



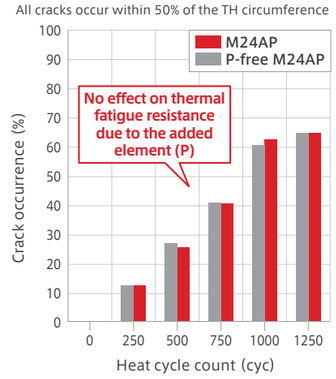
Solder-rich dross lumps

M24AP

Fine-grain dross containing P+Ge

Effect of P addition on thermal fatigue resistance

Combined addition of P+Ge suppresses dross formation without adversely affecting thermal fatigue resistance.



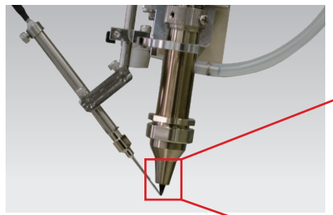
Solder alloy for preventing soldering iron tip erosion

M705RK/M20RK

- Flux-cored solder alloy containing additive elements (Fe, Zr) that effectively prevent tip erosion.
- Significantly reduces tip wear which reduces tip replacement frequency and replacement costs.
- Lineup includes 3% Ag-based M705RK and silver-free M20RK.

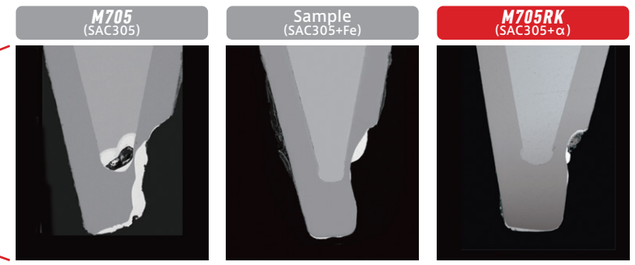
Reduced replacement frequency caused by tip erosion

Significantly improved tip erosion resistance by addition of Fe and Zr.
By minimizing tip wear, this alloy contributes to process condition stability and enhances soldering automation.



Test conditions
Solder diameter: ϕ 0.8 mm
Tip temperature: 420°C
Solder feed amount: 10 mm
Solder feed speed: 20 mm/sec

■ Tip erosion



Heating element reached after 20,000 shots

Heating element not reached even after 60,000 shots

Heating element not reached even after 100,000 shots

Bonding material for power semiconductors

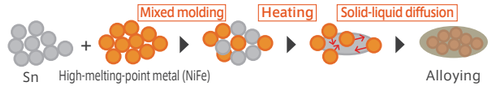
NFTLP Series

- Achieves heat resistance exceeding 700°C via TLP diffusion reaction.
  ＊TLP: Transient Liquid Phase Diffusion
- Achieves excellent thermal conductivity by means of proprietary technology.
- Product lineup tailored to bonding locations.

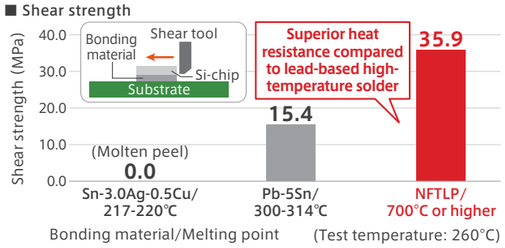
Heat resistance exceeding bonding temperatures

Next-generation NFTLP bonding material achieves heat resistance exceeding 700°C and high bonding strength even at 260°C. Demand is growing for bonding applications that require high heat resistance, such as SiC power semiconductors.

■ Bonding process using TLP diffusion reaction



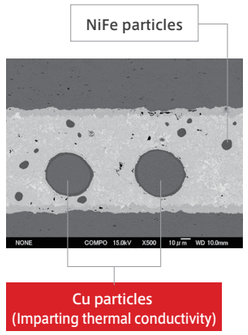
■ Shear strength



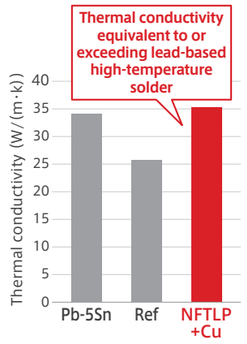
Excellent thermal conductivity
(Enhanced thermal conductivity with addition of Cu particles)

Addition of Cu particles improves thermal conductivity. This achieves thermal conductivity equivalent to Pb-based high-temperature solder, which is expected to enable its use as an alternative material and reduces environmental impact.

■ TLP+Cu particle bonding cross-section



■ Thermal conductivity



Pressureless Ag sintering paste for power semiconductors

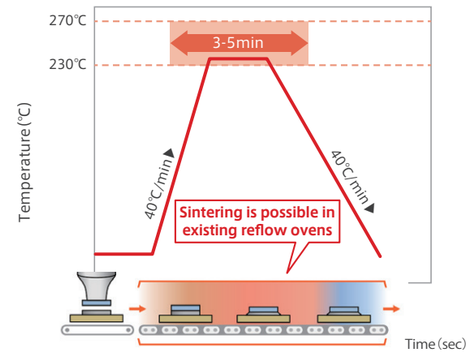
ECO SINTER PASTE Series

- Enables pressureless, short time sintering and is compatible with SMT line assembly.
- Forms a dense sintered structure, which provides excellent thermal conductivity and bond strength.
- Product lineup is tailored to required characteristics.

Sinter bonding is possible on SMT lines

Enables pressureless, short time sintering and allows assembly with existing equipment.

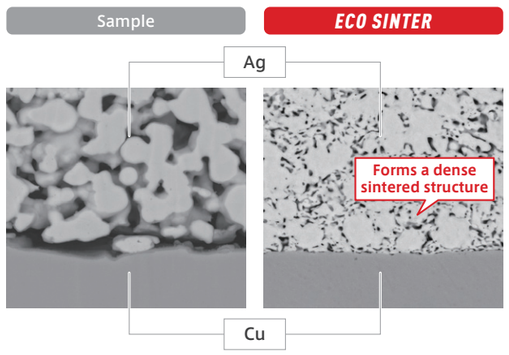
■ Temperature profile example



Excellent thermal conductivity

Forms a dense sintered structure by appropriately combining silver powders of different sizes. Achieves excellent thermal conductivity and bond strength.

■ Sintering structure comparison



Blended with a fine powder solder alloy and high-performance flux

SOLDER PASTE

Solder paste is produced by blending fine solder powder with a high-viscosity flux to form a paste. It serves as an essential interconnect material in modern electronics manufacturing, used across a wide range of applications from common household appliances to automobiles and servers.

Solder paste list

- High performance: For automotive and power semiconductors
- Mainstream: For mobile devices and servers
- Semiconductor: For semiconductors and smart devices
- Carbon neutral: For general household appliances

Application method	Heating method	Cleaning requirement	Key characteristics	Roots		Legacy (Basic)		Future (High level)	Flux type designation: IPC J-STD-004C	Recommended solder alloy combination									Suitable solder powder particle Size (μm) Particle size type designation: IPC J-STD 005					Representative product name
										Sn-Ag-Cu type					Sn-Sb type				25-45	20-38	15-25	5-15	2-11	
										M705	M58	M758	M731	M40	M754	M10	M14	M17	Type3	Type4	Type5	Type6	Type7	
For electronic devices																								
Printing	Reflow/ Air or N_2	No-clean	High wettability/ Low voids	*GWS* ●	→	*GLV* ●	→																	
	Reflow/ Air or N_2	No-clean	High-strength solder compatible			*ULT963* ●	→	*ULT880* ●● *ULT880HF* ●●	ROL1 ROL0	●	●									●	●			M705-ULT880 Type5 M58-ULT880HF Type4
	Reflow/ Air or N_2	No-clean	General purpose	*GRN360-K-V* ●	→	*ULT369* ●	→																	
	Reflow/ Air or N_2	No-clean	Fine pattern compatible	*GRN360-KJV* ●	→	*S70G* ●	→	*RGS800* ● *RGS800HF* ●	ROL1 ROL0	●											●	●	●	M705-RGS800 Type6 M705-RGS800HF Type5
	Reflow/ Air or N_2	No-clean	Room temperature storage			*S70GR* ●	→	*RTP* ●●	ROL1	●				●						●				M705-RTP Type4
	Reflow/ Air or N_2	No-clean	Low-silver solder compatible			*LS720* ●	→	*LS720V* ● *LS720V-HF* ●	ROL1 ROL0					●						●				M40-LS720V Type4
	Reflow/ Air	No-clean	Residue crack suppression					*S280-T* ●	ROL1	●										●				M705-S280-T Type4
	Reflow/ Air or N_2	No-clean/ Cleanable	High insulation reliability			*NXC400* ●	→	*NTS333n* ●	ROL0	●										●	●	●		M705-NTS333n Type5
	Reflow/N_2	No-clean	Joint reinforcement					*JPP* ●●	REL1	●														M705-JPP-SMT1
	Air or N_2	No-clean	Low-temperature compatible					*JPP-J10(W)* ●	REL1															L20-JPP-J10(W)
	Air or N_2	No-clean	Low-temperature compatible					*165HF* ●	ROL0															L29-165HF Type4
Dispensing	Laser	No-clean	Insert component compatible				→	*DLN258-ZH* ●	ROL0	●										●				M705-DLN258-ZH Type4
	Laser	No-clean	Fine dispensing compatible	*444C* ●	→	*DSR1* ●	→	*NXD300ZH* ●	ROL1 ROL0	●											●	●		M705-NXD300 Type6 M705-NXD300ZH Type5
	Reflow/ Air or N_2	Cleanable	High wettability	*440F* ●	→		→	*NXD400ZH* ●	ROL0	●		●					●			●	●			M705-NXD400ZH Type4
Jet dispensing	Reflow/ Air or N_2	No-clean	Non-contact supply compatible					*NXD900ZH* ●	ROL0	●							●					●		M705-NXD900ZH Type6
For semi conductors																								
Printing	Reflow/N_2	Cleaning required	For warm water cleaning			*WSG70* ●	→	*WSG83* ●	ORH0	●	●					●				●	●	●	●	M705-WSG70 Type5
	Reflow/N_2	Cleaning required	For die bonding, low voids, compatible with various cleaning agents	*374F* ●	→	*DB200* ●	→	*DB800* ●	ROL0	●			●		●	●		●		●				M754-DB800 Type4
	Reflow/N_2 or reducing atmosphere	No-clean	For die bonding, ultra-low residue					*NRB60* ●	ORL0	●										●				M705-NRB60 Type4
	Reflow/N_2	No-clean	For die bonding, ultra-low residue			*NRB70* ●	→	*NRB71* ●	ORL0	●					●	●	●		●	●	●			M705-NRB71 Type5-10
	Reflow/ reducing atmosphere	No-clean	For die bonding, ultra-low residue					*GSN10* ●	ORL0	●			●		●	●		●	●	●				M705-GSN10 Type5
	Reflow/N_2	Cleaning required	For bump formation, compatible with various cleaning agents	*FCR3* ●	→	*BPS3* ●	→	*BPS40* ●	ROL1	●											●	●	●	M705-BPS40 Type7

◎ For alloy compositions and product shapes not listed above, please contact our sales representative or visit our website (www.senju.com/en/).

Next-generation general-purpose solder paste

PFAS Free

ULT880 Series

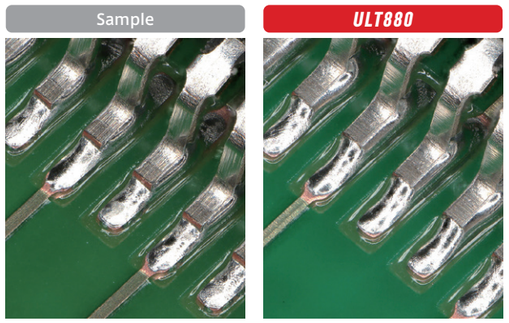
Recommended alloys **M705** **M58**

- Compatible with a wide range of applications from SAC305 to thermal fatigue resistant solder.
- Excellent wetting on lead ends improves inspection yield.
- Achieves low voids across all component types.

Improved wettability

Insufficient wetting frequently leads to errors during visual inspection. By enhancing wetting on the lead ends, inspection accuracy is improved.

■ Wetting on lead ends

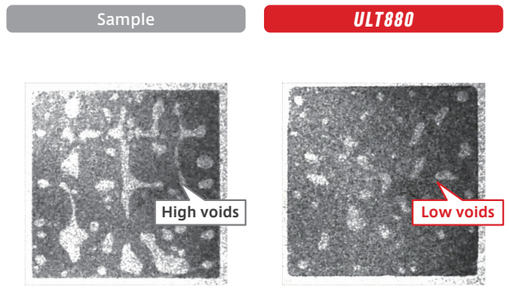


Insufficient wetting | Good

Void reduction

By optimizing flux behavior at each reflow stage and enhancing wetting during preheat, low void levels are achieved.

■ Void area evaluation results



Approx. 18% | Approx. 5%

Low-silver solder paste

PFAS Free

LS720V Series

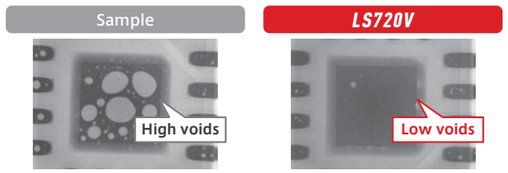
Recommended alloys **M40**

- Achieves low silver content while maintaining characteristics equivalent to SAC305.
- Excellent wetting and minimal voiding are achievable even under air reflow.

Exhibits superior wettability

Chip capacitor | Brass plate

■ Void area comparison/4 mm QFN



Approx. 35% | Approx. 5%

Solder paste for room-temperature storage

PFAS Free

RTP Series

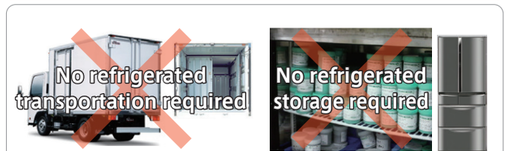
Recommended alloys **M705** **M40**

- Suppresses reactions between solder powder and flux, enabling room-temperature transport and storage.
- Suitable for continuous operation with paste replenishment, helping to reduce material waste.
- Exhibits low voids and stable wettability even after three months of room-temperature storage.

Enables room-temperature transportation and storage

Suppressing the reaction between flux and alloy powder enables room-temperature transport and long-term storage for up to three months. In addition to reducing refrigerated shipping costs, this eliminates the need for the thawing process, contributing to energy savings and overall cost reduction.

RTP Series



Room-temperature transportation possible

Room-temperature storage possible for up to three months

Air-reflowable, residue-crack-suppressing solder paste

PFAS Free

S280-T Series

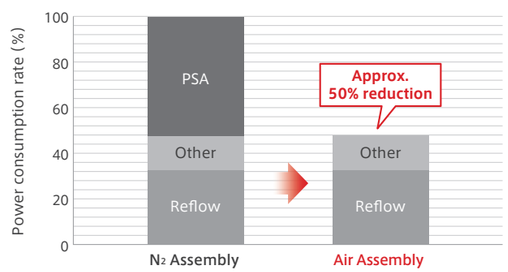
Recommended alloys **M705**

- Suitable for air reflow, contributing to lowered CO_2 emissions.
- Suppresses flux residue cracking, which reduces the risk of insulation degradation due to condensation.

Reduces CO_2 emissions by air reflow conversion

By enabling air reflow, the energy required for N_2 production is significantly reduced, achieving a 50% reduction in CO_2 emissions across the entire assembly line.

■ CO_2 emissions for air vs N_2 assembly

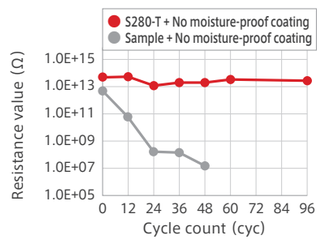


Operating conditions : 8 hours/day, 20 days/month
Annual operating hours : 1920 hours
CO_2 emission factor : 0.138 kg CO_2/kWh (Kansai Electric 2019 actual)
Oxygen concentration : at 1,000 ppm

Reduces risk of insulation degradation due to condensation

By providing elasticity to the flux residue, crack formation is prevented even after 1,000 thermal cycles. It maintains high insulation reliability under condensation and mitigates the risk of electrochemical migration.

■ Condensation cycle test results



Residue cracking test conditions:
−40°C ⇔ +100°C/1,000 cycles
Condensation cycle conditions:
−30°C ⇔ +25°C, 90% RH
＊Condensation cycle test is conducted after the residue cracking test.

＊ECM: Electrochemical Migration

Solder paste for area-laser heating

PFAS Free

DLN258-ZH Series

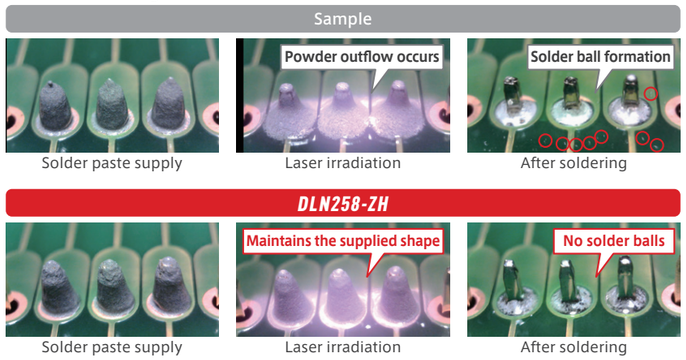
Recommended alloys **M705**

- Suitable for area laser heating of inserted components.
- Exhibits excellent wettability under rapid heating.
- Reduces solder balls caused by slumping and splattering.

Withstands rapid heating, suppresses solder ball formations, and exhibits excellent wettability

Exhibits excellent wetting with minimal solder balling even under rapid laser heating. Viscosity is optimized for through-hole component assembly, ensuring reliable joints deep within the barrels.

■ Area laser heating verification

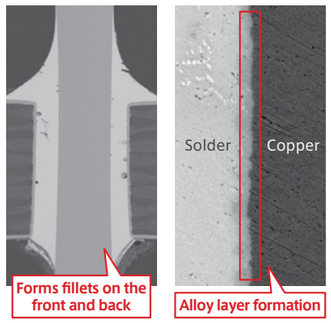


Good solder joint even with rapid heating

Achieves intermetallic layer formation and high-quality soldering despite short heating times.

■ Cross-section illustration of inserted component

■ Enlarged illustration of the joint interface



Solder paste for fine-pitch printing

PFAS Free

RGS800 Series

Recommended alloys **M705**

- Suitable for the assembly of increasingly miniaturized advanced electronic components.
- Ensures stable printing volume even through fine apertures.
- Achieves wetting properties tailored to the characteristics of fine solder powder.

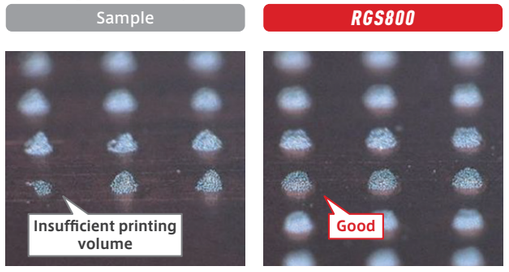
Stabilization of printing volume

Insufficient print volume in fine-pitch apertures leads directly to joint failure. RGS800 ensures consistent transfer efficiency even in fine apertures, enabling high-reliability interconnects.

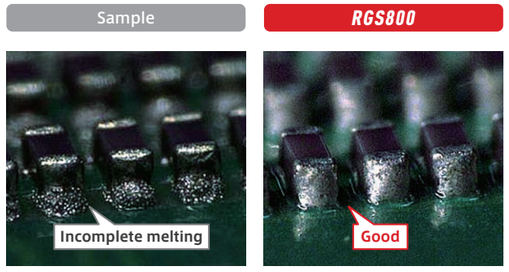
Wetting properties tailored to fine solder powder characteristics

As solder powder particle size decreases, the increased surface-area-to-volume ratio makes the alloy more susceptible to oxidation. RGS800 is engineered with enhanced oxidation-reduction capabilities and suppresses re-oxidation, ensuring excellent wettability.

■ Printing volume comparison



■ Wettability comparison



Solder paste for both cleaning and no-clean applications

PFAS Free

NTS333n Series

Recommended alloys **M705** **M58**

- Provides excellent performance in both cleaning and no-clean environments.
- Utilizes nanotechnology to suppress electrochemical migration (ECM).
- Exhibits superior cleanability with all types of cleaners.

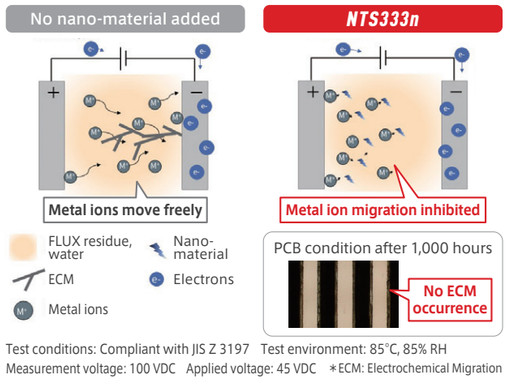
Delivers superior insulation properties enabled by nano-material additives

Newly adopted nano-materials suppress metal ion migration, reducing the risk of ECM and ensuring insulation reliability.

Achieves excellent cleanability with various cleaning agents

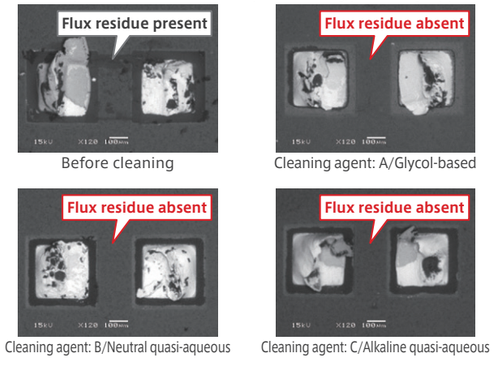
Cleaning agents include glycol-based, quasi-aqueous, hydrocarbon-based, and other types. The NTS333n provides clean results with any cleaning agent.

■ Effects of nano-material addition: insulation resistance and ECM test results



Test conditions: Compliant with JIS Z 3197 Test environment: 85°C, 85% RH
Measurement voltage: 100 VDC Applied voltage: 45 VDC ∗ECM: Electrochemical Migration

■ Cleanability verification results (0603C component mounting, post-cleaning chip peel test)



Joint reinforcement solder paste

PFAS Free

JPP Series

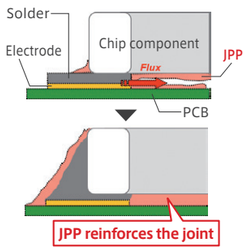
Recommended alloys **M705**

- Adhesive flux properties deliver superior joint strength after assembly.
- Achieves both soldering and underfill in a single reflow process.

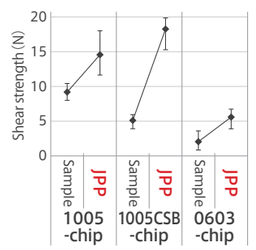
Reinforces joints while soldering

Thermosetting flux flows into the gap between the components and the substrate to provide structural adhesion. By reinforcing the joints during the soldering process, it eliminates the need for cleaning and underfilling, streamlining the assembly process.

■ Joint strength enhancement mechanism



■ Chip component joint strength test



Laser-compatible solder paste

PFAS Free

NXD300ZH Series

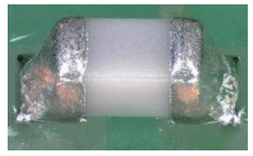
Recommended alloys **M705** **M10** **M14**

- Optimized for laser heating with exceptional wettability.
- Superior dispensing stability with high component retention.

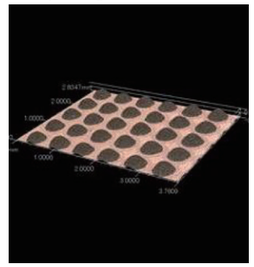
Suitable for laser heating and capable of micro-dispensing

NXD300ZH is designed for add-on component mounting. It offers exceptional dispensing stability for fine-pitch patterns and is compatible with laser heating.

■ Wettability verification/1005C



■ Dispensing volume verification



Solder paste with excellent wettability for dispensing applications

PFAS Free

NXD400ZH Series

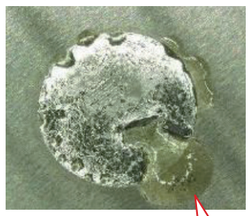
Recommended alloys **M705**

- Exhibits excellent wettability on nickel and nickel silver.
- Achieves superior continuous dispensing stability.

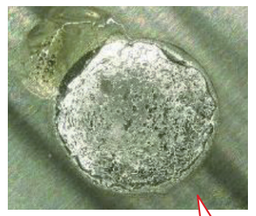
Wettability verification

NXD400ZH delivers exceptional wettability even on difficult-to-solder materials such as Nickel and Nickel Silver.

■ Nickel



■ Nickel silver



Solder paste for jet dispensing process

PFAS Free

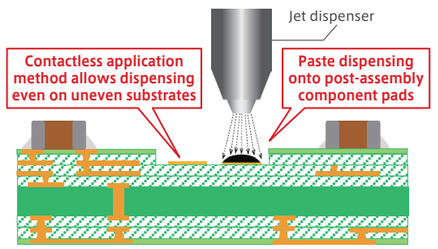
NXD900ZH

Recommended alloys **M705** **M14**

- Enables non-contact, high-speed selective dispensing of solder paste.
- Suitable for micro-dispensing, and achieves stable continuous application.

Jet dispensing method

This approach has recently gained prominence as a selective jet-dispensing technique for 3D substrates, enabling non-contact, point-by-point solder volume control.



Selective paste application via jet dispenser

Solder paste for water-based cleaning agent

PFAS Free

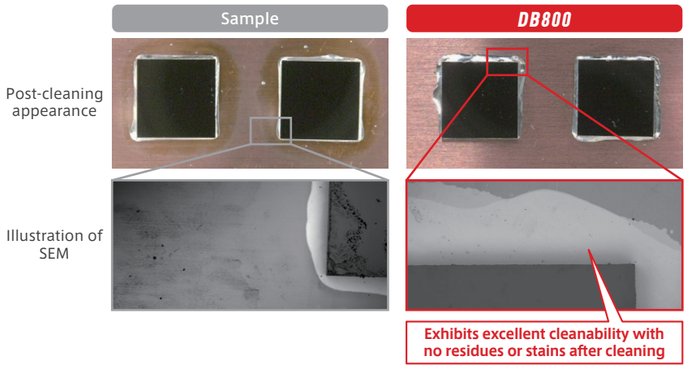
DB800 Series

Recommended alloys: M705 M754 M10 M731

- Exceptional cleanability with water-based cleaning agents.
- Effectively reduces voids in power semiconductors.
- Product lineup is adapted for printing and dispensing.

Achieves excellent cleanability

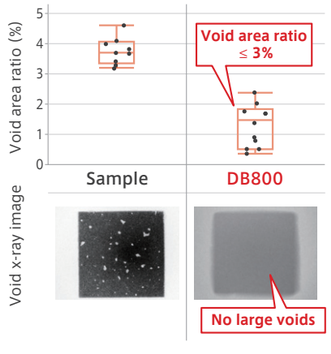
While water-based cleaners are increasingly adopted worldwide, removing flux residues after reflow has remained a challenge. DB800 is specifically engineered for high cleanability with these cleaners, ensuring a spotless finish without leaving residues or stains.



Void reduction effect

Enhances void reduction in power semiconductor die bonding and achieves peak performance when paired with vacuum reflow processes.

■ Void area ratio verification



Solder paste for reducing atmosphere heating

PFAS Free

GSN10 Series

Recommended alloys: M705 M754 M10 M731

- Leveraging the reducing atmosphere to eliminate the need for activators and enable a completely no-clean process.
  ∗Reducing atmosphere examples: Formic acid, H_2 + N_2 mixture.
- Exhibits excellent void reduction effect.
- Attitude control possible with Ni filler addition.

Effects of reducing atmosphere reflow

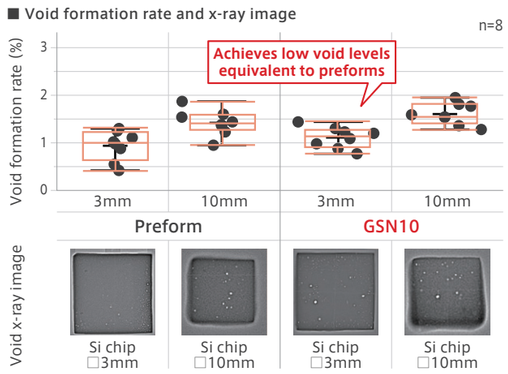
This activator-free formulation utilizes highly volatile materials to enable a no-clean process. By eliminating the need for cleaning, it reduces total processing costs. It offers the same ease of printing and dispensing as conventional solder pastes.

■ Si chip/□ 3 mm

Excellent void reduction effect

A high-volatility formulation eliminates the need for added activators and facilitates superior outgassing, resulting in low-voiding.

■ Void formation rate and x-ray image



Water-washable solder paste

PFAS Free

WSG83 Series

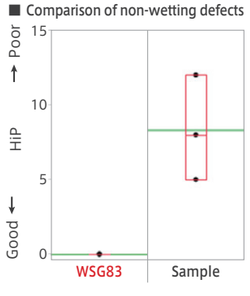
Recommended alloys: M705 M58 M10

- Excellent solderability for BGA packages, reducing non-wetting defects and voids.
- Superior cleanability even at low water temperatures (20°C), improving cleaning process efficiency.

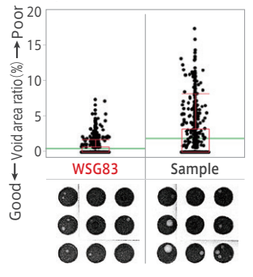
Achieves consistent soldering by reducing non-wets and voids

Enhanced activator persistence improves wettability and minimizes non-wetting defects, while optimized melting behavior suppresses void formation for consistent, high-quality assembly.

■ Comparison of non-wetting defects



■ Comparison of void formation rate



Bump-forming solder paste

PFAS Free

BPS40 Series

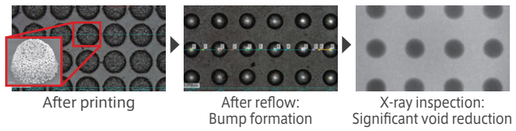
Recommended alloys: M705

- Achieves excellent printability suitable for fine bump formation.
- Optimized melting behavior during heating reduces voids.

Excellent printability for low-void bump formation

Achieves consistent deposit volumes via superior micro-aperture filling and high shape retention after stencil release. Minimizing hot slump and optimizing melting behavior ensures a significant reduction in bridging and voiding.

■ Bump formation via 120 μm pitch printing



■ BPS significantly reduces voids.

No- residue type solder paste

PFAS Free

NRB60 Series

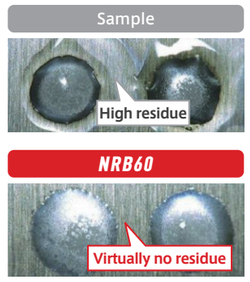
Recommended alloys: M705 M10

- Post-reflow residue is reduced to approx. 1%, making it ideal for no-clean processes.
- Achieves a void area ratio of less than 2% when used in combination with vacuum reflow ovens.

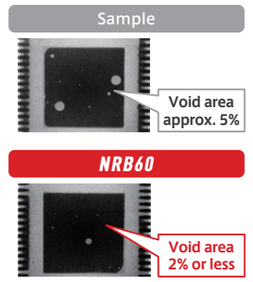
Residue condition verification

Composed of flux components that volatilize nearly completely during reflow, achieving residue levels of less than 1%.

■ Residue comparison after heating



■ Void comparison after vacuum reflow



No- residue type solder paste

PFAS Free

NRB71 Series

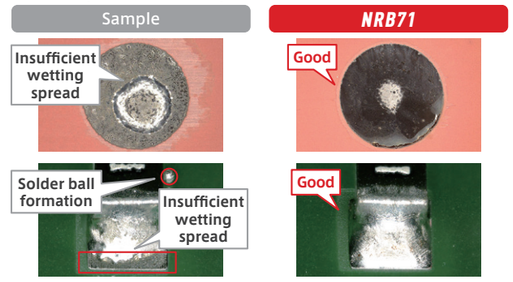
Recommended alloys: M705 M754 M10 M14

- Residue after heating is reduced to 5% or less for a beautiful finish.
- Enables reflow at an O_2 concentration of 1,000 ppm for excellent mountability.

Exhibits excellent solderability

Optimized flux activators enhance wetting and minimize solder balling. The halogen-free formulation ensures high reliability even in no-clean processes and is compatible with both printing and dispensing.

■ Reflow performance comparison test



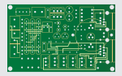
Liquid flux for improved solderability

POST FLUX

An essential liquid formulation for wave and selective soldering, this flux utilizes a solvent base to dissolve rosin and activators, enhancing solderability. It is compatible with various application methods - including spraying, dipping, brushing, and foaming - and ensures exceptional post-soldering insulation reliability.

- **High performance** — For automotive and power semiconductors
- **Mainstream** — For mobile devices and servers
- **Semiconductor** — For semiconductors and smart devices
- **Carbon neutral** — For general household appliances

For PCB assembly

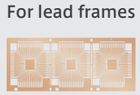


- High workability
  - (General purpose) → ES-1100
  - (Low solids) → ES-1100C
- High reliability
  - (General purpose) → ESR-1100M
  - (Halogen-free) → ES-Z-15
  - (Low residue) → EZR-01S
- Low-temperature assembly → LT-1600Y2

For terminal processing

- High workability
  - (General purpose) → T-1
  - (Rosin-based general purpose) → TY-8
- High reliability
  - (Halogen-free) → T-5
  - (Rosin-based halogen-free) → No.48M

For lead frames



- High workability
  - (General purpose) → 405F
- High reliability
  - (Halogen-free) → WF-55GF

Post flux for printed circuit board assembly

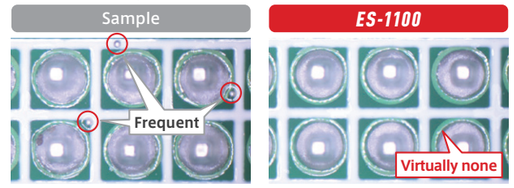
PFAS Free

ES-1100/ES-1100C/ESR-1100M

Recommended alloys: M705 M24MT M24AP

- Achieves a clean finish using nearly colorless refined rosin.
- Newly developed additive that effectively reduces solder balls.
- Lineup includes versatile ES-1100, low-solid type ES-1100C with enhanced cleanability, and IPC ROL1 compliant ESR-1100M that provides superior insulation reliability.

■ Solder ball comparison



Post flux for printed circuit board assembly

PFAS Free

ES-Z-15

Recommended alloys: M705

- Halogen-free type compliant with IPC ROL0.
- Ensures wettability equivalent to ROL1 type.

Post flux for printed circuit board assembly

PFAS Free

EZR-01S

Recommended alloys: M705 M24MT M24AP

- Ensures excellent workability and high surface insulation through the optimal blending of base rosin and activators.
- Low residue type with excellent inspectability.

Post flux for printed circuit board assembly

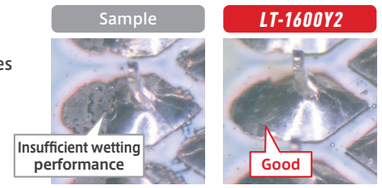
PFAS Free

LT-1600Y2

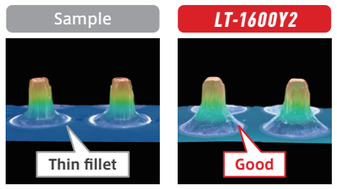
Recommended alloys: L20 L199

- Activity temperature range is optimized for Sn-Bi-based low-temperature solder.
- Optimized flux viscosity ensures adequate fillet thickness.

■ Wetting performance comparison



■ Fillet volume comparison



Terminal tinning flux

PFAS Free

T-1/T-5

Recommended alloys: M705

- Designed specifically for pre-soldering lead wires.
- Extremely low solid content (1%) for a clean finish.
- Lineup includes T-1 with excellent wettability and halogen-free T-5.

Terminal tinning flux

PFAS Free

TY-8/NO.48M

Recommended alloys: M705 M709 M760HT

- Designed specifically for coil component manufacturing.
- Exhibits excellent heat resistance, which is suitable for soldering above 400°C.
- Lineup features TY-8 with superior wettability and halogen-free NO.48M.

Lead frame flux

PFAS Free

405F

Recommended alloys: M705 M20

- Designed specifically for materials that are difficult to solder, such as stainless steel.
- Exhibits excellent heat resistance, which allows for burner heating.

＊Due to the high corrosiveness, thoroughly rinse and dry completely after cleaning.

Lead frame flux

PFAS Free

WF-55GF

Recommended alloys: M705

- Designed specifically for the hot-dip solder plating of lead frames.
- Produces a clean finish with minimal bridging and icicles.
- Glycolic acid-free design that is compliant with specific chemical substance regulations.

＊Due to the high corrosiveness, thoroughly rinse and dry completely after cleaning.

Flux-filled solder wire

FLUX CORED

This product features a solid flux core at its center, enabling the simultaneous supply of both solder alloy and flux. It offers a versatile range of advantages, including superior wetting, low splattering, and high reliability. The product is compatible with various soldering methods, ranging from manual soldering irons to automated laser heating.

● High performance — For automotive and power semiconductors
● Mainstream — For mobile devices and servers
● Semiconductor — For semiconductors and smart devices
● Carbon neutral — For general household appliances

Type	Features	Root		Legacy (Basic)		Future (High Level)	Flux Type IPC J-STD-004C	Applicable methods: Soldering iron application	Robot	Laser heating	Sleeve heating
High workability	Emphasis on wetting speed		→	NEO ● GAO-ST ●	→	GAO-WR ● ●	ROL1	●	●	●	
	Emphasis on finish quality	ESC ● ESC21 ●	→	GAO-LF ●	→	ESC24 ● ●	ROM1	●	●		
	Low fumes										
	Low-temperature mounting			LEO ●	→	LEO-2 ●	ROL1	●	●		
High reliability	General purpose	RMA02 ● RMA08 ●	→	LSC ●	→	SEN ● ●	ROL1	●	●	●	●
	Residue crack suppression			FORTE ●	→	MACROS ●	ROL1	●	●	●	
	Halogen-free	ZERO ●	→	CBF ●	→	HAL ●	ROL0	●	●	●	●
	Low-temperature mounting/ Halogen-free				→	LEO-2-HF ●	ROL0	●	●		

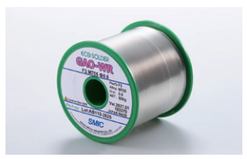
High workability flux cored solder

PFAS Free

GAO-WR

Recommended alloys: M705 M705RK M35 M20RK M24MT M24AP

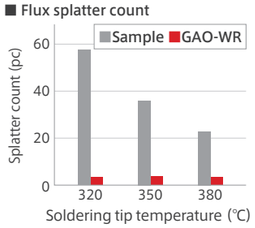
- Excellent wettability across a wide temperature range.
- Significantly reduces flux and solder ball splatter.



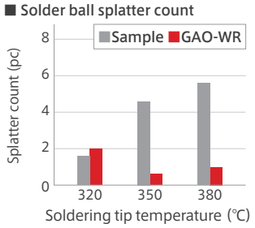
Excellent wettability with low splatter

Our newly developed activator provides excellent wettability across a wide temperature range, minimizing wetting time variations caused by fluctuations in iron tip temperature. Splatter is also reduced.

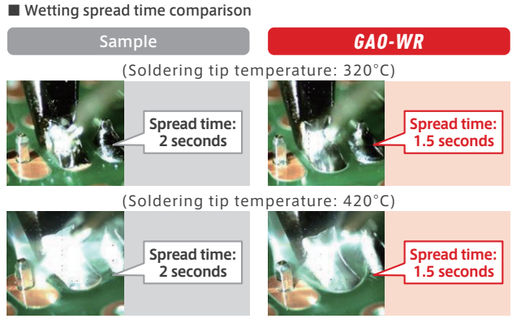
■ Flux splatter count



■ Solder ball splatter count



■ Wetting spread time comparison



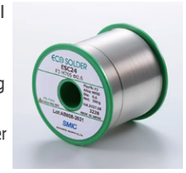
High-temperature-resistant flux cored solder

PFAS Free

ESC24

Recommended alloys: M705

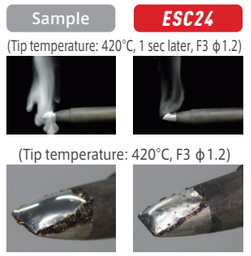
- Ideal for substrates with high thermal mass and high-temperature areas.
- Minimizes residue discoloration and soldering iron sticking while suppressing smoke generation.
- Exhibits excellent wettability and low splatter even in high-temperature environments.



Reduces tip carbonization and fume emission while preventing splatter and residue

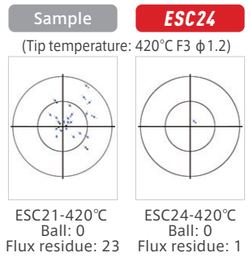
Suppresses tip carbonization and fume emission while minimizing solder ball spatter and residue. This ensures consistent process stability, even in high-temperature environments.

■ Fume emission and tip carbonization comparison



∗ M705 (3Ag-0.5Cu-SnBal.) Tip: DL32 (mfgr: HAKKO)

■ Ball splatter and flux residue comparison



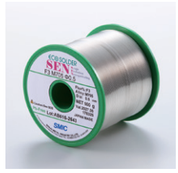
Ultra-low spatter flux-cored solder

PFAS Free

SEN Series

Recommended alloys: M705 M705RK M20RK M24MT

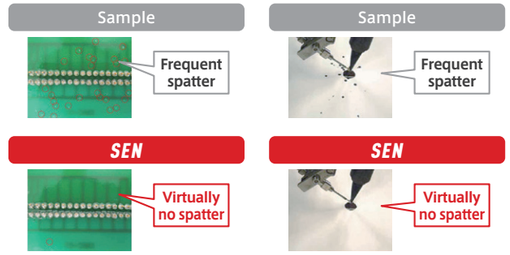
- Designed specifically to minimize spatter across a wide range of process conditions.
- Colorless, transparent flux that leaves a clean, professional finish.
- Reduced fume emission for an enhanced workplace environment.



Achieves low spatter across all heating methods

Engineered to minimize spatter by addressing its core causes. Delivers superior spatter reduction across diverse heating methods, from soldering irons to lasers.

Spatter comparison test



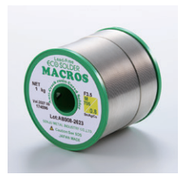
Flux cored solder to prevent residue cracking

PFAS Free

MACROS Series

Recommended alloys: M705 M31

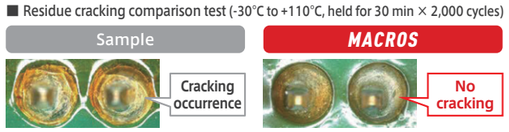
- Crack-resistant flux residue ensures high insulation reliability.
- Enhanced heat-resistant flux provides superior workability.



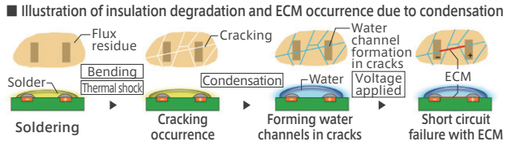
Prevents moisture ingress caused by condensation

Developed to prevent residue cracking even under extreme temperature fluctuations, such as those found in automotive electronics. This suppresses moisture ingress from condensation and mitigates the risk of insulation degradation, ensuring long-term device stability.

■ Residue cracking comparison test (-30°C to +110°C, held for 30 min × 2,000 cycles)



■ Illustration of insulation degradation and ECM occurrence due to condensation



∗ECM: Electrochemical Migration

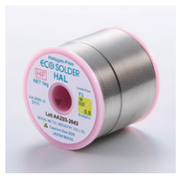
Halogen-free flux cored solder

PFAS Free

HAL Series

Recommended alloys: M705 M58

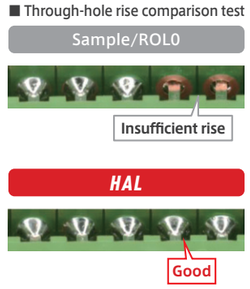
- Optimizes flux flowability for excellent wettability.
- Complies with IPC Standard ROL0, which ensures high insulation reliability.



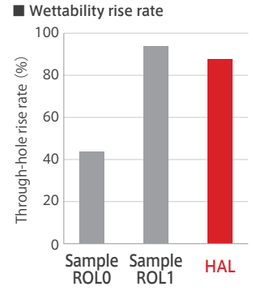
Achieves good workability even with halogen-free formulations

Overcomes halogen-free wetting challenges through optimized flux behavior during heating, delivering ROL1-level performance.

■ Through-hole rise comparison test



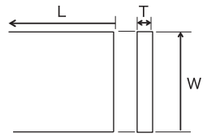
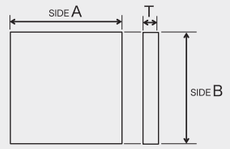
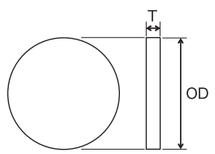
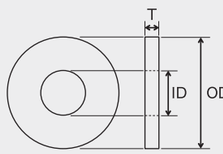
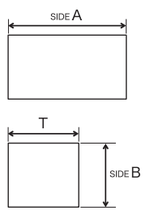
■ Wettability rise rate



Solder alloys processed into various structures and shapes

SOLDER PREFORM

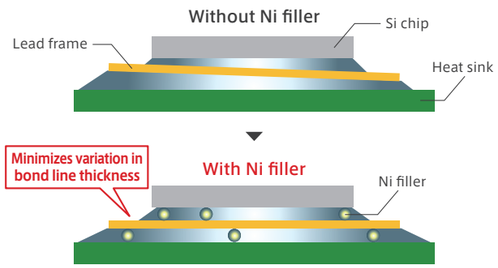
These products are manufactured by processing solder alloys into various geometries and structures. Optimal soldering is achieved by selecting the appropriate alloy composition, dimensions, and one of five distinct preformed shapes.

Shape	Internal structure: Single layer	Internal structure: Ni filler	Internal structure: Flux cored	Processed shape
Ribbon	●	●	●	 **W: Width** Min = 0.5mm Max = 70mm **T: Thickness** Min = 0.05mm Max = 0.35mm **L: Length** Specifications available upon request
Pellet	●	●	●	 **SIDE A** Min = 0.5mm Max = 100mm **T: Thickness** Min = 0.05mm Max = 2.5mm **SIDE B** Min = 0.5mm Max = 70mm
Disc	●	●	●	 **OD: Outer diameter** Min = 0.3mm Max = 62mm **T: Thickness** Min = 0.05mm Max = 2.5mm
Washer	●	●	●	 **OD: Outer diameter** Min = 1.2mm Max = 40mm **T: Thickness** Min = 0.05mm Max = 2.5mm **ID: Inner diameter** Min = 0.6mm Max = 35mm ◎ Processing conditions: (OD−ID) ÷ 2≥T
Chip	●			 **SIDE A** Min = 0.6mm Max = 3.2mm **T: Thickness** Min = 0.3mm Max = 1.6mm **SIDE B** Min = 0.3mm Max = 1.6mm

＊Min/Max processing dimensions vary depending on the alloy composition and product type. For details, please contact our sales representative or visit our website (www.senju.com/en/).

Effect of Ni filler addition

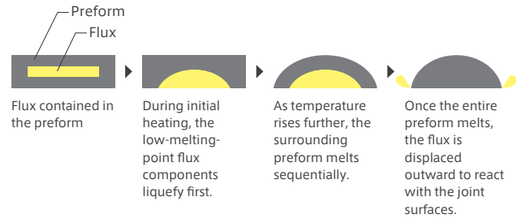
By incorporating a precise volume of Ni filler within the preform, this product ensures optimal bond line thickness and component parallelism, delivering superior joint reliability.



Effect of flux core

Incorporating solid flux into the preform enables simultaneous supply of solder and flux. This eliminates the flux application step and provides excellent wettability.

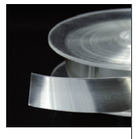
■ Illustration of melting process

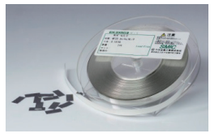


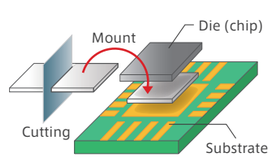
Applying geometric features to the assembly process

Ribbon

This is a tape-shaped preform wound on a reel. It can be cut to any length to create multiple sizes and allows adjustment of the solder volume.

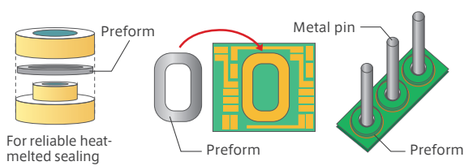



Reel-wound for easy automated cutting



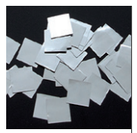
Washer

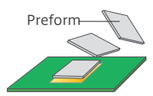
This is a ring-shaped preform. Suitable for applications requiring simultaneous, precise solder supply to multiple points, such as connector pins.



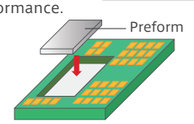
Pellet

This is a square-shaped preform. It provides consistent solder coverage over large surface area. Ideal for components requiring high thermal conductivity or specific performance.





Can be designed to match pad shapes, also useful for identification and positioning

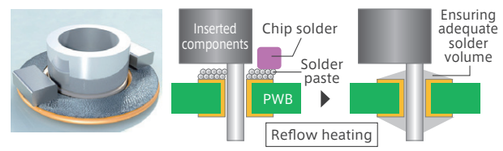


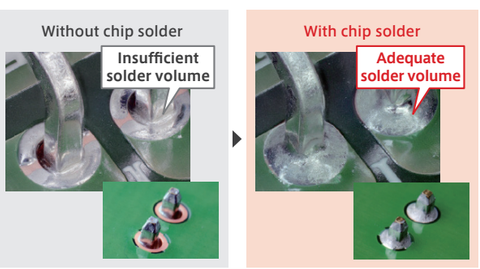
Provides a stable supply of the required amount even to areas which are difficult to solder with paste

Chip

This is a rectangular-shaped preform. Available in sizes to match chip components and is compatible with automated pick-and-place mounters. Ideal for solder fortification in areas with insufficient volume, facilitating fully automated re-soldering.

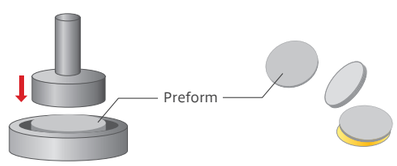
■ Capable of reinforcing the bonding of through-hole inserted components in reflow processes





Disc

This is a circular-shaped preform. Supplies the appropriate amount of solder in a size suitable for bonding components.



＊We can process various shapes and dimensions to meet customer requirements.

Solder balls for semiconductor bumping

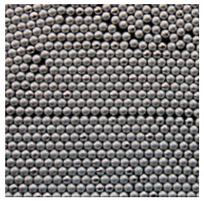
SOLDER BALL

These spherical solder balls are primarily used for semiconductor bump formation. Offering exceptional sphericity and strict dimensional control, they ensure highly stable solder volume. Options include pure solder alloy spheres and copper-core balls with solder-plated surfaces.

Features of solder balls

Solder balls are an essential material for modern semiconductor bump formation. We offer a wide range of compositions and sizes to meet various package types, pitches, and performance requirements.

■ Solder ball appearance

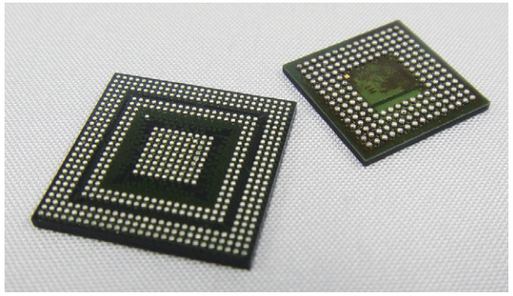


■ Ball size selection guide

Package type	Bump pitch (mm)	Ball size (ϕ mm)
BGA	1.27	0.76
	1.00	0.60
	0.80	0.50
CSP	0.60	0.35
	0.50	0.30
	0.40	0.25
Flip Chip	0.30	0.20
	0.15	0.10
	0.13	0.08
	0.10	0.06

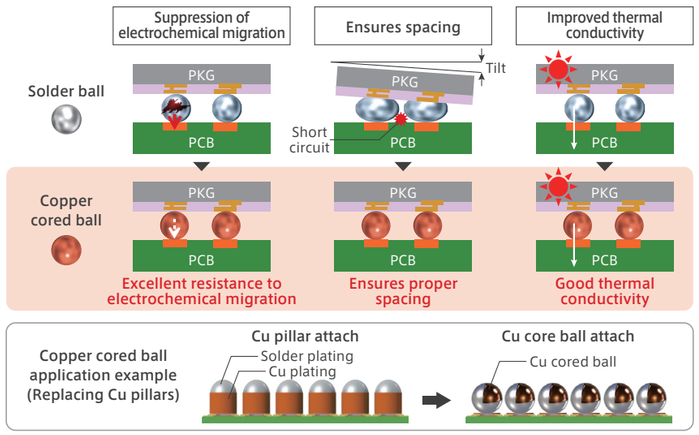
∗ See page 6 for compatible solders.

■ Example of a semiconductor with formed bumps



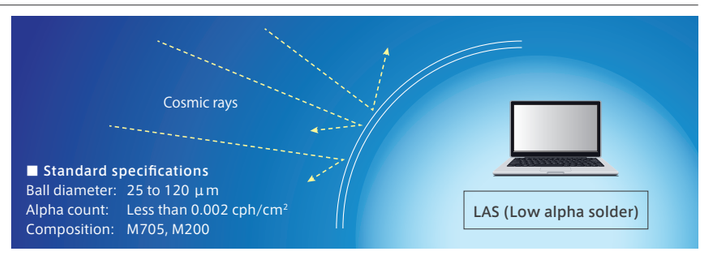
Features of copper cored balls

These are solder-plated copper core balls. They maintain a consistent standoff height during reflow. This structure offers superior resistance to electrochemical migration in fine-pitch assemblies while enhancing thermal dissipation.



Low alpha solder for soft error mitigation

Soft errors occur when trace amounts of alpha particles or cosmic rays, emitted from solder or semiconductor materials, flip data bits within memory. Flip-chip packages are particularly susceptible to these errors, necessitating the use of electronic materials with low-alpha characteristics. Our Low Alpha Solder (LAS) was specifically developed to meet these requirements.



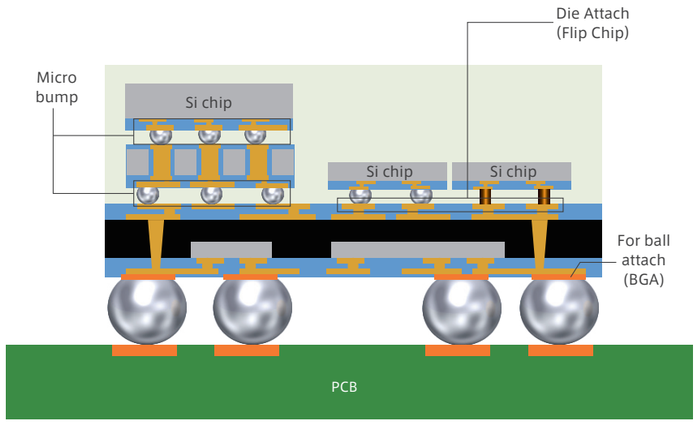
Flux products optimized for semiconductor applications based on usage

FLUX for SEMICONDUCTORS

These flux products are designed for the temporary fixation (tacking) of solder balls and chips while ensuring excellent solderability. They are precisely formulated to accommodate various bump sizes, pitches, application methods, and cleaning processes to deliver optimal performance.

Semiconductor package interconnects and compatible fluxes

Semiconductor packages feature a high density of internal interconnects with varying sizes, pitches, and materials. Our specialized fluxes are engineered to ensure superior joint integrity across these diverse applications.



Flux for micro-bump formation

PFAS Free

MB-T100 Series

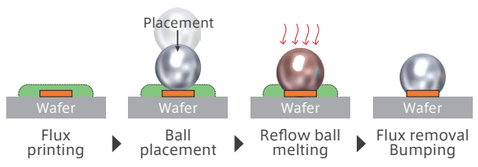
■ Excellent oxide film removal capability enables stable bump formation.

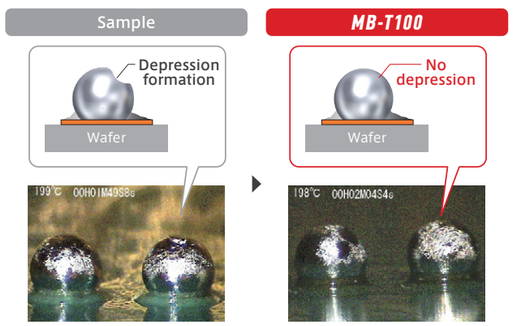
■ Halogen-free type MB-T100HF is also available.

Achieves dimple-free, spherical bump formation

Excellent heat resistance and sustained activity enable dimple-free spherical bump formation even with micro-sized balls. Halogen-free products are also available, and these are compatible with semi-aqueous cleaning solutions.

■ Solder ball mounting process flow





Low-temperature soldering solutions
for carbon neutrality

MILATERA

MILATERA
Low Temperature Soldering for Earth

Δt 80°C connecting to a sustainable future

Efforts toward carbon neutrality in manufacturing are increasingly important not merely as environmental measures, but as a key component of corporate growth strategies.

To meet these demands from our era and society, SMIC developed MILATERA, a low-temperature soldering solution.

MILATERA, which is provided to customers by means of a three-part system of materials, equipment, and process methods, achieves low-temperature soldering with a melting point approx. 80℃ lower than conventional methods. It significantly contributes to carbon neutrality across the entire supply chain by reducing CO_2 emissions by means of reducing energy consumption, streamlining processes, and minimizing waste generation.

Guided by our commitment to creating a future that is kind to both people and the environment through manufacturing, SMIC has consistently recognized environmental challenges early on and developed and provided the required solutions.
Moving forward, we will continue to leverage our long-cultivated technology and innovation to overcome challenges, while working alongside our customers to realize manufacturing that we can be proud to pass on to the next generation.

Wave soldering

BITHUS-Wave MTF-300

Flux mixing machine MTM-4L

TABLUX

MILATERA BAR

Reflow soldering

MILATERA PASTE

Manual soldering

MILATERA FLUX CORED

Benefits of implementing Sn-Bi based low-temperature soldering

Reduced environmental impact

Lowering assembly temperatures reduces heat dissipation from equipment, easing factory air conditioning loads and cutting overall power consumption. Furthermore, Bi emits less CO_2 during the refining process compared to other common solder elements, such as Tin and Silver.

Reduced heat dissipation from equipment

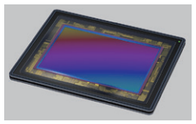
Reduced factory power consumption for air conditioning

Reduced CO_2 emissions during refining

Increased freedom in selecting electronic and electrical components

MILATERA enables the use of components and substrates with lower heat resistance, expanding design flexibility and contributing to overall cost reduction through a wider range of material choices.

Flow:
Inserted components,
paper-phenolic boards



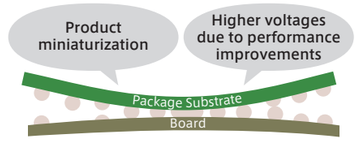
SMT:
LEDs, CMOSs,
flexible substrates

Allows selection of heat-sensitive components and boards

Improved assembly quality

As high-performance semiconductor packages become increasingly compact and thin, this technology mitigates defects caused by thermally induced warpage. Lowering the assembly temperature minimizes deformation and enhances overall assembly quality.

Increasing number of components prone to heat warping



Reduced defect rates through low-temperature soldering

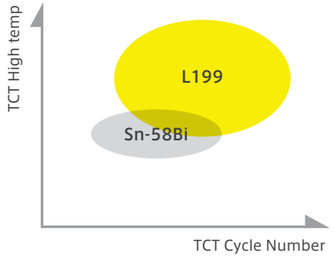
Improved thermal fatigue resistance in low-temperature wave soldering

MILATERA BAR L199

- Developed with the concept of enhancing reliability under more severe temperature conditions.
- Suppresses crack propagation by means of microstructure strengthening with the addition of Sb.

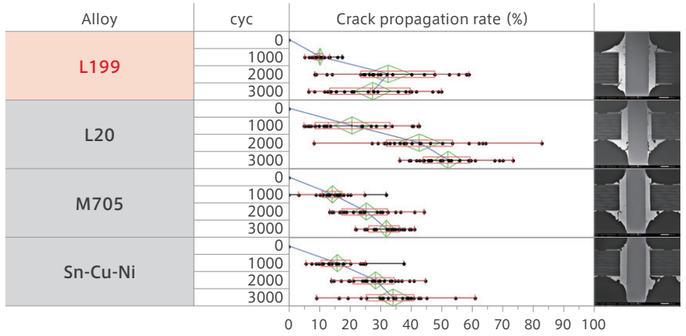
Development concept

To address environments where a binary Sn-58Bi composition cannot meet joint reliability requirements, microstructural reinforcement is achieved through the addition of an optimized amount of Antimony (Sb).



Improved thermal fatigue resistance

L199 demonstrates a lower crack propagation rate compared to binary Sn-58Bi, confirming its superior joint reliability. Furthermore, it ensures sufficient reliability comparable to Sn-3.0Ag-0.5-Cu (SAC305) and Sn-Cu-Ni alloys.

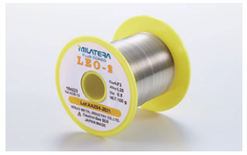


Flux-cored solder wire for low-temperature assembly

PFAS Free

MILATERA FLUX CORED LEO-2 Series

Recommended alloys L20 L199

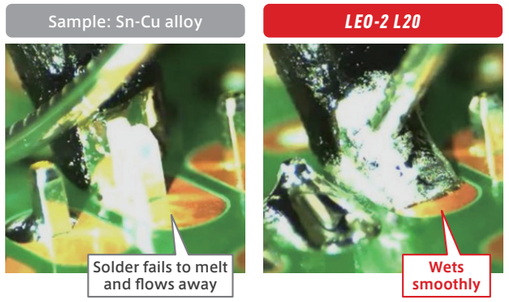


- Capable of assembly from 230°C land temperature.
- Reduces soldering iron tip wear.

Capable of assembly from 230°C land temperature

Mass production of flux-cored solder wire is now achievable with Sn-Bi alloys, overcoming processing challenges. With a melting point of approx. 140°C, this low-temperature alloy enables assembly at board land temperatures as low as 230°C.

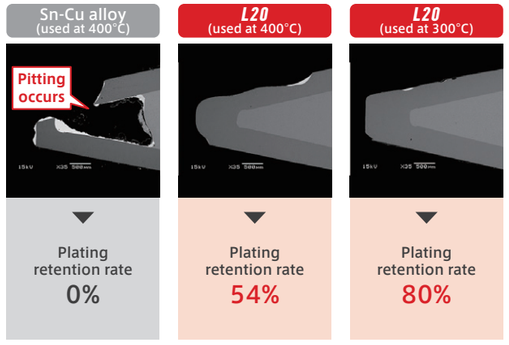
■ Soldering condition (Soldering iron tip temperature: 280°C, PCB land temperature: 230°C)



Reduces soldering iron tip wear

Sn-Bi low-temperature solder causes less soldering iron tip wear compared to Sn-based solder. Furthermore, the reduced soldering temperature can minimize soldering iron tip wear to as little as one-fifth.

■ Soldering tip condition after 3,000 shots



Contributing to carbon neutral manufacturing

PFAS Free

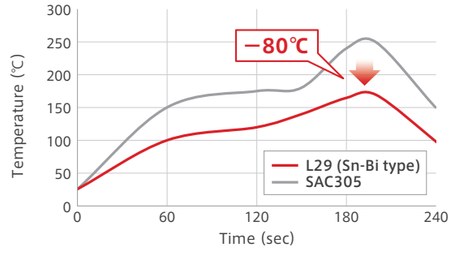
MILATERA PASTE L29-165HF Series

Recommended alloys L20 L29

- Reduces CO_2 emissions by lowering assembly temperatures.
- L29 was developed with enhanced ductility to provide superior joint reliability.
- Reduces no-wets and solder balls through wetting properties optimized for low-temperature assembly.

Reducing CO_2 emissions

Using low-temperature solder allows for an approx. 80°C reduction in assembly temperatures. This contributes to lower energy consumption and a 22% reduction in CO_2 emission.

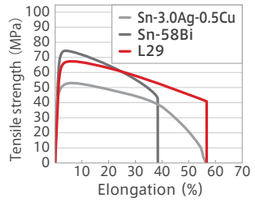


CO_2 reduction rate during PCB assembly: **−22%**※

※ : Equivalent to SNR-840GT

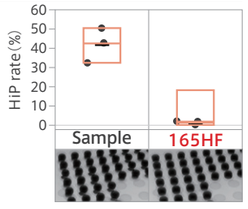
Effect of L29 solder alloy

Optimal additions of Sb and Ni enhance alloy ductility while maintaining high tensile strength. This combination is particularly effective for improving drop-impact resistance.



Wetting properties optimized for assembly temperatures

Optimized wetting properties improve incomplete fusion in hybrid assembly (Sn-Ag-Cu bumps + low-temperature paste) while also reducing solder balling.



Joint reinforcement type low-temperature solder paste

PFAS Free

MILATERA PASTE JPP Series

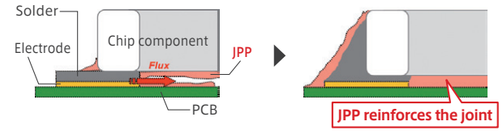
Recommended alloys L20

- Flux with adhesive properties ensures high bonding strength post-assembly.
- Balances superior wettability with low voiding to ensure seamless air-reflow compatibility.

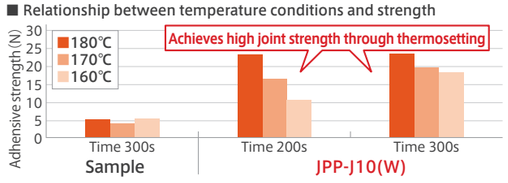
Enhancing chip component joint strength

Thermosetting flux flows thoroughly between components and the PCB, providing a reinforcing adhesive effect that significantly enhances post-assembly joint strength.

■ Joint reinforcement mechanism



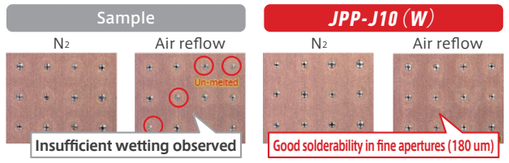
■ Relationship between temperature conditions and strength



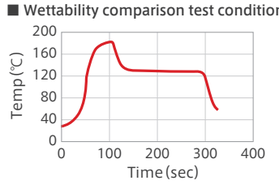
Ensures stable assembly during air reflow

Optimized active ingredients enhance wettability, ensuring reliable bonding even on fine-pitch patterns while minimizing void formation.

■ Fine pattern wettability comparison test



■ Wettability comparison test conditions



Reflow oven: SNR-825GT (Senju)
O_2 concentration : 1000ppm
: Air
Stencil thickness : 100μmt
Aperture size : □180μm

Environmental initiatives
(Recycling and PFAS-Free)

Supporting a recycling-oriented society through solder recycling

The importance of solder recycling and SMIC Group's initiatives

As the transition to a circular economy accelerates, increasing recycling rates has become a priority for the manufacturing industry. The SMIC Group has established a proprietary solder recycling system dedicated to recovering soldering materials, contributing to the realization of a resource-circulating society.

Recycling process and technical features

We collect and sort solder scrap generated during manufacturing and used solder recovered from customer factories, regardless of the manufacturer or type. Takahashi Alloy refines and casts these materials. Only materials that pass rigorous component inspections at Industrial Analysis Service and meet quality standards are reused. SMIC strives to achieve the stable supply and improved quality of recycled materials. Through collaboration with our customers, we aim for sustainable product manufacturing and reduced environmental impact.

SMIC network recycling system

SMIC
SENJU METAL INDUSTRY CO., LTD.

Research, Development, Manufacturing, Collection
Senju Metal Industry

Researches, develops, and manufactures soldering materials and equipment, and provides total solutions for bonding technology. Proactively collects used solder to improve recycling rates.

Customers

IAS

Analysis, Measurement, and Composition Inspection
Industrial Analysis Service

Focuses on non-ferrous metal analysis, performs PFAS analysis, RoHS Directive analysis, organic compound structural analysis, and more, and provides critical technical support to ensure solder quality.

TAK-G
Sustainable Recycle Line for EARTH

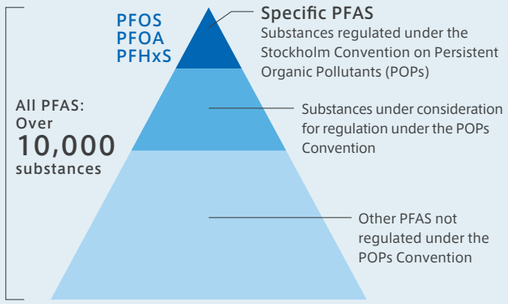
Melting, Refining, Purification, Casting
Takahashi Alloy

Possesses specialized technologies to suppress the generation of harmful substances and is Japan's only solder paste processing facility. Manufactures high-quality recycled solder materials using integrated processes from melting to casting.

Enjoy peace of mind with the use of PFAS-free solder

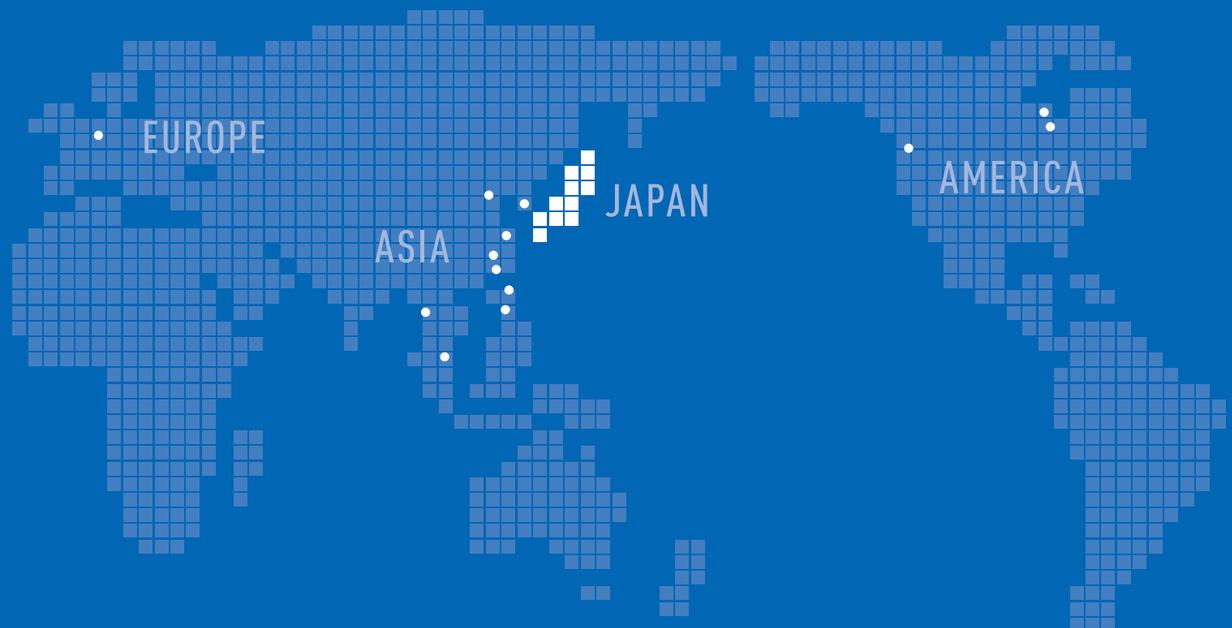
PFAS issues and global regulatory trends

Per- and polyfluoroalkyl substances (PFAS) have been used in many products because of their excellent heat resistant and water repellent properties. However, they are difficult to break down in nature, which has raised concerns about their impact on the environment and human health. Currently, comprehensive PFAS regulations are progressing, primarily in the EU, and these require compliance even for trace amounts in products.



SMIC initiatives and management system

Our SMIC Group has been advancing the development of PFAS-free solder and strengthening our manufacturing systems. We have established a thorough management system, which includes segregated production lines, labeling, workplace environment improvements, and regular blood fluoride level testing. Our Industrial Analysis Service's inspection and analysis system ensures our product quality and safety.



SMIC GROUP GLOBAL NETWORK

SENJU METAL INDUSTRY CO., LTD.
DUNS# 690663091

Established
April 15, 1938

Headquarters location
23 Senju Hashidocho, Adachi-ku, Tokyo 120-8555 Japan

President
Ryoichi Suzuki

Major affiliated companies

■ **Japan**
Industrial Analysis Service, Ltd.
Senju Sprinkler Co., Ltd.
Senju Electronic Corp.
Senju System Technology Co., Ltd.
Senju Giken Co., Ltd.

■ **United States**
Senju America Inc.
Senju Comtek Corp.
Senju Fire Protection Corp.

■ **Europe**
Senju Metal Europe GmbH
Senju Manufacturing Europe s.r.o.

■ **Asia**
Senju (Malaysia) Sdn. Bhd.
Senju Trading (M) Sdn. Bhd.
Senju (Thailand) Co., Ltd.
Senju Solder (Phils.) Inc.
Tianjin Senju Fire Protection Equipment Co., Ltd.
Tianjin Senju Electronics Co., Ltd.
Shanghai Senju Business Management Consulting Co., Ltd.
Senju Metal (Shanghai) Co., Ltd.
Senju Metal (Huizhou) Co., Ltd.
Senju Metal (Hong Kong) Limited
Senju Electronic Materials (Hong Kong) Co., Ltd.
Senju Electronic (Taiwan) Co., Ltd.
Senju Semiconductors Taiwan Co., Ltd.
Senju Metal Korea Co., Ltd.

Domestic locations

Headquarters
Kitakami Office
Sendai Office
Koriyama Office
Tochigi Segment Matsuyama Factory
Tochigi Segment Kinugaoka Factory
Soka Segment
Toyama Segment
Matsumoto Office
Chubu Segment
Seto Segment
Kusatsu Office
Kansai Segment Nishiwaki Factory
Kansai Segment Naka Factory
Himeji Office
Fukuoka Office

Business locations as of August 2025