

Senju Metal Industry Co.,Ltd.
Senju Manufacturing (Europe) Ltd.

ECO SOLDER®

High-Reliability Lead-Free Solder Paste

M705-GRN360-K1-V

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M705-GRN360-K1-V

Lead-Free solder paste ECOSOLDER M705-GRN360-K1-V has been developed as a result of Senju's experience when working with a number of customers using lead free solder paste.

It features improved thermal properties for high temperature reflow.

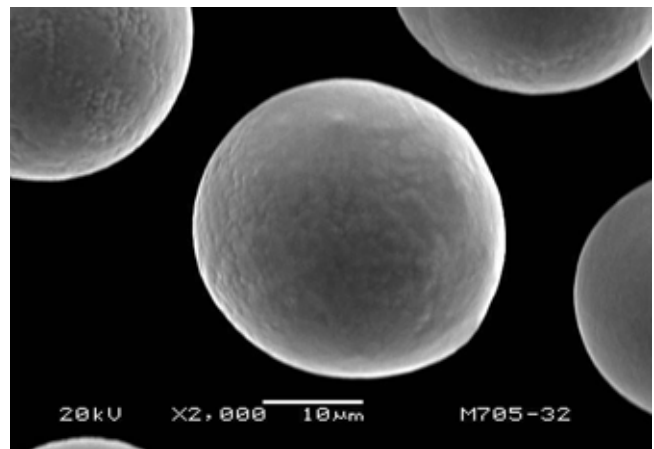
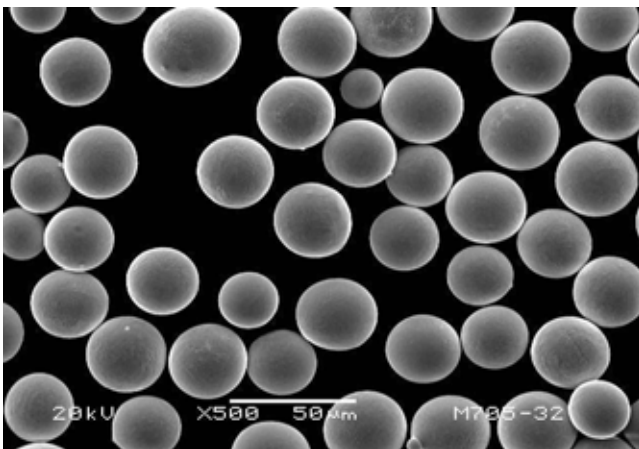
Users will also benefit from:

- | | |
|------------------------------------|---------------------------------|
| Very stable solder paste viscosity | Excellent wettability |
| Clear flux residue combined | Reduced flux residue cracking |
| Excellent joint cosmetics | Reduced occurrence of side ball |

Characteristic of M705 alloy compared to eutectic tin-lead alloy

		M705	63Sn-Pb
Alloy Composition(%)		Sn96.5-Ag3.0-Cu0.5	Sn63-Pb37
Specific gravity		7.4	8.4
Melting temperature (C)	Solidus	217	183
	Peak	219	
	Liquidus	220	
Tensile strength (MPa)		53.3	56.0
Elongation(%)		46	59
Young's module (GPa)		41.6	26.3
0.2% Yield point (MPa)		39.4	45.8
Coefficient of linear expansion (ppm/C)		21.7	23.5
Vickers Hardness (Hv)		17.9	16.6

SEM Photo of M705 powder



No surface oxidation, spherical lead-free powder is used in all Senju ECOSOLDER paste products .
(The photograph shows type-4 (25-36um))

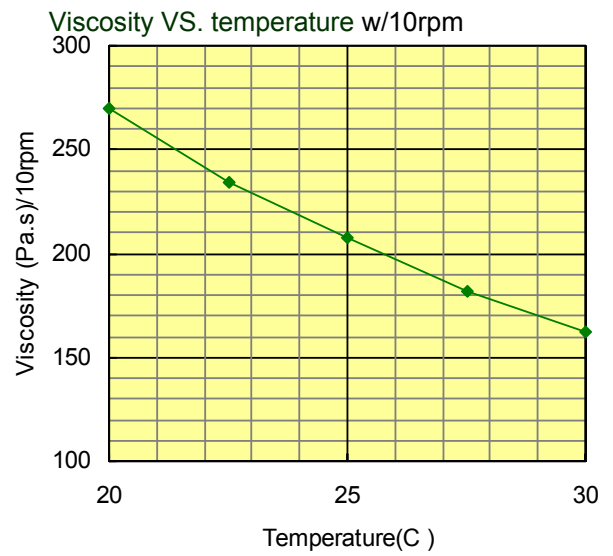
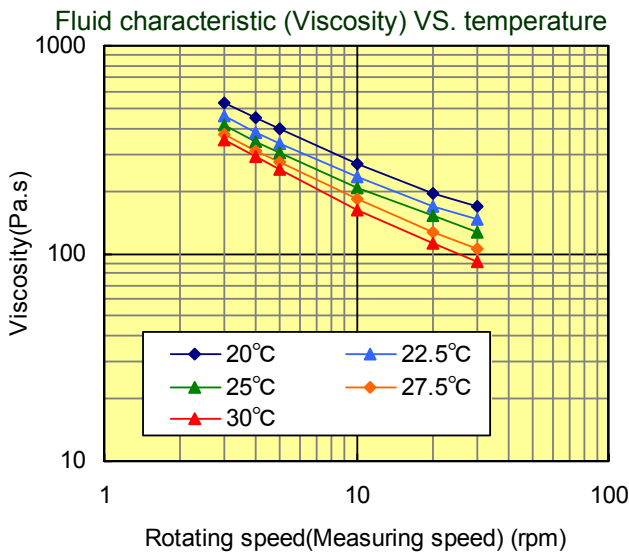
M705-GRN360-K1-V characteristics

Items	M705-GRN360-K1-V	Test method /Remarks
Solder Powder		
Alloy Composition	Sn96.5-Ag3.0-Cu0.5	---
Melting Temperature	217 ~ 220 C	DSC
Powder Shape	Spherical	SEM
Powder size/distribution	25 ~ 36um	SEM & Laser method
FLUX		
Type	R0	J-STD-004
Activity	L0	J-STD-004
Halide	0.0%/Flux *1	Titration method
Surface Insulation Resistance (40C90%RH,168hr)	Over 1.0E+12	JIS Z 3284
Electro-migration Resistance (85C85%RH Bias DC45V, 1000hr)	Over 1.0E+9 No migration	JIS Z 3284
Copper mirror test	PASS	JIS Z 3197
Fluoride Test	PASS	JIS Z 3197
Solder Paste		
Viscosity	K1:180 Pa.s	JIS Z 3284
Thixotropic Index	0.5	JIS Z 3284
Flux Content	11.5%	JIS Z 3197
Hot Slump	0.4mm Max.	JIS Z 3284
Tackiness	1.3N	JIS Z 3284
Tackiness Time	Over 24h/1.0N	JIS Z 3284
Copper plate corrosion test	PASS	JIS Z 3197
Validity (unopened, keep at 0 ~ 10°C)	6 months	---

*1 : This products has a small amount of halide (Br)

number of this table is for reference

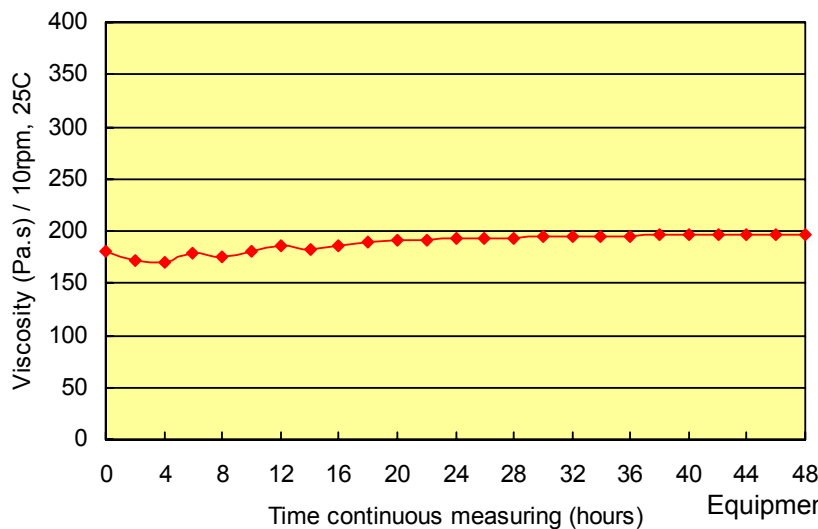
M705-GRN360-K1-V Fluid characteristic(Viscosity) VS. temperature



Equipment: Malcom-PCU viscometer

The solder paste characteristics change with temperature. There is a trend toward a lower viscosity at higher temperatures.
A lower viscosity may affect the printability, increasing slump and solder ball and bridging.
A higher viscosity may stick to the squeegee and clog the stencil.
We recommend to use the paste M705-GRN360-K1-V at 25+/-2.5C.

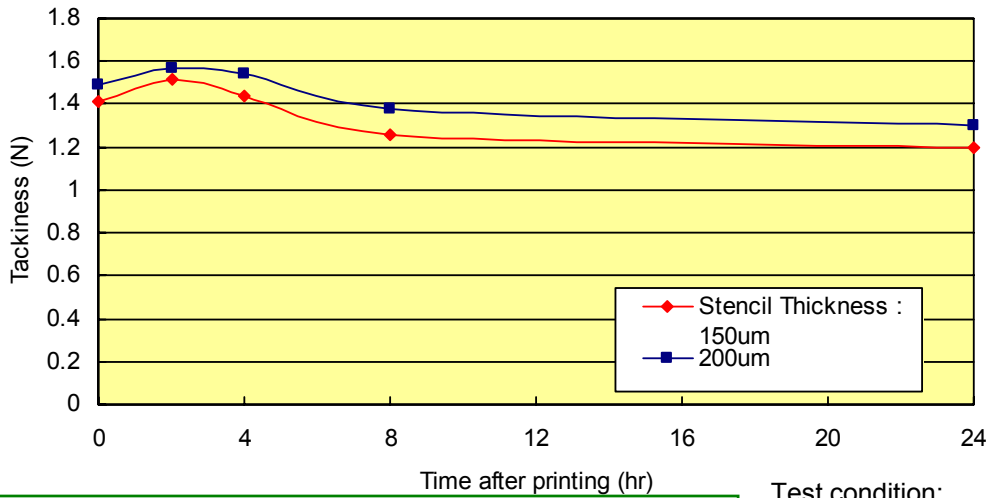
M705-GRN360-K1-V stability of viscosity



Equipment: Malcom-PCU viscometer

The paste M705-GRN360-K has little change from the initial stage, and its printing characteristic is stable over a long time.

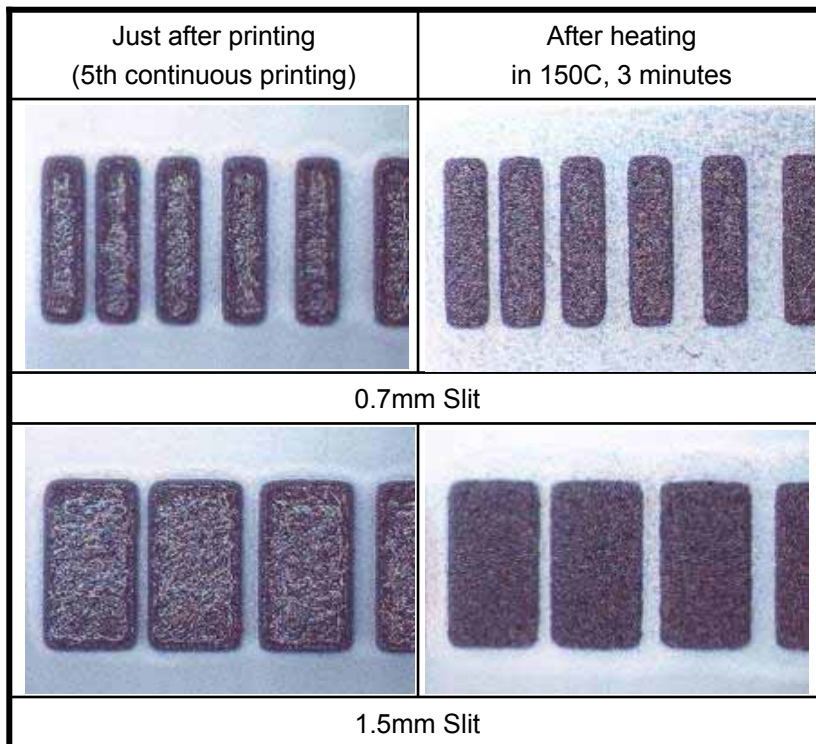
M705-GRN360-K1-V Tackiness and Tackiness time



Test condition:
Equipment: Rhesca, Tackiness tester
Immersion speed: 2.0mm/s
Press time : 0.2sec.
Press load : 0.49N
Test speed : 10.0mm/s

Tackiness force and the tack time of Solder Paste are important characteristics when related to the performance of high speed placement equipment.
Tack time affects the defect rate (missing component, tombstone etc.) after machine stops and maintenance.
GRN360-K series has higher initial tackiness, and longer tackiness after printing.

M705-GRN360-K1-V Hot Slump

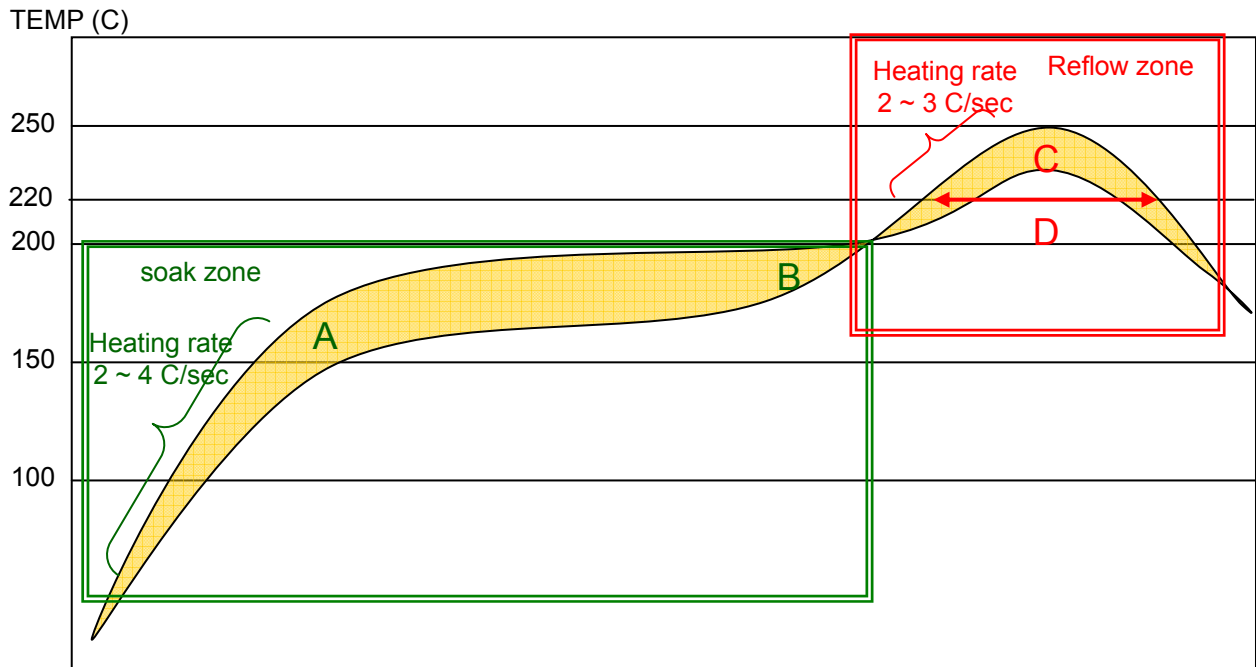


Test condition
Stencil Thickness: 0.2mm
Heating: 150C, 3 minutes
(in convection oven)

The paste slump correlates with solder balling and bridging for fine pitch applications.
GRN360-K series has no slump and the characteristic also has a big effect in controlling side-ball.

M705-GRN360-K1-V Recommended reflow temperature profile

Recommended reflow temperature profile for M705-GRN360-K1-V is shown below. During reflow not all temperatures on PCB are the same, there will be a variation due to the different thermal mass. However, all soldering points on the PCB showed go into the following recommendation for the thermal profile.



Recommendation :

<p>A: soak start: 150 ~ 170 C</p> <p>B: soak end: 170 ~ 190 C</p> <p>Soak time 90 +/- 30 sec.</p>	<p>C: Peak Temp. 230 ~ 250 C</p> <p>D: time above 220C 30 ~ 60 sec. (Solidus line)</p>
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M705-GRN360-K1-V Reflowability

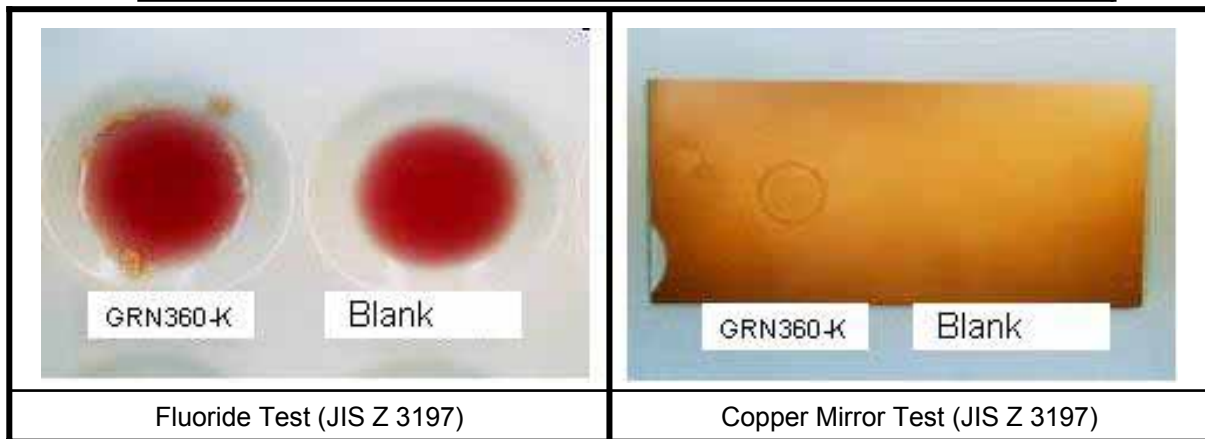
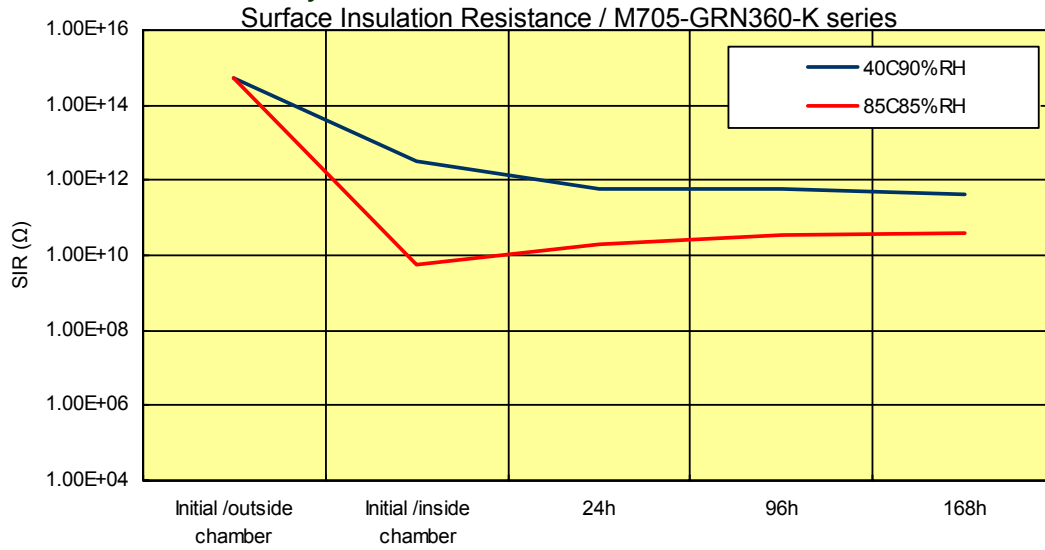
Pattern for 0.5mm Pitch/ GRN360-K1-V	Pattern for 0.4mm Pitch/ GRN 360-K1-V
5mm square/ GRN360-K1-V	5mm square /M705 conventional type
Test condition: Stencil thickness: 150um Reflow: soak temp:175~200C, 120sec/ Peak: 235C	

The residue of M705-GRN360-K series after reflow has the clear colour ,without crack not peeling. There are also no solder balls. Its appearance is good(see top of photograph). Moreover, compared with conventional paste with M705, this GRN360-K has no de-wet and a good wettability is shown at a large pad.

Ni-Plate		42-Alloy plate	
GRN360-K series	M705 conventional	GRN360-K series	M705 conventional
Test Parameter: Stencil thickness: 200um Pre-heat: 150C, 90sec/ Reflow: 250C, 30sec(Solder pot)			

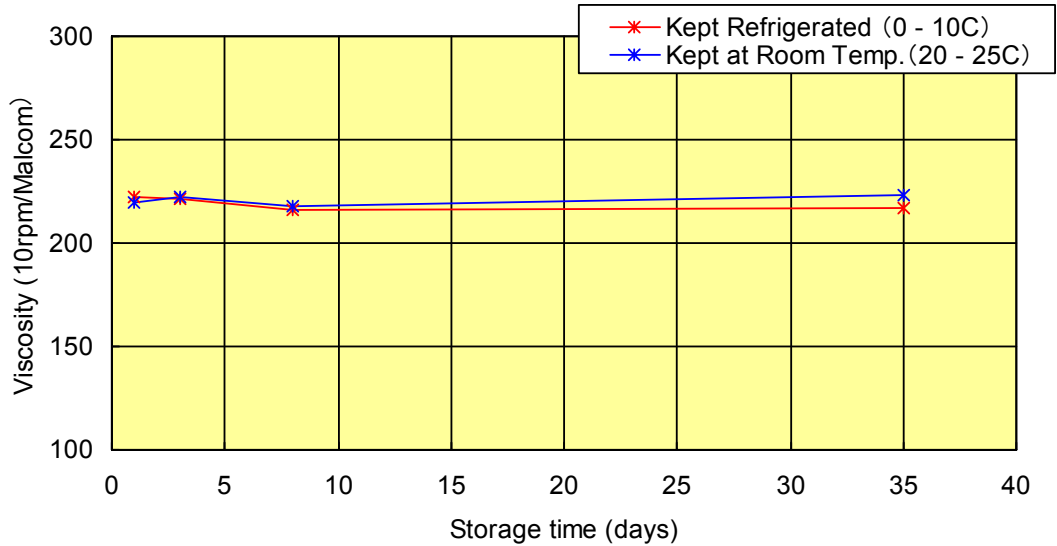
The M705-GRN360 K-series shows an excellent wettability even in case of bad wetting materials.

M705-GRN360-K1-V Reliability



M705-GRN360-K1-V Storage stability

Viscosity monitoring results with Storage time (Initial ~ 35 days)



M705-GRN K-series is very stable paste when stored in a fridge and also room temperature.

Long term stability of the solder paste is a key feature required for stable production, especially for irregular or low volume production. As shown by the above graph M705-GRN360-K1-V is very stable at room temperature and so it performs exceptionally well during production.

The paste life is six months when the paste is kept unopened and in refrigerated storage (0-10 degrees C).