



Create Value with ALPHA's Dual Alloy SMT Process™

How can you reduce your manufacturing costs in this very competitive business environment?

ALPHA® CVP-520 Pb-free Low-Temperature Solder Paste

**Energy
Cost**



**Material
Cost**



**Labor
Cost**





How can you add value
to your company's
process...



How much money do I spend for the purchasing and inventorying of bar solder and flux?



How much does it cost my company to handle and dispose of dross?



How much does multi-technology processing, including wave soldering, add to my cost of manufacturing?



How much time and money do selective soldering pallets cost my company?

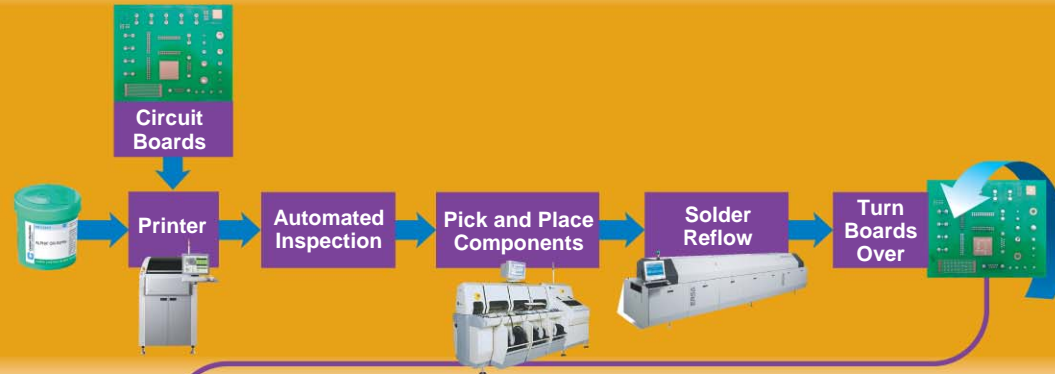


How costly is it to maintain my wave soldering line?

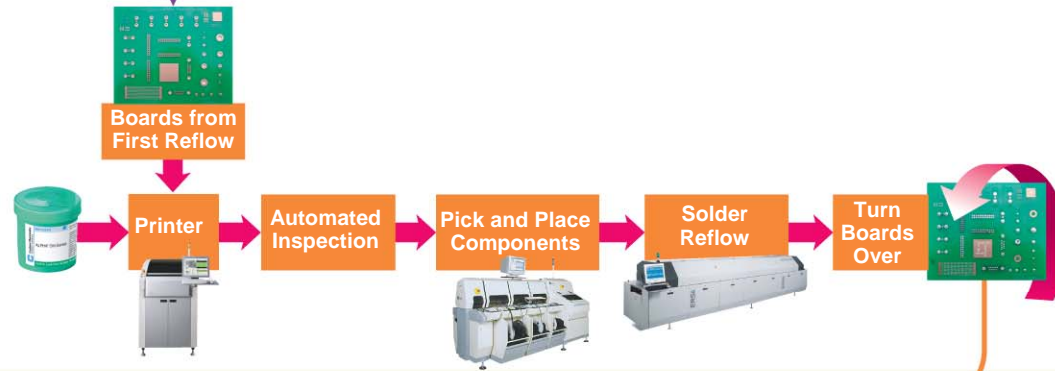


Typical SMT and Wave Multi-Technology Soldering Process

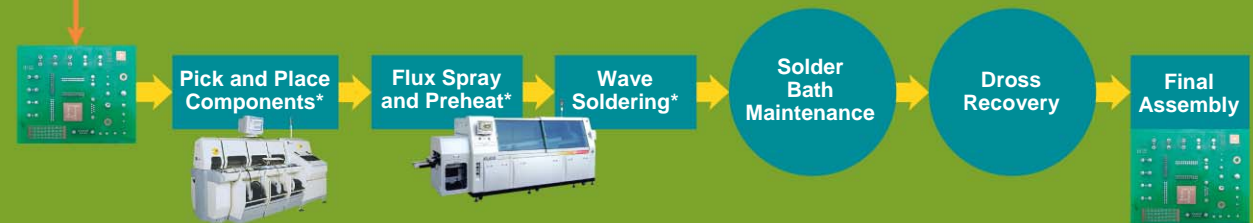
SMT Reflow
Side A



SMT Reflow
Side B



Wave Soldering

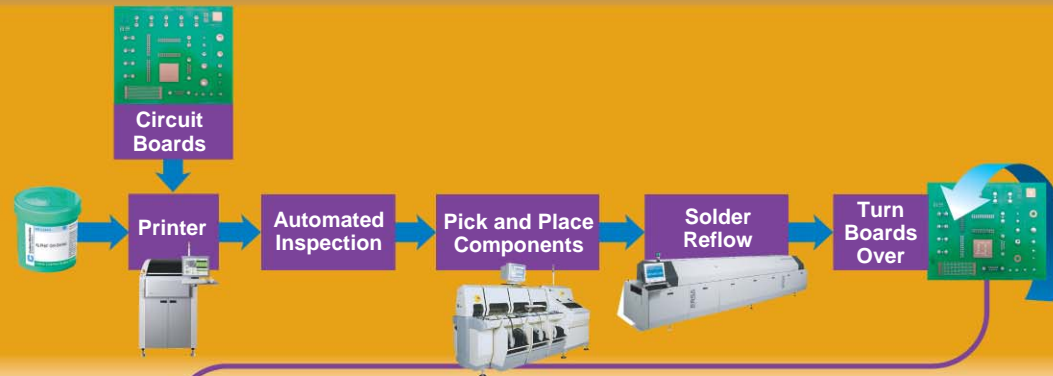


* Purchase and inventory components, flux, bar solder and pallets

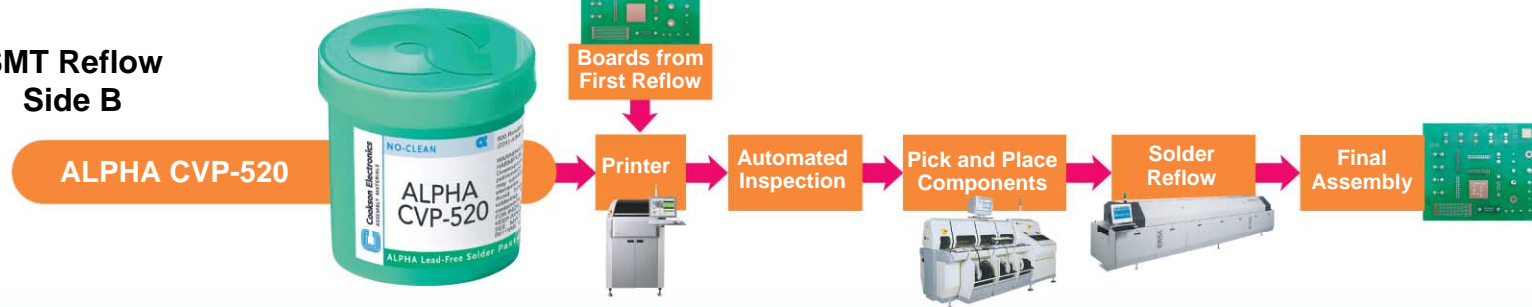
New Dual Alloy SMT Process:™

Introducing ALPHA® CVP-520 Pb-Free Low-Temperature Solder Paste

SMT Reflow Side A



SMT Reflow Side B



Opportunities to eliminate wave soldering costs



Energy savings

- Flux preheat process
- Melting of bar solder
- Maintenance of solder bath temperature



Materials savings

- Bar solder
- Wave soldering flux
- Improved solder yield
- Selective solder pallets



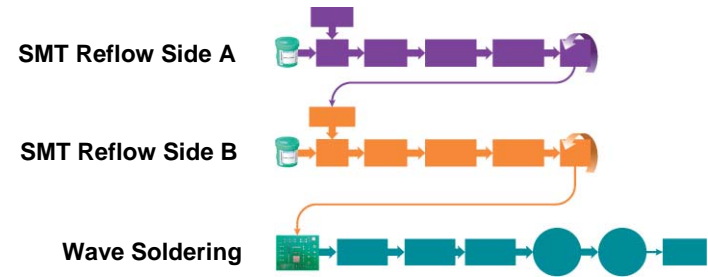
Labor savings

- Wave process operators
- Wave materials inventory ordering and management
- Dross handling and disposal



Estimated Cots:

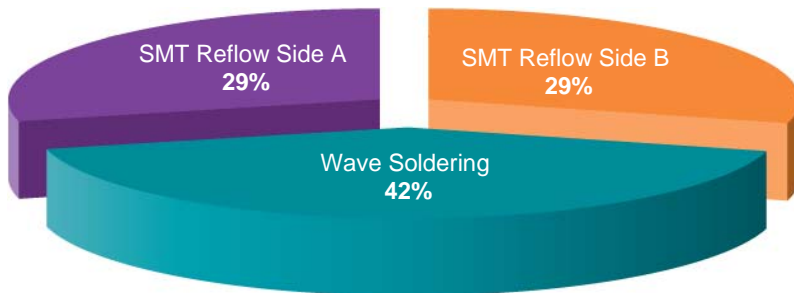
- Two SMT Steps
- One Wave Soldering Step



Current Process Total Cost of Ownership

	SMT Reflow Side A	SMT Reflow Side B	Wave Soldering	Variable Cost/Month/Line
Oven Energy Consumption (kW/hr)	20	20	Flux Preheat Energy Requirement (kW/hr)	30
Motors, PC Monitor etc. (kW/hr)	5	5	Solder Bath Energy Requirement (kW/hr)	36
Total Energy Consumption/Hour (kW/hr)	25	25	Motors, PC Monitor etc. (kW/hr)	5
			Total Energy Consumption/Hour	71
Solder Paste Used/Line/Day (kg)	5	5	Flux Used/Day (liters)	14
Solder Paste Price (per kg)	\$65.00	\$65.00	Flux Price/Liter	\$4.00
			Bar Solder Consumption (kg/day)	7
			Bar Solder Cost (\$/kg)	\$37.47
Operating Hours/Day (hours)	16	16	Operating Hours/Day	16
Working Days/Month (days)	22	22	Working Days/Month	22
Energy Cost (per kWh)	\$0.15	\$0.15	Energy Cost (per kWh)	\$0.15
Cost of Energy/Month	\$1,320	\$1,320	Cost of Energy/Month	\$5,736
Cost of Paste/Month	\$7,590	\$7,590	Cost of Flux/Month	\$1,232
			Cost of Bar Solder/Month	\$5,770
Variable Cost/Month/Machine	\$8,910	\$8,910	Variable Cost/Month/Machine	\$12,738
			No. of Selective Soldering Pallets in Use	25
			Cost/selective soldering pallet	\$100
			Pallet Cost/Machine	\$2,500
			Cost of Metal in Solder Pot	\$30,600
				\$30,558

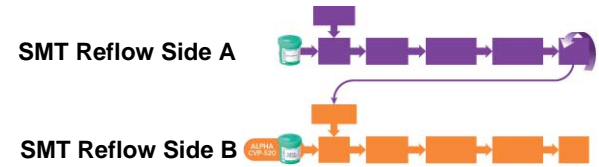
Monthly Energy + Material Cost: **\$30,558**



Variable Cost/Month/Line **\$30,558**



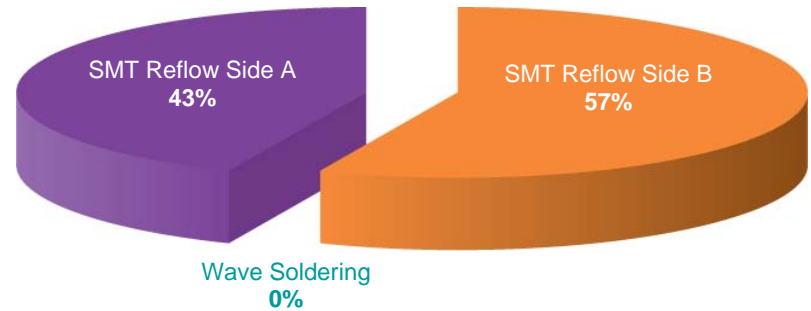
Value Created with Unique New Dual Alloy SMT Process™



Comparison of Proposed Total Cost of Ownership

	SMT Reflow Side A	SMT Reflow Side B
Oven Energy Consumption (kW/hr)	20	15
Motors, PC Monitor, etc. (kW/hr)	5	5
Total Energy Consumption/Hour (kW/hr)	25	20
Solder Paste Used/Line/Day (kg)	5	7
Solder Paste Price (per kg)	\$65.00	\$65.00
Operating Hours/Day (hours)	16	16
Working Days/Month (days)	22	22
Energy Cost (per kWh)	\$0.15	\$0.15
Cost of Energy/Month	\$1,320	\$1,056
Cost of Paste/Month	\$7,590	\$10,670

Monthly Energy + Material Cost: **\$30,558**
32% Reduction



Total Cost/Month/Machine	\$8,910	\$11,726	Proposed Process	\$20,636
Existing Process	Current Variable Cost/Month/Line			\$30,558

Cost Reduction/Line

Pallet Cost/Machine	\$2,500	Cash Flow Impact	\$33,100	Variable Savings/ Month/Line	\$9,722 32%
----------------------------	----------------	-------------------------	-----------------	-------------------------------------	--------------------

Note: This assumes 16 hours/day, 22 days/month.



Total Cost of Ownership of Current Process

Fill in your best estimate in each yellow box. Calculate using the formulas in the blue text.

	SMT Reflow Side A		SMT Reflow Side B			Wave Soldering		Total	
Oven Energy Consumption	A1		A2		kW/hr	A	Flux Preheat Energy Requirement		kW/hr
Motors, PC Monitor, etc.	B1		B2		kW/hr	B	Solder Bath Energy Requirement		kW/hr
Total Energy Consumption/Hour (=A+B)	C1		C2		kW/hr	C	Motors, PC Monitor etc.		kW/hr
						D	Total Energy Consumption (=A+B+C)		kW/hr
Solder Paste Used/Day/Line	D1		D2		kg	E	Flux Used/Day		liters
Solder Paste Price	E1		E2		per kg	F	Flux Price/Liter		
						G	Bar Solder Consumption		kg/day
						H	Bar Solder Cost		\$/kg
Operating Hours/Day	F1		F2		hours	I	Operating Hours/Day		hours
Working Days/Month	G1		G2		days	J	Working Days/Month		days
Energy Cost – \$/KWH	H1		H2		per kWh	K	Energy Cost (per kWh)		
Cost of Energy/Month (=CxFxGxH)	I1		I2			L	Cost of Energy/Month (=DxIxJxK)		
Cost of Paste/Month (=DxExG)	J1		J2			M	Cost of Flux/Month (=ExFxJ)		
						N	Cost of Bar Solder/Month (=GxHxJ)		
Total Cost/Month/Machine (=I+J)	K1		K2			O	Total Cost/Month/Machine (=L+M+N)		
							Pallet Cost/Machine		
						P	No. of Selective Soldering Pallets in Use		
						Q	Cost/Selective Soldering Pallet		
						R	Total Pallet Cost/Machine (=PxQ)		
							Metal Inventory Value		
						S	Solder Pot Capacity		KG
						T	Total Metal Value/Machine (SxH)		
Total Line Cost/Month (=K1+K2+O+R+T)						U			





Value Created with Unique **New Dual Alloy SMT Process™** and **ALPHA® CVP-520 Pb-Free Low-Temperature Solder Paste**

Fill in your best estimate in each yellow box. Calculate using the formulas in the blue text.

Note: Side A processing should be the same as the current processing.

	SMT Reflow Side A		SMT Reflow Side B			Total
Energy Consumption	A3		A4		kW/hr	
Motors, PC Monitor, etc.	B3		B4		kW/hr	
Total Energy Consumption/Hour (=A+B)	C3		C4		kW/hr	
Solder Paste Used/Day/Line	D3		D4		kg	
Solder Paste Price	E3		E4		per kg	
Operating Hours/Day	F3		F4		hours	
Working Days/Month	G3		G4		days	
Energy Cost \$ /KWH	H3		H4		per kWh	
Cost of Energy/Month (=CxFxGxH)	I3		I4			
Cost of Paste/Month (=DxExG)	J3		J4			
Total Cost/Month/Machine (=I+J)	K3		K4			
Current Variable Cost/Month/Line (U)	V					
Proposed Variable Cost/Month/Line (K3+K4)	W					
Proposed Variable Cost Savings/Month/Line (V-W-R)	X					

New ALPHA® CVP-520 Pb-Free Low-Temperature Solder Paste Enables Unique New Dual Alloy SMT Process™

Unique SnBiAg alloy offers money-saving lower temperature melting point and excellent soldering performance that delivers:

- Elimination of costly wave soldering step
- Reduced energy consumption
- Ability to use lower cost components and substrates
- Superior ability to reflow even with extreme paste overprint
- Comparable reliability to Sn-Pb solder joints
- Compatibility with ALPHA Preforms to add additional solder volume as required
- Excellent results on consumer electronics products

1. ALPHA CVP-520 enables extreme overprinting of paste resulting in the formation of SMT and through hole solder joints with a clear, colorless residue*.



Bare board with plated through holes



CVP-520 extreme overprint



CVP-520 reflowed

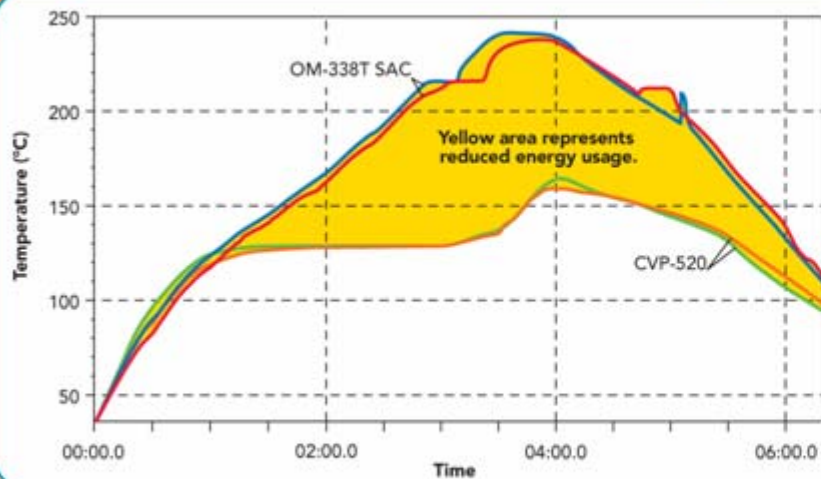
* Meeting IPC J-STD-001D 6.3

CVP-520 Reflow Video



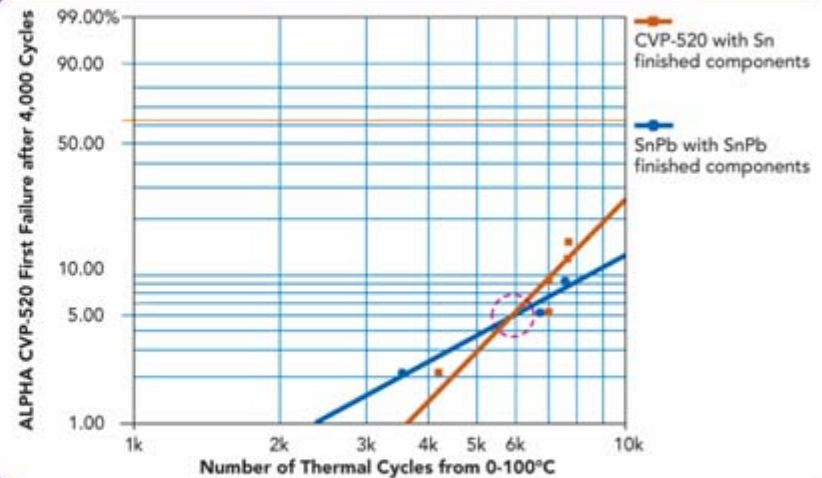
New ALPHA® CVP-520 Pb-Free Low-Temperature Solder Paste Enables Unique New Dual Alloy SMT Process™

2. Lower Temperature Reflow Profile vs. Traditional Pb-Free 305 Alloy



ALPHA CVP-520 power consumption is 30% less than required for ALPHA OM-338T in 2009 field trial.

3. Reliability Performance: Thermal Cycling



ALPHA CVP-520 Pb-free solder joints performed comparable to SnPb control for up to 6,000 cycles.

ALPHA[®] Exactalloy[®] Solder Preforms with CVP-520 Solder Paste Increase Solder Volume Where Needed

Enabling Unique Dual Alloy SMT Process[™]

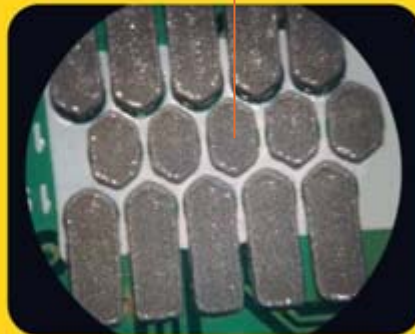
Even in restricted printing areas, CVP-520 Solder Paste supports the use of SnBiAg Preforms to provide additional solder volume.

- Preforms are provided in tape and reel packaging for ease of placement with standard chip shooter equipment
- Preform alloy matches CVP-520 alloy for ease of integration
- 100% barrel fill achieved by providing the precise Preform size
- Flux in paste is sufficient to reflow a preform that is up to four times the volume of the solder paste

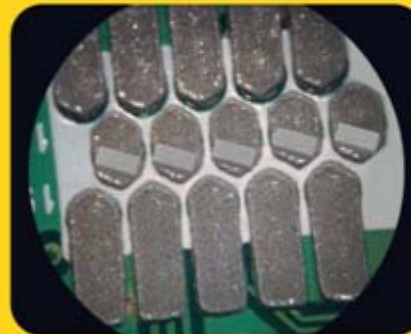


**15 Pin VGA
Din Connector**

Restricted Printing Area



Solder paste as printed



Preforms placed in paste



Solder paste and preforms reflowed

ALPHA® Exactalloy® Solder Preforms Add Volume Where Board Space for Paste is Limited

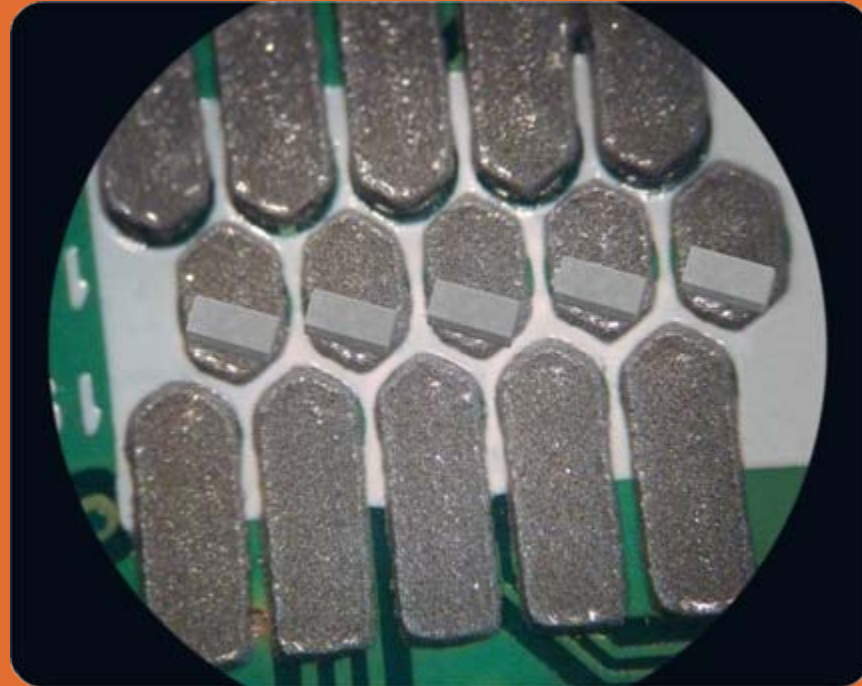
There is a limited amount of board real estate available to overprint solder paste on the inner pads of the connector.

LOCATION	PRINTED SOLDER PASTE VOLUME mm ³	EQUIVALENT METAL VOLUME mm ³
Outer pads	2.6	1.3
Inner pads	1.25	0.625
Difference	1.35	0.675
0603H	Ş	0.64

The difference in paste volume is
 $2.60 - 1.25 = 1.35\text{mm}^3$

The difference in metal volume is
 $1.35/2 = 0.67\text{ mm}^3$

An 0603H perform, which contains 0.64mm^3 solder, is placed in the solder paste prior to reflow, resulting in a uniform volume of metal for all pins.



PART TYPE	PART DIMENSIONS						VOLUME	
	a		b		c		mm ³	inch ³
	mm	inch	mm	inch	mm	inch		
0603H	1.60	0.063	0.80	0.031	0.50	0.020	0.64	0.000039
0805H	2.01	0.079	1.30	0.051	0.40	0.016	1.05	0.000064
1206	3.01	0.118	1.47	0.057	0.77	0.030	3.41	0.000208
1406	3.56	0.140	1.52	0.060	0.77	0.030	4.17	0.000254