



## REPORT

CUSTOMER'S REF NO:  
ALS THAILAND REF NO.: ATT/ELP/14/3496-H  
ALS SINGAPORE REF NO.: ATS/ELT/1315/14  
DATE: 22 January 2015  
COMPANY: SEI Interconnect Products (Thailand)Ltd.  
700/128 Moo 5 Bangna-Trad Road, T. Klong Tam Roo  
A. Muang, Chonburi 20000

DATE SAMPLE RECEIVED: 26 December 2014  
DATE ANALYZED: 09 January 2015  
DATE TEST COMPLETED: 20 January 2015

SAMPLE DESCRIPTION: One lot of sample was received with references:  
Description: RQ14-1737 Tahoe\_XL APFA ww# 27  
After Crest# 11 cell# 8  
MinAik/EngTek/LSI+SUMI/Rencol/ISC  
PN. 2053-208501-F21 PR: 18kn00011878  
Model: Tahoe\_XL APFA  
Surface Area: APFA = 83.60 cm<sup>2</sup> AFA = 73.80 cm<sup>2</sup>

### METHOD:

Particle Analysis by SEM EDX	Taped Area For Drive Parts	No. of Times Taped	Surface Area Analysed (cm <sup>2</sup> )	Particle Ranges
Procedure No: 2092-701412 Rev. AE	Arm	3	0.02090	0.5um - 5.0um
	Pivot	8	0.02090	
	Swage	4	0.02090	

### RESULTS:

The Specification is based on WD's specification Doc No 96-004575 Rev.AX for APFA Single Platter / (CP/ECD) (3.5" Enterprise & 3.5" Desktop)

	Total Hard Particles/cm <sup>2</sup>	Total MgSiO Particles/cm <sup>2</sup>	Total Steel Particles/cm <sup>2</sup>	Total Magnetic Particles/cm <sup>2</sup>
Result on Arm	0	0	48	0
Result on Pivot	48	0	707	0
Result on Swage	72	0	216	0
Average result	40	0	324	0
Specification	<400	<100	<800	0
PASS / FAIL	PASS	PASS	PASS	PASS

Total hard particles/cm<sup>2</sup> = total no. of hard particles/(no. of times taped x surface area analysed)

Note: This report was performed test by ALS Singapore.



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 Stage Mimic of Arm Stage Mimic of Pivot Stage Mimic of Swage



Please refer to attachment for details of results  
 Analysis Table on Arm

Elemental Composition	Count	Particle/cm2	Remarks
<b>Hard Particles</b>			
Al-O	0	0	
Al-Si-O	0	0	
Si-O	0	0	
Si-C	0	0	
Al-Cu-O	0	0	
Al-Mg-O	0	0	
Al-Si-Cu-O	0	0	
Al-Si-Fe-O	0	0	
Al-Si-Mg-O	0	0	
Al-Ti-O	0	0	
Ti-O	0	0	
Ti-C	0	0	
Ti-B	0	0	
Ti-N	0	0	
W-O	0	0	
W-C	0	0	
Zr-O	0	0	
Zr-C	0	0	
Pb-Zr-Ti-O	0	0	
Subtotal - Hard Particles Only	0	0	
<b>Magnetic Particle</b>			
Ce-Co	0	0	
Fe-Nd	0	0	
Fe-Sm	0	0	
Fe-Sr	0	0	
Nd-Pr	0	0	
Ni-Co	0	0	
Sm-Co	0	0	
Subtotal - Magnetic Particles Only	0	0	
Subtotal- Hard Particles including Magnetic Partilces	0	0	



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 Analysis Table on Arm

Elemental Composition	Count	Particle/cm2	Remarks
<b>Steel Particle</b>			
SS 300- Fe-Cr-Ni	0	0	
SS 300- Fe-Cr-Ni-Mn	2	32	
SS 300- Fe-Cr-Ni-Si	0	0	
SS 400- Fe-Cr	1	16	
SS 400- Fe-Cr-Mn	0	0	
Other Steel - Fe	0	0	
Other Steel - Fe-Mn	0	0	
Other Steel - Fe-Ni	0	0	
Other Steel - Fe-O	0	0	
Subtotal - Steel Particle Only	3	48	
<b>Other Particle</b>			
No Element	0	0	
Ni	0	0	
Ni-P	0	0	
Sn base	23	367	
Other	7	112	
Al	0	0	
Al-Mg	0	0	
Al-Ti	1	16	
Al-Si (1)	0	0	
Al-Si (2)	0	0	
Si	0	0	
Al-Cu	0	0	
Al-Si-Cu	0	0	
Al-Si-Fe	0	0	
Al-Si-Mg	1	16	
Mg-Si-O-Al	0	0	
Mg-Si-O	0	0	
Ti	0	0	
Nd	0	0	
S-Cr-Mn	0	0	
Zn base	0	0	
Ca base	1	16	
Ni base	0	0	
Cr base	0	0	
Zr base	0	0	
Cl base	0	0	
Na-Cl	0	0	
Cu	0	0	
Cu-Au	0	0	
Ag-S	0	0	



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Elemental Composition	Count	Particle/cm2	Remarks
Au-Ni	0	0	
Ag	0	0	
Au	1	16	
Cu-Au-Ni	0	0	
Cu-Zn	0	0	
Cu-Zn-Ni	0	0	
Cu-Zn-Au-Ni	0	0	
Zn-O	0	0	
Pb	0	0	
Fe-Cu	0	0	
Cr-Mn	0	0	
Al-Si Base	2	32	
F-O	0	0	
Cu-S-Al-O Base	1	16	
Ti-O/Al-Si-Fe	1	16	
Cr-Rich (Cr Base + Cr-Mn)	0	0	
Subtotal - Other Particle Only	38	607	
Grand Total of Particles	41	655	

#### Analysis Table on Pivot

Elemental Composition	Count	Particle/cm2	Remarks
<b>Hard Particles</b>			
Al-O	3	18	
Al-Si-O	1	6	
Si-O	1	6	
Si-C	0	0	
Al-Cu-O	0	0	
Al-Mg-O	0	0	
Al-Si-Cu-O	0	0	
Al-Si-Fe-O	0	0	
Al-Si-Mg-O	0	0	
Al-Ti-O	1	6	
Ti-O	1	6	
Ti-C	1	6	
Ti-B	0	0	
Ti-N	0	0	
W-O	0	0	
W-C	0	0	
Zr-O	0	0	
Zr-C	0	0	
Pb-Zr-Ti-O	0	0	
Subtotal - Hard Particles Only	8	48	



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Magnetic Particle			
Ce-Co	0	0	
Fe-Nd	0	0	
Fe-Sm	0	0	
Fe-Sr	0	0	
Nd-Pr	0	0	
Ni-Co	0	0	
Sm-Co	0	0	
Subtotal - Magnetic Particles Only	0	0	
Subtotal- Hard Particles including Magnetic Partilces	8	48	

Analysis Table on Pivot

Elemental Composition	Count	Particle/cm2	Remarks
Steel Particle			
SS 300- Fe-Cr-Ni	73	437	
SS 300- Fe-Cr-Ni-Mn	9	54	
SS 300- Fe-Cr-Ni-Si	10	60	
SS 400- Fe-Cr	21	126	
SS 400- Fe-Cr-Mn	0	0	
Other Steel - Fe	0	0	
Other Steel - Fe-Mn	0	0	
Other Steel - Fe-Ni	0	0	
Other Steel - Fe-O	5	30	
Subtotal - Steel Particle Only	118	707	
Other Particle			
No Element	0	0	
Ni	1	6	
Ni-P	0	0	
Sn base	119	712	
Other	71	425	
Al	27	161	
Al-Mg	5	30	
Al-Ti	0	0	
Al-Si (1)	2	12	
Al-Si (2)	29	173	
Si	0	0	
Al-Cu	0	0	
Al-Si-Cu	3	18	
Al-Si-Fe	1	6	
Al-Si-Mg	30	179	
Mg-Si-O-Al	0	0	
Mg-Si-O	0	0	



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Elemental Composition	Count	Particle/cm2	Remarks
Ti	0	0	
Nd	0	0	
S-Cr-Mn	0	0	
Zn base	3	18	
Ca base	5	30	
Ni base	1	6	
Cr base	0	0	
Zr base	0	0	
Cl base	2	12	
Na-Cl	0	0	
Cu	1	6	
Cu-Au	0	0	
Ag-S	0	0	
Au-Ni	1	6	
Ag	0	0	
Au	2	12	
Cu-Au-Ni	0	0	
Cu-Zn	18	108	
Cu-Zn-Ni	0	0	
Cu-Zn-Au-Ni	0	0	
Zn-O	0	0	
Pb	0	0	
Fe-Cu	0	0	
Cr-Mn	0	0	
Al-Si Base	3	18	
F-O	7	42	
Cu-S-Al-O Base	0	0	
Ti-O/Al-Si-Fe	2	12	
Cr-Rich (Cr Base + Cr-Mn)	0	0	
Subtotal - Other Particle Only	333	1992	
Grand Total of Particles	459	2747	



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## Analysis Table on Swage

Elemental Composition	Count	Particle/cm2	Remarks
<b>Hard Particles</b>			
Al-O	3	72	
Al-Si-O	0	0	
Si-O	0	0	
Si-C	0	0	
Al-Cu-O	0	0	
Al-Mg-O	0	0	
Al-Si-Cu-O	0	0	
Al-Si-Fe-O	0	0	
Al-Si-Mg-O	0	0	
Al-Ti-O	0	0	
Ti-O	0	0	
Ti-C	0	0	
Ti-B	0	0	
Ti-N	0	0	
W-O	0	0	
W-C	0	0	
Zr-O	0	0	
Zr-C	0	0	
Pb-Zr-Ti-O	0	0	
Subtotal - Hard Particles Only	3	72	
<b>Magnetic Particle</b>			
Ce-Co	0	0	
Fe-Nd	0	0	
Fe-Sm	0	0	
Fe-Sr	0	0	
Nd-Pr	0	0	
Ni-Co	0	0	
Sm-Co	0	0	
Subtotal - Magnetic Particles Only	0	0	
Subtotal- Hard Particles including Magnetic Partilces	3	72	



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#### Analysis Table on Swage

Elemental Composition	Count	Particle/cm2	Remarks
<b>Steel Particle</b>			
SS 300- Fe-Cr-Ni	4	96	
SS 300- Fe-Cr-Ni-Mn	1	24	
SS 300- Fe-Cr-Ni-Si	1	24	
SS 400- Fe-Cr	1	24	
SS 400- Fe-Cr-Mn	0	0	
Other Steel - Fe	1	24	
Other Steel - Fe-Mn	0	0	
Other Steel - Fe-Ni	0	0	
Other Steel - Fe-O	1	24	
Subtotal - Steel Particle Only	9	216	
<b>Other Particle</b>			
No Element	0	0	
Ni	0	0	
Ni-P	0	0	
Sn base	68	1627	
Other	20	478	
Al	4	96	
Al-Mg	2	48	
Al-Ti	1	24	
Al-Si (1)	0	0	
Al-Si (2)	6	144	
Si	0	0	
Al-Cu	0	0	
Al-Si-Cu	1	24	
Al-Si-Fe	0	0	
Al-Si-Mg	8	191	
Mg-Si-O-Al	0	0	
Mg-Si-O	0	0	
Ti	0	0	
Nd	0	0	
S-Cr-Mn	0	0	
Zn base	0	0	
Ca base	0	0	
Ni base	0	0	
Cr base	0	0	
Zr base	0	0	
Cl base	0	0	
Na-Cl	0	0	
Cu	0	0	





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Elemental Composition	Count	Particle/cm2	Remarks
Cu-Au	0	0	
Ag-S	0	0	
Au-Ni	0	0	
Ag	0	0	
Au	2	48	
Cu-Au-Ni	0	0	
Cu-Zn	3	72	
Cu-Zn-Ni	0	0	
Cu-Zn-Au-Ni	0	0	
Zn-O	0	0	
Pb	0	0	
Fe-Cu	0	0	
Cr-Mn	0	0	
Al-Si Base	2	48	
F-O	0	0	
Cu-S-Al-O Base	0	0	
Ti-O/Al-Si-Fe	1	24	
Cr-Rich (Cr Base + Cr-Mn)	0	0	
Subtotal - OrtherParticle Only	118	2824	
Grand Total of Particles	130	3112	

ALS Testing Services  
(Thailand) Co.,Ltd.

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