ES-88-C: FINISH SPECIFICATION – TIN LEAD ALLOY

1.0 SCOPE

This specification defines the requirements for all TIN LEAD ALLOY finishes on metallic surfaces.

2.0 PURPOSE

To define the standard finish characteristics and finish codes along with their minimum and maximum layer requirements.

3.0 REFERENCE DOCUMENTS

ES-88 Molex Finish Specification

4.0 DEFINITIONS

4.1 Finish Specification Codes

4.1.1 60/40 Tin Lead Alloy over Nickel Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	60/40 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL NICKEL MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	M	140	75(1.91)	50(1.27)	
	M	145	75(1.91)	50(1.27)	OBSOLETE
	M	146	200(5.08)	50(1.27)	
	M	151	100(2.54)	50(1.27)	
	B	167	200(5.08)	40(1.02)	NOT RECOMMENDED
		178	150(3.81)	50(1.27)	
	B	188	80(2.03) 160(4.06)	80(2.03) 128(3.25)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Nickel	Continuous plating	50µ” (1.27µm)
	Batch plating	50µ” (1.27µm)
Tin-Lead Alloy	Continuous plating	75µ” (1.91µm)
	Batch plating	250µ” (6.35µm)

4.1.2 70/30 Tin Lead Alloy over Nickel Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	70/30 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL NICKEL MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	S	137	80(2.03) 160(4.06)	80(2.03) 128(3.25)	
	S	138	200(5.08)	80(2.03) 128(3.25)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Nickel	Continuous plating	50µ" (1.27µm)
	Batch plating	50µ" (1.27µm)
Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)

4.1.3 90/10 Tin Lead Alloy over Nickel Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	90/10 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL NICKEL MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	M	157	100(2.54)	50(1.27)	
	B	159	150(3.81) 250(6.35)	10(0.25)	NOT RECOMMENDED
	B	166	100(2.54) 175(4.45)	50(1.27)	OBSOLETE
		169	40(1.02) 120(3.05)	40(1.02) 100(2.54)	NOT RECOMMENDED
	B	186	50(1.27) 150(3.81)	30(0.76) 80(2.03)	NOT RECOMMENDED
	B	189	80(2.03) 160(4.06)	40(1.02) 128(3.25)	NOT RECOMMENDED
		190	100(2.54)	100(2.54)	
	B	191	100(2.54) 175(4.45)	30(0.76)	NOT RECOMMENDED
	B	193	80(2.03)	50(1.27)	
	B	194	100(2.54) 150(3.81)	50(1.27)	
	B	195	60(1.52) 100(2.54)	50(1.27)	
	M	143	200(5.08)	50(1.27)	
	M	150	150(3.81) 250(6.35)	30(0.76) 80(2.03)	NOT RECOMMENDED
	B	158	150(3.81) 250(6.35)	50(1.27) 80(2.03)	OBSOLETE
	B	162	160(4.06)	40(1.02)	OBSOLETE
	B	164	150(3.81) 250(6.35)	50(1.27)	
		179	150(3.81)	50(1.27)	
		182	160(4.06) 240(6.10)	50(1.27)	
	B	192	200(5.08)	50(1.27)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Nickel	Continuous plating	50µ" (1.27µm)
	Batch plating	50µ" (1.27µm)
Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)

4.1.4 95/05 Tin Lead Alloy over Nickel Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	95/05 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL NICKEL MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
		177	200(5.08)	50(1.27)	
		185	100(2.54)	50(1.27)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Nickel	Continuous plating	50µ" (1.27µm)
	Batch plating	50µ" (1.27µm)
Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)

4.1.5 93/07 Tin Lead Alloy over Nickel Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	93/07 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL NICKEL MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	N	155	100(2.54) 200(5.08)	50(1.27) 80(2.03)	OBSOLETE

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Nickel	Continuous plating	50µ" (1.27µm)
	Batch plating	50µ" (1.27µm)
Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)

4.1.6 60/40 Tin Lead Alloy over Copper Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	60/40 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL COPPER MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	M	142	200(5.08)	100(2.54)	
	M	165	100(2.54) 200(5.08)	100(2.54)	OBSOLETE
		180	150(3.81)	50(1.27)	
H	M	908	40(1.02) 80(2.03)	80(2.03)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)
Copper	Continuous plating	50µ" (1.27µm)
	Batch plating	100µ" (2.54µm)

Preplated, Reflowed and Hot Dipped:

Tin-Lead Alloy	100µ" (2.54µm) > Minimum Thickness	100µ" (2.54µm)
	Minimum Thickness > 100µ" (2.54µm)	150µ" (3.81µm)

4.1.7 90/10 Tin Lead Alloy Overall over Copper Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	OVERALL 90/10 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL COPPER MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	M	106	80(2.03)	80(2.03)	OBSOLETE
	M	141	200(5.08)	100(2.54)	
	M	149	200(5.08) 300(7.62)	30(0.76)	
	M	153	150(3.81)	30(0.76)	OBSOLETE
	M	163	118(3.00)	100(2.54)	
	S	168	120(3.05) 200(5.08)	40(1.02) 100(2.54)	
		171	80(2.03) 160(4.06)	40(1.02) 100(2.54)	
		175	60(1.52) 140(3.56)	8(0.20)	
		176	200(5.08) 300(7.62)	8(0.20)	
		181	150(3.81)	50(1.27)	
		183	160(4.06) 240(6.10)	80(2.03) 160(4.06)	
		184	120(3.05) 200(5.08)	60(1.52) 100(2.54)	
		187	120(3.05) 200(5.08)	40(1.02) 100(2.54)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)
Copper	Continuous plating	50µ" (1.27µm)
	Batch plating	100µ" (2.54µm)

4.1.8 95/05 Tin Lead Alloy over Copper Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	95/05 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL COPPER MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)
Copper	Continuous plating	50µ" (1.27µm)
	Batch plating	100µ" (2.54µm)

4.1.9 93/07 Tin Lead Alloy over Copper Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	93/07 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL COPPER MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	N	160	150(3.81) 250(6.35)	100(2.54)	OBSOLETE

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)
Copper	Continuous plating	50µ" (1.27µm)
	Batch plating	100µ" (2.54µm)

4.1.10 60/40 Tin Lead Alloy Only Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	OVERALL 60/40 TIN LEAD MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	M	173	50(1.27)	
H	M	903	50(1.27) 150(3.81)	
H	M	904	20(0.51) 80(2.03)	
H	M	911	200(5.08) 350(8.89)	
H	M	913	100(2.54) 250(6.35)	
H	M	914	40(1.02) 100(2.54)	
	B	919	80(2.03) 160(4.06)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)

Preplated, Reflowed and Hot Dipped:

Tin-Lead Alloy	100µ" (2.5µm) > Minimum Thickness	100µ" (2.54µm)
	Minimum Thickness > 100µ" (2.5µm)	150µ" (3.81µm)

4.1.11 90/10 Tin Lead Alloy Only Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	OVERALL 90/10 TIN LEAD MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	B	156	150(3.81) 250(6.35)	
		172	120(3.05) 200(5.08)	
	B	174	80(2.03)	
H	B	915	40(1.02) 100(2.54)	
H	B	916	40(1.02) 120(3.05)	
H	B	917	160(4.06) 320(8.13)	
	B	920	80(2.03) 160(4.06)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)

4.1.12 95/05 Tin Lead Alloy Only Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	OVERALL 95/05 TIN LEAD MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)

4.1.13 Tin Lead/Nickel Miscellaneous

4.1.13.1 60/40 Selective Tin Lead Alloy over Nickel Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	SELECT 60/40 TIN LEAD MIN µin (µm) MAX µin (µm)	SELECT 60/40 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL NICKEL MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	M	202	200(5.08)	75(1.91)	50(1.27)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)
Nickel	Continuous plating	50µ" (1.27µm)
	Batch plating	50µ" (1.27µm)

4.1.13.2 90/10 Selective Tin Lead Alloy over Nickel Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	SELECT 90/10 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL NICKEL MIN µin (µm) MAX µin (µm)	OBSOLETE/ RECOMMENDED
	B	147	150(3.81) 250(6.35)	10(0.25)	NOT RECOMMENDED
	M	152	50(1.27)	50(1.27)	OBSOLETE

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Nickel	Continuous plating	50µ" (1.27µm)
	Batch plating	50µ" (1.27µm)
Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)

4.1.13.3 Dual 90/10 Selective Tin Lead Alloy over Nickel Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	DUAL SELECT 90/10 TIN LEAD MIN µin (µm) MAX µin (µm)	SELECT 90/10 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL NICKEL MIN µin (µm) MAX µin (µm	OBSOLETE/ RECOMMENDED
	M	144	200(5.08)	75(1.91)	50(1.27)	
	M	161	200(5.08)	150(3.81)	50(1.27)	OBSOLETE
		196	200(5.08)	150(3.81)	50(1.27)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)
Nickel	Continuous plating	50µ" (1.27µm)
	Batch plating	50µ" (1.27µm)

4.1.13.4 Dual 95/05 Selective Tin Lead Alloy over Nickel Overall

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	SELECT 95/05 TIN LEAD MIN µin (µm) MAX µin (µm)	SELECT 95/05 TIN LEAD MIN µin (µm) MAX µin (µm)	OVERALL NICKEL MIN µin (µm) MAX µin (µm	OBSOLETE/ RECOMMENDED
	M	139	200(5.08)	150(3.81)	50(1.27)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)
Nickel	Continuous plating	50µ" (1.27µm)
	Batch plating	50µ" (1.27µm)

4.1.13.5 95/05 SELECTIVE TIN LEAD ALLOY 60/40 TO 95/05 SELECTIVE TIN LEAD ALLOY OVER NICKEL OVERALL

Note: See ES-88 for specific material properties, quality, packaging, etc. details.
Conversion factor 1µm = 39.37µin

PROCESS CODE	APPEARANCE CODES	FINISH CODE	SELECT 95/05 TIN LEAD MIN µin (µm) MAX µin (µm)	SELECT 60/40 TO 95/05 SELECTIVE TIN LEAD ALLOY MIN µin (µm) MAX µin (µm)	OVERALL NICKEL MIN µin (µm) MAX µin (µm	OBSOLETE/ RECOMMENDED
		170	150(3.81)	150(3.81)	50(1.27)	

UNLESS OTHERWISE SPECIFIED MAXIMUM FINISH THICKNESS ALLOWED ABOVE MINIMUMS:

Continuous and Batch Plating:

Tin-Lead Alloy	Continuous plating	75µ" (1.91µm)
	Batch plating	250µ" (6.35µm)
Nickel	Continuous plating	50µ" (1.27µm)
	Batch plating	50µ" (1.27µm)