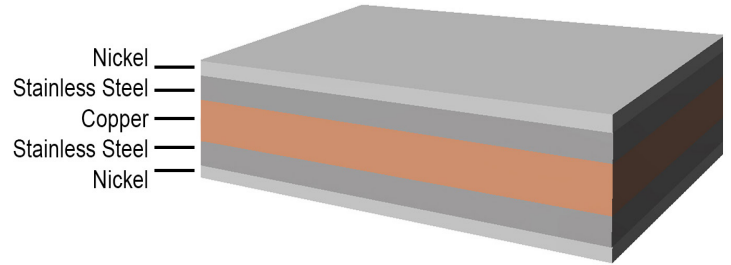




Material Attributes

- High Electrical & Thermal Conductivity
- Easily Welded by Resistance or Laser
- Solderable nickel surface layers
- Higher strength for stronger welds and improved busbar rigidity
- High conductive properties allow for thinner, lighter, lower cost cell connectors



Description

Composition

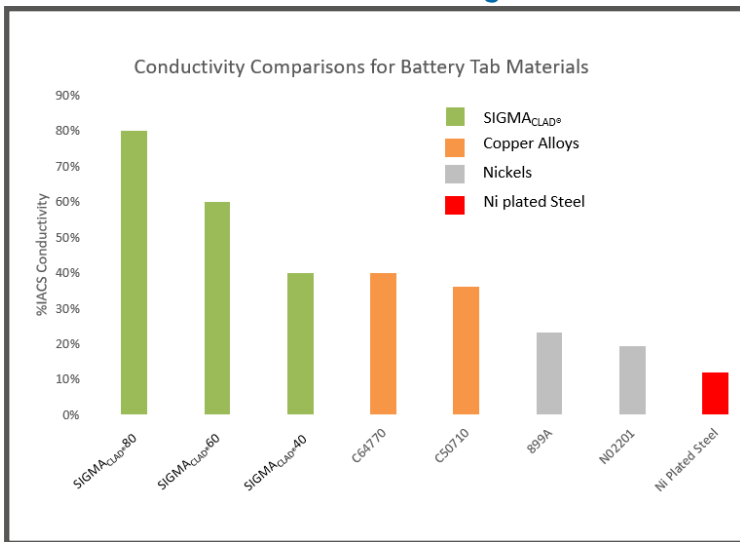
Nickel / Austenitic Stainless Steel / Copper / Austenitic Stainless Steel / Nickel

Material Condition

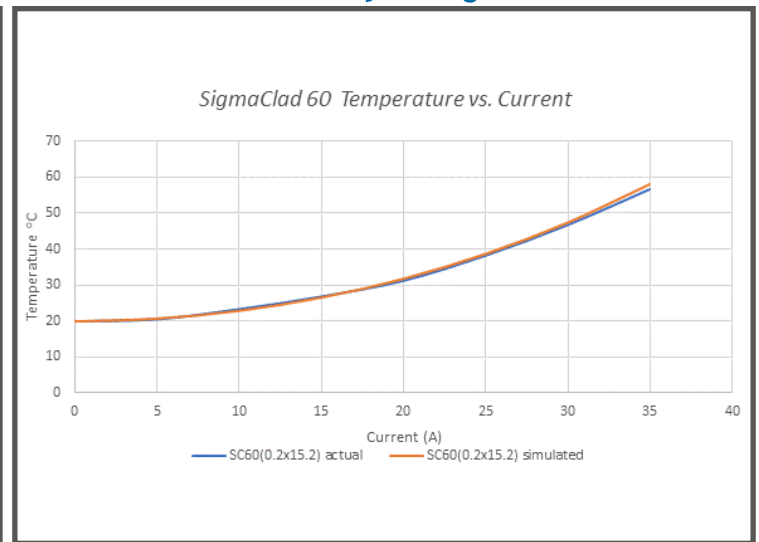
- **Surface** Medium Luster Matte Finish
- **Temper** Annealed (Specific Tempers Available on Request)
- **Hardness** Hv 150-210 (Stainless Steel)

SIGMA _{CLAD} ® Options					
SIGMA _{CLAD} ®40		SIGMA _{CLAD} ®60		SIGMA _{CLAD} ®80	
Thickness		Thickness		Thickness	
0.15 mm	0.006"	0.15 mm	0.006"	0.5 mm	0.020"
0.20 mm	0.008"	0.20 mm	0.008"		
0.25 mm	0.010"	0.25 mm	0.010"		
0.30 mm	0.012"	0.30 mm	0.012"		
		0.40 mm	0.016"		
		0.50 mm	0.020"		

Conductivity



Ampacity



Ampacity Data

Ampacity is defined as the maximum amount of current that a conductor can carry continuously under the conditions of use without exceeding its temperature rating. Several cross-sectional area of SIGMA_{CLAD}® material have been measured and are presented in graphical format. These graphs can help the battery pack designer determine the proper material given the application's current range.



Physical Properties @ 20°C (typical properties)	SIGMA^{CLAD}® 40 Annealed	SIGMA^{CLAD}® 60 Annealed	SIGMA^{CLAD}® 80 Annealed	201 Nickel (Annealed)	Ni Plated Steel (AISI 1020)
Density (Kg/m ³)	8,415	8,580	8,666	8,900	7,870
Yield Strength (MPa)	205	138	93	103	350
Tensile Strength (MPa)	475	368	282	414	420
Elongation %	45	48	43	45	15
Erichsen Cup Height (mm)	11.2	11.9	N/A	12.1	N/A
Elastic Modulus (GPa)	165	148	131	207	186
CTE: (µm/m°C)	16.6	16.7	17.1	13.3	11.7
Thermal Conductivity ⁽²⁾ (W/m-K)	178	253	317	79	52
Specific Heat (J/Kg-°C)	447	423	413	456	486

* ⁽¹⁾ Properties can vary depending on finish thickness ⁽²⁾ Parallel to strip direction

Electrical Properties @ 20°C (typical properties)	SIGMA^{CLAD}® 40 Annealed	SIGMA^{CLAD}® 60 Annealed	SIGMA^{CLAD}® 80 Annealed	201 Nickel (Annealed)	Ni Plated Steel (AISI 1020)
Conductivity (%IACS) ⁽¹⁾	40%	60%	80%	20%	11%
Resistivity (ohm-m)	4.310 x 10 ⁻⁸	2.874 x 10 ⁻⁸	2.155 x 10 ⁻⁸	8.621 x 10 ⁻⁸	1.567 x 10 ⁻⁷

* ⁽¹⁾ Properties can vary depending on finish thickness * ⁽²⁾ Parallel to strip direction * ⁽³⁾ SIGMA^{CLAD}® 80 mechanical properties based on limited data

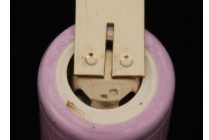
Material & Thickness	Electrode Configuration	Anti-Shunt Slots? / Projections	Watt Seconds	Pull Strength
SIGMA ^{CLAD} ® 40 0.127 mm	parallel	Yes/No	65	5.4/6.4
SIGMA ^{CLAD} ® 40 0.250 mm	parallel	Yes/Yes	150	23/28
SIGMA ^{CLAD} ® 40 0.400 mm	parallel	Yes/Yes	250	30/20
SIGMA ^{CLAD} ® 60 0.381 mm	parallel	Yes/Yes	275	23/31
SIGMA ^{CLAD} ® 60 0.508 mm	parallel	Yes/Yes	500	48/35
SIGMA ^{CLAD} ® 60 0.508 mm	step	No/Yes	150	38/38

* Welding method required depends on bulk thickness and electrical conductivity.

Soldering



Welding



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