

PEI Plating Reference Guide

PROCESS		TYPE CLASS	THICK -NESS	COMMENTS & SPEC NO.		PROCESS		TYPE CLASS	THICK -NESS	COMMENTS & SPEC NO.					
CHROMIC ANODIZE				MIL-A-8625				BLACK OXIDE COATING				MIL-C-13924			
Minimum weight type 1 after sealing: Class 1 - 200 milligrams/sq.ft. Class 2 - 5000 milligrams/sq.ft. Corrosion Resistance Requirements: Salt spray requirement is 336 hours. 5% solution per method 811 of FED-STD-151 or ASTM B117 (surface inclined approximately 6 degrees from the vertical). The specimen panels or finished products shall show no more than a total of 15 isolated spots or prts, none larger than 1/32 inch in diameter, in a total of 150 sq. in. of test area grouped from 5 or more test pieces; or no more than 5 isolated spots or pits in a total of 30 sq.in. from one or more test pieces.		Type 1A		0.00002" 0.0003"		Conventional chromic acid bath. Shall not be applied to aluminum alloys with over 5.0% copper, 7.0% silicon, or total alloying constituents over 7.5% (Note: alloys with higher than 8.0% silicon may be anodized subject to approval of acquiring activity if supplier shows coatings equivalent to that on lower silicon contents). Low voltage chromic acid anodizing (20V). Use Type IB for 7000 series alloys. Heat treatable alloys which are to receive Type I coatings should be tempered (such as T4 or T6). Non-dyed (natural, including dichromate sealing) Dyed. Specify color on contract.		Class 4		No dimensional change For moving parts which cannot tolerate the dimensional change of a more corrosion resistant finish. For decorative applications and can be used to decrease light reflectoin. Alkaline oxidizing. For 300 series corrosion resistant steel alloys only..					
		Type 1B		0.00002" 0.0003"											
		Class 1 Class 2													
CHEMICAL FILMS						MIL-DTL-5541									
Materials qualified produce coatings that range in color from clear to iridescent yellow or brown, inspection difficulties may arise with clear coatings because visual inspection does not reveal the presence of a coating.		Class 1A				Class 3 Type I only				For maximum protection against corrosion, painted or unpainted For protection against corrosion where low electrical resistance is required					
HARD ANODIZE				MIL-A-8625				COPPER				MIL-C-14550			
Color will vary from light tan to black depending on alloy and thickness. Can be dyed in darker colors depending on thickness. Coating PENETRATES base metal as much as builds up on the surface. The term THICKNESS includes both the buildup and penetration. Provides very hard ceramic type coating. Abrasion resistance will vary with alloy and thickness of coating. Good dielectric properties. Do not seal coatings where main function is to obtain maximum abrasion or wear resistance. When used for exterior applications requiring corrosion resistance but permitting reduced abrasion resistance, the coating shall be sealed (boiling deionized water or hot 5% sodium dichromate solution, or other suitable chemical solutions). Abrasion resistance for unsealed coatings tested by method 6192 of FED-STD-141 using CS-17 wheels with 1000 gm load. For 2024 and other copper bearing alloys the anodic coating loss shall not exceed 40 milligrams - for all other alloys shall not exceed 20 milligrams.		Type III		As specified on drawing. If not specified nominal thickness shall be 0.002"		Conventional chromic acid bath. Shall not be applied to aluminum alloys with over 5.0% copper, 7.0% silicon, or total alloying constituents over 7.5% (Note: alloys with higher than 8.0% silicon may be anodized subject to approval of acquiring activity if supplier shows coatings equivalent to that on lower silicon contents). Low voltage chromic acid anodizing (20V). Use Type IB for 7000 series alloys. Heat treatable alloys which are to receive Type I coatings should be tempered (such as T4 or T6). Non-dyed (natural, including dichromate sealing) Dyed. Specify color on contract.		Class 0		Unless otherwise specified .001-.005		For heat treatment stop-off. For carburizing and decarburizing shield, also plated through printed circuit boards. As an undercoat for nickel and other platings. To prevent basis metal migration into tin (prevents poisoning solderability)).			
		Class 1													
		Class 2													

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TYPE CLASS	THICK -NESS	COMMENTS & SPEC NO.		TYPE CLASS	THICK -NESS	COMMENTS & SPEC NO.	
ELECTROLESS NICKEL MIL-C-26074				GOLD MIL-DTL-45204			
Similar to stainless steel in color. Plates uniformly in recesses and cavities (does not build up on edges). Corrosion resistance is good for coatings over .001" thickness. Electroless nickel is used extensively in salvage of mis-machined parts. Also, for inside dimensions and irregular shapes (where assembly tolerances need uniformity provided by "electroless" process). Precoating and postcoating procedures: -Class 1- below RC40. Baking at 375°F ± 25°F at users option -Class 1-RC40 and above. Bake at 375°F ± 25°F FOR 3 HOURS. Shot peen steel parts designed for unlimited life under dynamic loads prior to plating. Class 2-below RC4 0. Shot penned parts designed for unlimited life prior to plating. Post plating bake 3 hours min. 350°F. Class 2 coating. Shall have minimum hardness of 850 knoop (100gm load) Class 3. Post bake 1-1½ hours at 375°F ± 25°F Class 4. Post bake heat treatable alloys 1-1½ hours at 240°F-260"	Class 1	Unless otherwise specified .001-.005	*The minimum thickness of the nickel coating shall be 0.0005 inch(grade B) for copper-, nickel-, and cobalt-based titanium and beryllium alloys.	Yellow to orange color depending on proprietary process used. Will range from matte to bright finish depending on basis metal. Good Corrosion resistance, and has high tarnish resistance. Provides a low contact resistance, and is a good conductor. Has excellent solderability. If the hardness grade for the gold coating is not specified, Type I shall be furnished at hardness Grade A, and type II shall be furnished at hardness Grade C. For soldering, a thin purity soft gold coating is preferred. A minimum thickness of 0.000050 inch and a maximum thickness of 0.00010 inch shall be plated.	Type I	99.7 gold minimum Grades A, B, C. 99.0 gold minimum Grades A, B, C. 99.9 gold minimum Grades A, B, C. 90 Knoop maximum. 91-129 Knoop maximum. 130-200 Knoop maximum. 201 Knoop and over.	
	Class 2		As plated, no subsequent heat treatment. A bake for hydrogen embrittlement relief is not considered a treatment.		Type II		
	Class 3		Heat treated to obtain required hardness. May be used on all metals not affected by heating to 500°F and above.		Type III		
	Class 4		Aluminumalloys non-heat-treatab,leand beryllium alloys processed to improve adhesion of the nickel deposit.		Grade A		
	Grade A	0.001"	Aluminumalloy,heat treatable, processed to improve adhesion of the nickel deposit.		Grade B		
Grade B	0.0005"min			Grade C			
Grade C	0.0015"min			Grade D			
				Class 00	.00002" min.		
				Class O	.00003" min.		
				Class 1	.00005" min.		
				Class 2	.00010" min.		
				Class 3	.00020" min.		
				Class 4	.00030" min.		
				Class 5	.00050" min.		
				Class 6	.00150" min.		
				SULFAMATE NICKEL MIL-P-27418 (USAF)			
				Soft Gray ductile nickel plate. Additives may be used to harden.		.000010 to .200+"	Electroforms, Molds, Electronic leads for ductility. Flexible circuits, soldering, Brazing, PC Boards, diffusion barrier in between Gold over Copper.
				NICKEL QQ-N-290			
				There is a nickel finish for almost any need. Nickel can be deposited soft or hard-dull or bright, depending on process used and conditioned employed in plating. Thus, hardness can range from 150-500 Vickers. Can be similar to stainless steel in color, or can be a dull grey or light grey (almost white) color. Corrosion resistance is a function of thickness. Has a low coefficient of thermal expansion- is magnetic. All steel parts having a hardness of RC-40 or greater require a post bake at 375°F ± 25°F for 3 hours.	Class 1	.0016" .0012" .0010" .0008" .0006" .0004" .0002"	NOTE: All steel parts having a tensile strength of 220,000 or greater shallnot be nickel plated wrthout specific approval of procuring agency.
					Grade A		
					Grade B		
					Grade C		
					Grade D		
				Grade E	For corrosion protection. Plating shall be applied over an underplating of copper or yellow brass on zinc and zinc based alloys. In no case, shall the copper underplate be substitutedfor any part of the specified nickel thickness.		
				Grade F			
				Grade G			
				Class 2			
				For engineering applications.			
				PASSIVATE QQ-P-35			
				Specifications covers standard recommendation practice for cleaning and descaling stainel ss steel parts, equipment and systems. Cleaning includes all operations necessary for the removal of surface contaminates from metals to ensure (1) maximum corrosion resistance of the meta;l (2) prevention of product contamination; and (3) achievement of desired appearance.	Type II	No dimensional change	Medium temperature nitric acid solution with sodium dichromate additive.
					Type VI		Low temperature nitric acid solution.
					Type VII		Medium temperature nitric acid solution.
					Type VII		Medium temperature high concentrate nitric acid solution.
ELECTROPOLISHING (NO MIL-SPEC NO.)							
Process electrolytically removes or diminishes scratches, burrs and unwanted sharp edges from most metals. Finishes from satin to mirror-bright are produced by controlling-time, temperature, or both. .		Typical Thickness Loss .0002"	Typical dimensional change. Process is not recommended for close tolerance surfaces.				

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COMMENTS & SPEC NO.				COMMENTS & SPEC NO.			
RHODIUM				TIN			
MIL-R-46085		MIL-T-10727					
Metallic and similar to stainless steel in color. Excellent corrosion resistance. Almost as hard as chromium. Very good abrasion resistance. Thicker coatings are very brittle. Has high reflectivity. Parts having hardness of Rockwell C33 or above shall be baked at 375°F for 3 hours prior to cleaning. Parts having hardness of Rockwell C-40 and above shall be baked within 4 hours after plating at 375°F for 3 hours.		Type I Type II Class 1		Over nickel, silver, gold, or platinum. Over other metals, requires nickel undercoat. Used on silver for tarnish resistance. Applications range from electronic to nose cones-wherever wear, corrosion resist solderability and reflectivity are important.		Color is gray-white in a plated condition. Has very high luster in fused condition. Soft, but is very ductile. Corrosion resistance is good. (Coated items should meet 24 hour 5% salt spray requirement). Soderability is excellent. Tin is not good for low temperature applications (changes structure and loses adhesion when exposed to temperatures below 40°C). Customer to specify bright or dull.	
				Type I			
						.0001-.00025" .0002-.0004" .0003" min. 0002-0006"	
						Electrodeposited Flash for soldering To prevent galling and seizni g Where corrosion resistance is important. To prevent formation of case during nitriding.	
SILVER				TIN LEAD			
QQ-S-365		MIL-P-81728					
White matte to very bright in appearance. Good corrosion resistance , depending on base metal. Will tarnish easily. Hardness varies from about 90 Brinnell to about 135 Brinnell depending on process and plating conditions. Solderability is excellent, but decreases with age. Best electrical conductor. Has excellent lubricity and smear characteristics for anti-galling uses on static seals, bushing, etc. Stress relief steel parts at a minimum 375°F ± 25°F or more prior to cleaning and plating if they contain or are suspected of having damaging residual tensile stresses. Embittlement relief all steel parts RC40 and above at 375°F ± 25°F for 3 hours within 4 hours after plating.		Typical Thickness Loss .0002"		Increasing use in both decorative and engineering fields, including electrical and electronic fields Matte Semi-bright Bright Chromate post-treatment to improve tarnish resistance. No supplementary treatment.		Excellent solderabilitiy. Either a matte or bright luster is acceptable. For electronic components use only parts with a matte or flow brightened finish.	
		60/40 90/10				Unless otherwise specified .0003" .0005" 0.0003" max	
						Electroforms, Molds, Electronic leads for ductility. Flexible circuits, soldering, Brazing, PC Boards, diffusion barrier in between Gold over Copper.	
ZINC				ASTM-B633			
Corrosion Resistance Requirements		Type I		Type I		As plated	
Types		Test Period hr.		TypeII		With colored chromate conversion coatings.	
II		96				With colorless chromate conversion coatings.	
III		12		Type III			

