Surface Finish Thickness Chart

This surface finish thickness chart compares common coating and treatment references used on sheet metal parts, then shows how to estimate their effect on holes, outside dimensions, fits, and threads. Use the chart to prepare a drawing or RFQ; the controlling standard, approved coating product, and finishing supplier should define the final thickness requirement.

Important: "Surface finish" can mean coating type, appearance, texture, roughness, or a chemical treatment. These are not interchangeable. The values below are standard classes or product-specific reference ranges, not universal or supplier-specific guaranteed values. Final thickness depends on the substrate, pretreatment, geometry, coating chemistry, application method, racking, masking, curing, significant-surface definition, and inspection method.

Surface Finish Thickness Chart

Read each row with its source context: a number without its governing specification can be misleading. 1 mil = 0.001 in = 25.4 µm.

SURFACE FINISH OR TREATMENT	THICKNESS REFERENCE	APPROX. MIL	HOW TO INTERPRET IT	FIRST DIMENSIONAL MODEL
Powder coating, single-coat product example	60–80 µm	2.4–3.1 mil	Example recommended dry film thickness from a polyester powder product data sheet; another powder, color, texture, primer, or two-coat system can require a different build	Added outward; use one film thickness per coated surface for early clearance checks
Cathodic e-coat product example	10–30 µm	0.4–1.2 mil	Product range published for Axalta AquaEC A400/A600; the approved electrocoat and performance specification control	Added outward; coverage is often more uniform than spray coating, but recess coverage and throwpower still depend on the system
Decorative/protective sulfuric anodizing	AA 5, 10, 15, 20, or 25 µm	0.2–1.0 mil	ISO 7599 uses thickness classes; the class number is the minimum average coating thickness, not a loose process range	Only part of the oxide grows above the original aluminum surface; one supplier reference uses about 30% outward growth for clear anodizing

SURFACE FINISH OR TREATMENT	THICKNESS REFERENCE	APPROX. MIL	HOW TO INTERPRET IT	FIRST DIMENSIONAL MODEL
Hard anodizing, MIL-PRF-8625 Type III	50.8 µm nominal when unspecified, ±20% up to this thickness	2.0 mil nominal	This is the default under the cited military specification when the contract, purchase order, or drawing does not state another thickness; it is not a default for every hard-anodize order	The specification states that a dimensional increase equal to one-half the applied coating thickness can be expected per coated surface
Electrodeposited zinc on iron or steel, ASTM B633	5, 8, 12, or 25 µm minimum	0.2, 0.3, 0.5, or 1.0 mil	Four service-condition thickness classes, SC1 through SC4; supplementary finish type and hydrogen-embrittlement requirements are separate decisions	Added outward, but current density can make edge and recess thickness less uniform than an electroless deposit
Electroless nickel-phosphorus, ASTM B733	0.1, 5, 13, 25, or 75 µm minimum	0.004, 0.2, 0.5, 1.0, or 3.0 mil	ASTM standard service conditions SC0 through SC4 define minimum thickness; phosphorus type and post-plate heat-treatment class must also be specified	Added outward; the process can produce relatively uniform thickness on wetted surfaces when solution circulation is adequate
Hot-dip galvanized fabricated steel, EN ISO 1461	45–85 µm minimum mean thickness, depending on steel section thickness	1.8–3.3 mil	Mean minimum for non-centrifuged steel articles; local minima are lower and actual coating can exceed the standard minimum	Treat as added outward for clearance planning, but expect more variation than precision plating and review holes, threads, drains, and runs separately
Stainless steel chemical passivation	No deposited coating thickness specified	—	ASTM A967/A967M defines chemical passivation treatments and effectiveness tests, not a dimensional coating class	Do not apply a generic coating allowance; cleaning, descaling, or etching may still alter the surface microscopically
Brushing, grinding, bead blasting, or polishing	No added film thickness	—	These are subtractive or texture-changing operations rather than deposited coatings	Do not add a coating allowance; specify the finished dimension and surface requirement if material removal matters

Metric values control this page. Mil equivalents are calculated with 1 mil = 25.4 µm and rounded to the nearest 0.1 mil in ranges or to the displayed precision in standards tables. Converted values are reference equivalents, not tighter acceptance limits.

How Coating Thickness Changes Dimensions

For a finish that builds outward, model the outward growth on one coated surface first, then apply it to the feature being measured.

$b = f \times c$

c = measured coating or treatment thickness on one surface | f = fraction of that thickness that grows above the original substrate surface | b = outward dimensional build on one coated surface

External size after finishing = external size before finishing + 2b
Internal size after finishing = internal size before finishing − 2b

The 2b term applies when two opposite surfaces affect the measured width or diameter; a one-sided step or height changes by b. For deposited paints and metallic coatings, use f = 1 as an early dimensional model. For anodizing, follow the conversion or growth guidance associated with the specified process rather than assuming the full oxide thickness grows outward.

Dimensional-Build Examples

The examples start with a 10.000 mm opening and assume both walls receive the stated finish uniformly. They illustrate arithmetic, not guaranteed post-finish dimensions.

EXAMPLE FINISH	COATING C	OUTWARD FRACTION F	BUILD PER SURFACE B	TWO-SURFACE CHANGE	ESTIMATED FINISHED OPENING
Powder coating	70 µm	1.00	0.070 mm	−0.140 mm	9.860 mm
E-coat	20 µm	1.00	0.020 mm	−0.040 mm	9.960 mm
Clear anodizing, supplier growth model	20 µm	0.30	0.006 mm	−0.012 mm	9.988 mm
Hard anodizing	50 µm	0.50	0.025 mm	−0.050 mm	9.950 mm
Zinc electroplating	12 µm	1.00	0.012 mm	−0.024 mm	9.976 mm
Electroless nickel	25 µm	1.00	0.025 mm	−0.050 mm	9.950 mm
Hot-dip galvanizing	70 µm	1.00	0.070 mm	−0.140 mm	9.860 mm

Actual coating inside a small hole may differ from the deposit measured on an accessible significant surface. Powder can be thin in recessed Faraday-cage areas, electroplating varies with current density, hot-dip zinc can accumulate or drain unevenly, and MIL-PRF-8625 notes that small and tapped holes can receive anywhere from no anodic film to a full normal coating. Critical openings therefore need a masking, allowance, or post-finish sizing strategy rather than arithmetic alone.

Anodizing — ISO 7599 Decorative & Protective Classes

ISO 7599 covers decorative and protective anodic oxidation coatings on aluminum but excludes hard anodizing used primarily for engineering wear resistance. The AA class identifies the minimum average coating thickness.

ISO 7599 THICKNESS CLASS	MINIMUM AVERAGE THICKNESS	APPROX. MIL
AA 5	5 µm	0.20 mil
AA 10	10 µm	0.39 mil
AA 15	15 µm	0.59 mil
AA 20	20 µm	0.79 mil
AA 25	25 µm	0.98 mil

Do not select the AA class from thickness alone. Alloy, temper, appearance, dye, sealing, exposure environment, pretreatment, and acceptable rack marks also belong in the finish definition. For precision components, review the pre-anodize etch because substrate removal can offset part of the outward oxide growth.

Anodizing — MIL-PRF-8625 Type III Hard Anodizing

Under the cited revision, when no other thickness is stated, the nominal Type III hard anodic coating is 0.002 in / 50.8 µm. For coatings up to 0.002 in, the specified default variation is ±20% unless otherwise stated.

LIMIT	MICROMETERS	INCHES
Lower	40.64 µm	0.0016 in
Nominal	50.80 µm	0.0020 in
Upper	60.96 µm	0.0024 in

MIL-PRF-8625 advises placing both machined and coated dimensions on applicable close-tolerance drawings. Its expected surface growth is one-half of the applied coating thickness per coated surface, so a 50.8 µm coating builds approximately 25.4 µm outward per surface, before considering pretreatment removal and process variation.

Zinc Electroplating — ASTM B633

ASTM B633 covers electrodeposited zinc on iron and steel articles. The service condition sets the minimum zinc thickness; the supplementary finish type defines the treatment over the zinc. Avoid specifying only “zinc plated” when corrosion performance, color, electrical contact, or compliance matters.

ASTM B633 SERVICE CONDITION	MINIMUM ZINC THICKNESS	APPROX. MIL	SERVICE DESCRIPTION IN THE CLASS NAME
SC1	5 µm	0.20 mil	Mild
SC2	8 µm	0.31 mil	Moderate
SC3	12 µm	0.47 mil	Severe

ASTM B633 SERVICE CONDITION	MINIMUM ZINC THICKNESS	APPROX. MIL	SERVICE DESCRIPTION IN THE CLASS NAME
SC4	25 µm	0.98 mil	Very severe

These are minimum zinc values on specified significant surfaces, not a promise of perfectly uniform buildup everywhere. Edge current concentration, shielding, recess geometry, racking, and supplementary treatments affect the delivered coating system. ASTM B633 states that steel above 1700 MPa tensile strength should not be zinc electroplated under that specification; high-strength steel requires an explicit hydrogen-embrittlement review.

Electroless Nickel — ASTM B733

ASTM B733 classifies electroless nickel-phosphorus by phosphorus type, service-condition thickness, and post-plate heat treatment. All three fields can affect performance; thickness alone does not define the deposit.

ASTM B733 SERVICE CONDITION	MINIMUM THICKNESS	APPROX. MIL	GENERAL SEVERITY LABEL
SC0	0.1 µm	0.004 mil	Minimum or flash
SC1	5 µm	0.20 mil	Light
SC2	13 µm	0.51 mil	Mild
SC3	25 µm	0.98 mil	Moderate
SC4	75 µm	2.95 mil	Severe

Because electroless nickel is autocatalytic rather than driven by current distribution, it can follow complex wetted geometry more uniformly than electrolytic plating, conditioned on adequate solution circulation. For a 25 µm deposit on both sides of a diameter, expect a first-pass diameter change of about 0.050 mm. A finished 10.000 mm bore would therefore begin near 10.050 mm before plating if the full deposit reaches both walls and no post-plate machining is planned.

Hot-Dip Galvanizing — EN ISO 1461

For non-centrifuged fabricated steel articles, EN ISO 1461 minimum coating thickness changes with the steel section thickness. The values below come from the Galvanizers Association’s published summary of the standard.

STEEL SECTION THICKNESS	MINIMUM LOCAL COATING	MINIMUM MEAN COATING	APPROX. MEAN MIL
Less than 1.5 mm	35 µm	45 µm	1.77 mil
1.5 mm to 3 mm	45 µm	55 µm	2.17 mil
More than 3 mm to 6 mm	55 µm	70 µm	2.76 mil
More than 6 mm	70 µm	85 µm	3.35 mil

> These are minimum local and mean values, not nominal precision-film targets. Actual hot-dip galvanized coatings can be thicker because steel chemistry, section size, surface condition, withdrawal, drainage, and reactive silicon or phosphorus content influence growth. Threads, close-clearance holes, overlapping surfaces, sealed cavities, venting, and drainage should be reviewed before fabrication.

Design Checks Before Releasing a Drawing

#	DESIGN CHECK
1	Specify substrate material, grade, alloy or temper, and nominal thickness.
2	Name the finish process and governing standard, including revision when contractually controlled.
3	State coating type, class, service condition, color, gloss, texture, seal, passivate, primer, or topcoat as applicable.
4	Distinguish minimum, nominal, local, mean, and total system thickness.
5	Identify significant surfaces, permissible rack or contact marks, cosmetic faces, and coating-free areas.
6	Show pre-finish and post-finish requirements for bores, slots, pins, gasket lands, bearing seats, press fits, grounding points, and mating edges.
7	Mask or separately control threads when film build could cause interference; do not assume every coating will enter internal and external threads equally.
8	Define inspection method and location when thickness is critical; magnetic, eddy-current, X-ray, microscopic, and coulometric methods have different applicability.
9	Check whether pretreatment, etching, pickling, blasting, or polishing removes substrate before the coating is applied.
10	Confirm that the cure or post-plate heat treatment is compatible with the material temper, adhesives, inserts, seals, and prior operations.
11	Decide whether hardware is installed before or after finishing; the selected sequence can affect hole size, electrical continuity, corrosion interfaces, and coating damage.
12	Define whether critical inspection occurs before or after coating, assembly, welding, and any touch-up.

Common Problems from Missing Thickness Requirements

PROBLEM	EFFECT	EARLY DESIGN RESPONSE
Holes and slots become too small	A finish applied to both walls reduces the clear opening by about twice the outward build. Even a 25 µm electroless nickel layer closes a uniformly plated diameter by about 0.050 mm; powder coat or hot-dip zinc can consume substantially more clearance and may vary locally.	Model the build per coated surface, then mask, pre-size, or machine critical openings after finishing.
Pins, tabs, and outside dimensions become too large	Two coated sides increase an external width or diameter by about twice the outward build, which can turn a slip fit into an interference fit or prevent a tab from entering a slot.	Apply a pre-finish allowance or mask the functional surface before coating.

PROBLEM	EFFECT	EARLY DESIGN RESPONSE
Threads bind or lose electrical contact	Coating changes pitch diameter and flank clearance, and some organic finishes electrically isolate the joint.	Mask, allow, or chase-tap after finishing; treat post-finish tapping as an intentional loss of local protection.
Appearance and performance vary across the part	Sharp edges, deep recesses, welds, porous castings, overlapping seams, and poor drainage do not receive every finish uniformly. A flat test coupon can meet thickness while a functional recess, edge, or thread does not.	Call out significant surfaces and inspection locations on the drawing.
Tolerance stack assigned to the wrong condition	The drawing may dimension the bare metal while assembly requires the coated size, or it may specify a finished size interpreted as pre-finish. General fabrication tolerance plus coating variation plus measurement uncertainty can exceed the available fit clearance.	State the inspection condition directly; separate general fabrication tolerances from finish-sensitive dimensions.

What to Do When the Finish Closes a Critical Fit

OPTION	WHEN IT HELPS	TRADE-OFF
Add a pre-finish machining or cutting allowance	Coating build is repeatable enough and the feature should be protected	Requires verified coating growth and a tolerance stack that includes both substrate and finish variation
Mask the functional surface	A bearing seat, thread, electrical contact, gasket land, or precision fit should remain uncoated	Leaves the substrate locally unprotected and adds masking labor and transition edges
Ream, hone, grind, tap, or machine after finishing	Final size is more important than complete coating coverage	Adds setup and cost; exposes substrate and may require approved touch-up
Select a thinner finish or lower thickness class	The application permits a different protection strategy	Can reduce corrosion, wear, appearance, or qualification performance
Use electroless rather than electrolytic deposition	More uniform build is needed on complex wetted geometry	Chemistry, cost, phosphorus content, heat treatment, and substrate compatibility still require review
Increase mating clearance or change the fit class	The assembly can tolerate more movement or gap	May affect alignment, vibration, sealing, appearance, or load transfer
Define a coating-free hardware strategy	Threads or inserted hardware cannot accept film buildup	Requires sequence control and corrosion planning at exposed interfaces
Validate with coated first articles or coupons	The finish and geometry are difficult to predict analytically	Adds lead time but produces evidence for final drawing allowances and inspection locations

Reference chart for engineering review. Coating thickness depends on the substrate, pretreatment, geometry, coating chemistry, application method, racking, masking, curing, significant-surface definition, and inspection method. Metric values control; mil equivalents are rounded conversions. Confirm the governing standard, approved coating product, and finishing supplier before release.