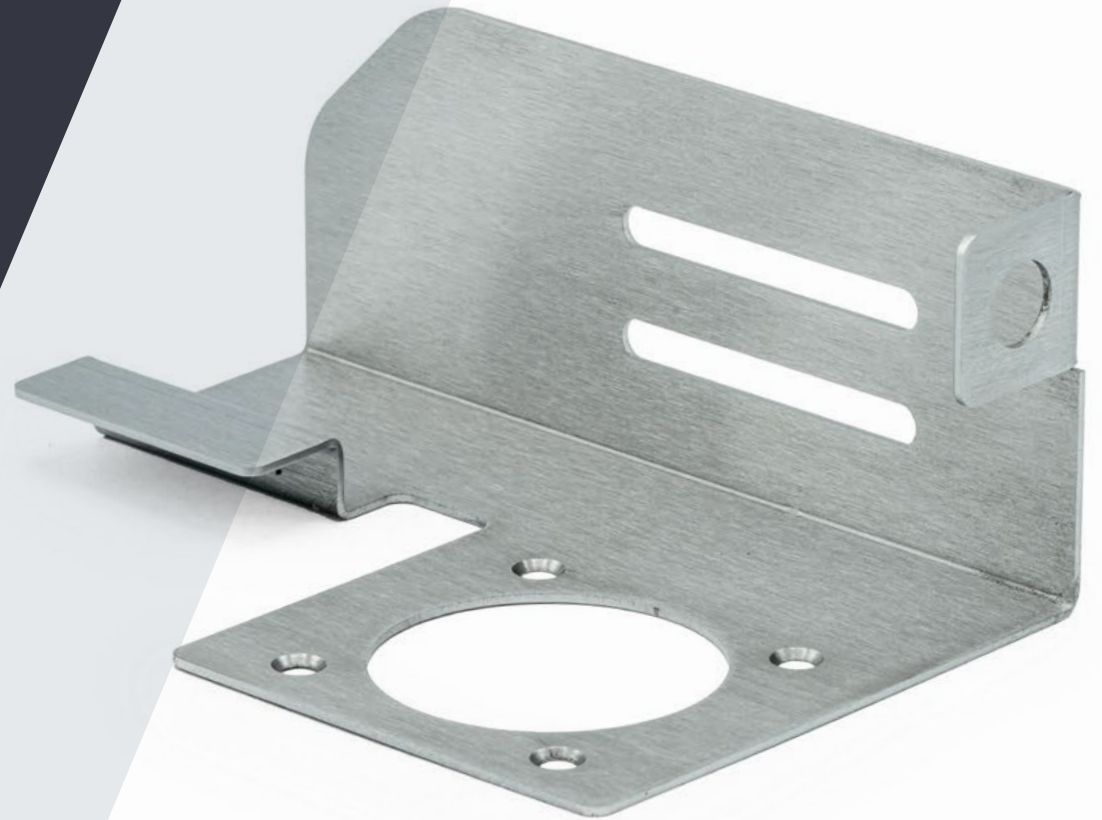




SURFACE FINISHES

SHEET METAL



PROTOLABS

Sheet metal fabrication is one of the oldest manufacturing techniques, so it has the reputation of being rather traditional when compared to its more digitally advanced cousins, CNC machining, injection molding, and 3D printing. When you consider that people have been bending and manipulating flat sheets of various metals for millennia—including precious ones like gold, silver, and platinum—you quickly realize that sometimes the best ideas are the oldest ones. From antiquity to the present day, it's a time-tested process that yields strong, durable parts.

The great thing about modern sheet metal fabrication is the multitude of finishing options available to you to change the appearance of these humble slabs of metal. You can choose finishes that make your parts vary from industrial to polished and chic. When you do, this ancient medium comes alive and your functional parts become aesthetically pleasing, too.

This guide offers just what you need to make good choices: a visual comparison of various finishes and how each affects specific material. Specifically, we'll cover the following:

- Aluminum
- Cold-rolled steel
- Stainless steel
- Galvanized/galvannealed steel

Each has been treated to either an orbital or standard-grain finish in both Protolabs Standard or Protolabs Cosmetic quality. In the case of galvanized/galvannealed steel, the mill edge is broken and the cosmetic level is Standard. You can compare unfinished parts with finished parts, so you get an apples-to-apples comparison.

Ready? Here we go!

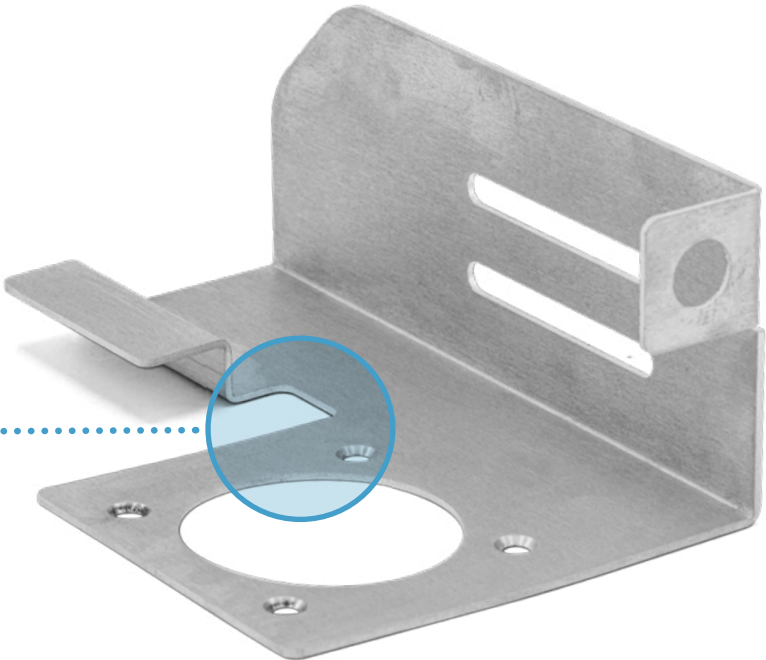
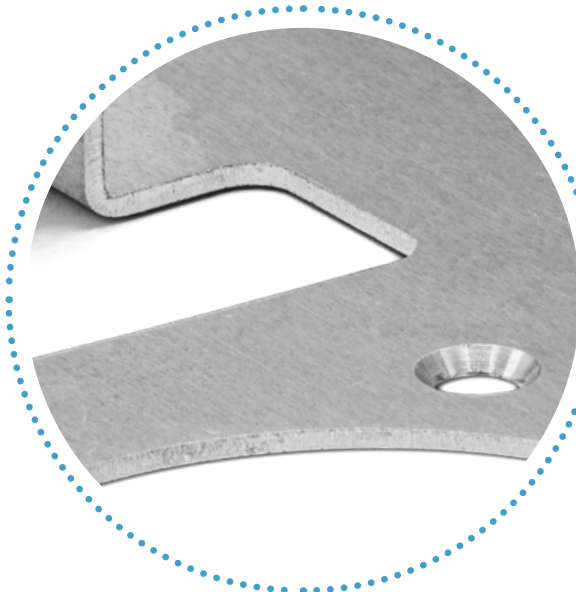


FINISH

Straight Grain

**APPEARANCE
GRADE**

Standard

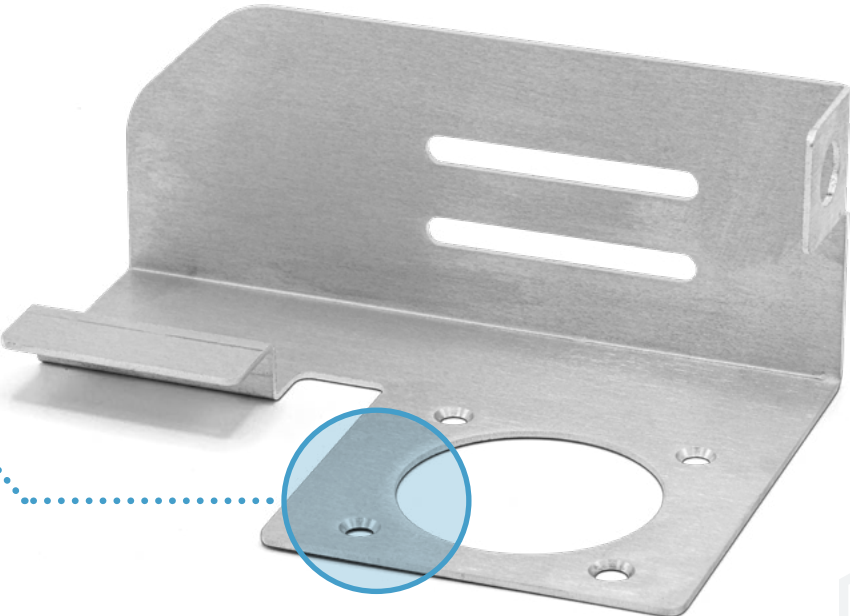
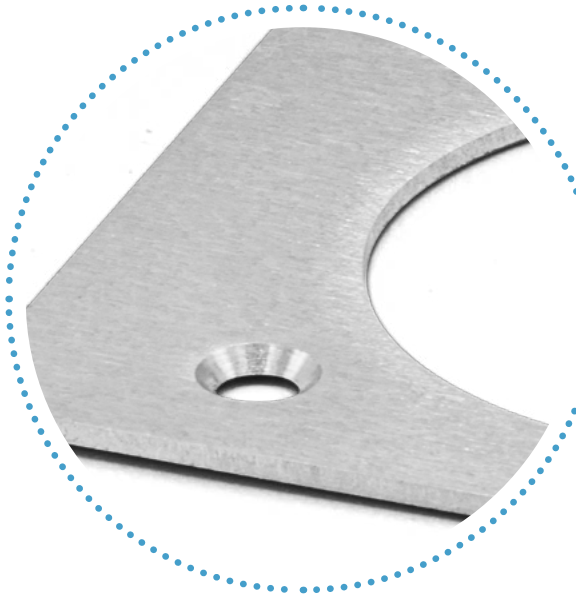


FINISH

Straight Grain

**APPEARANCE
GRADE**

Cosmetic



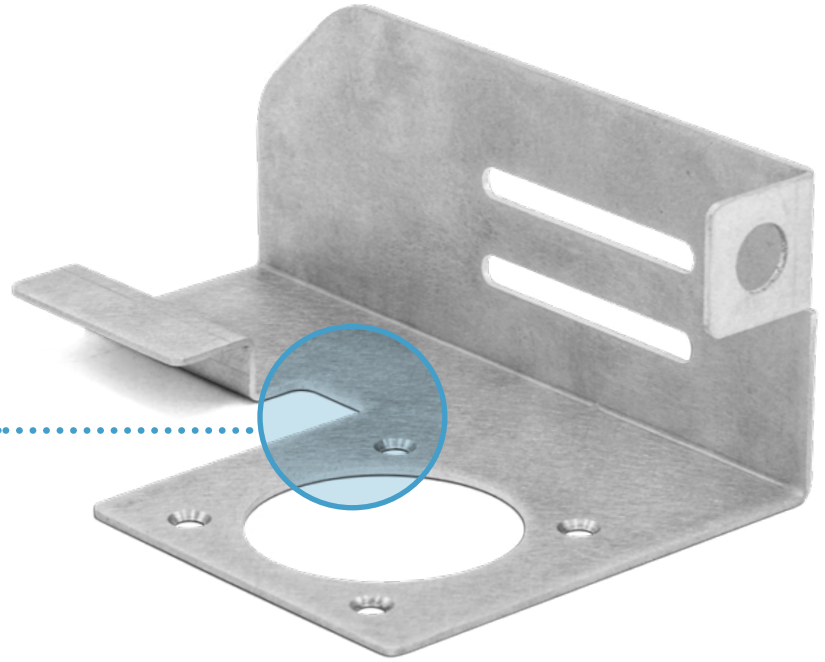
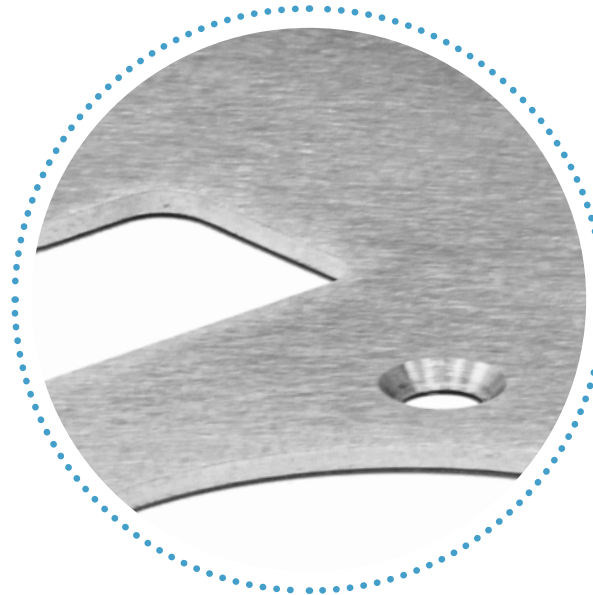
FINISH

Orbital

APPEARANCE

GRADE

Standard



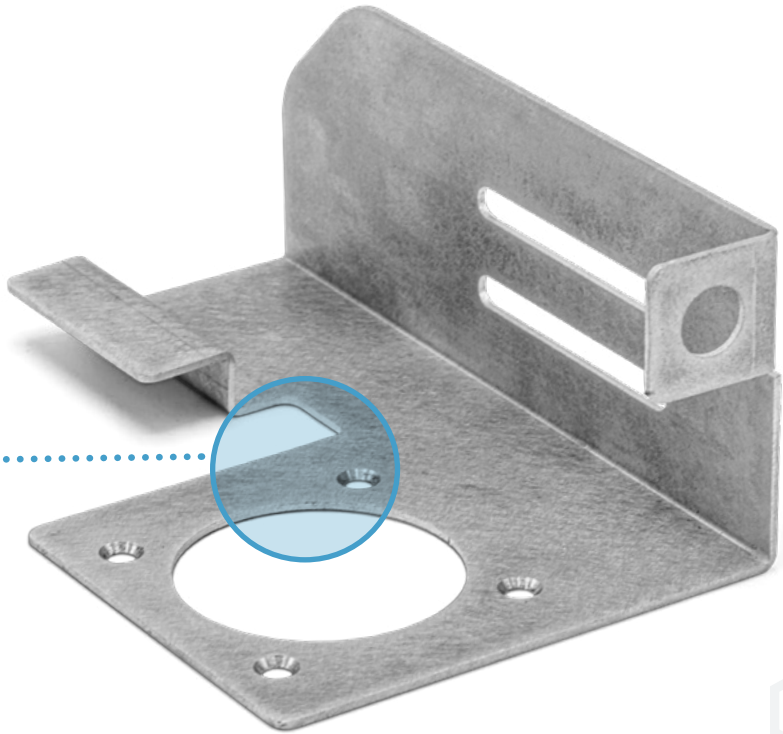
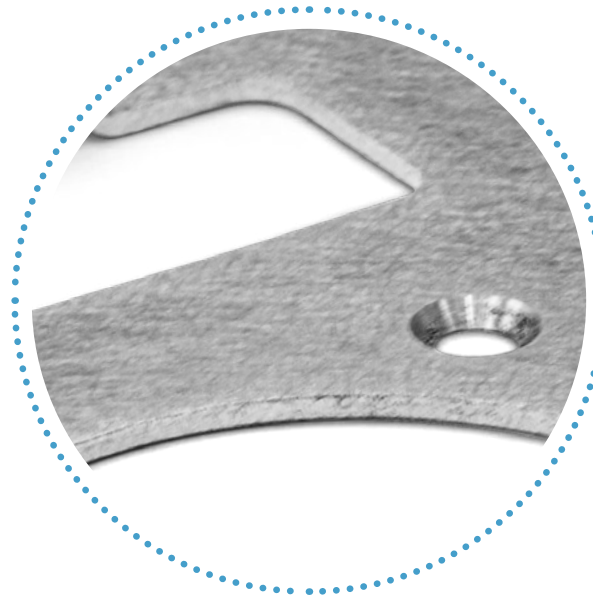
FINISH

Orbital

APPEARANCE

GRADE

Cosmetic

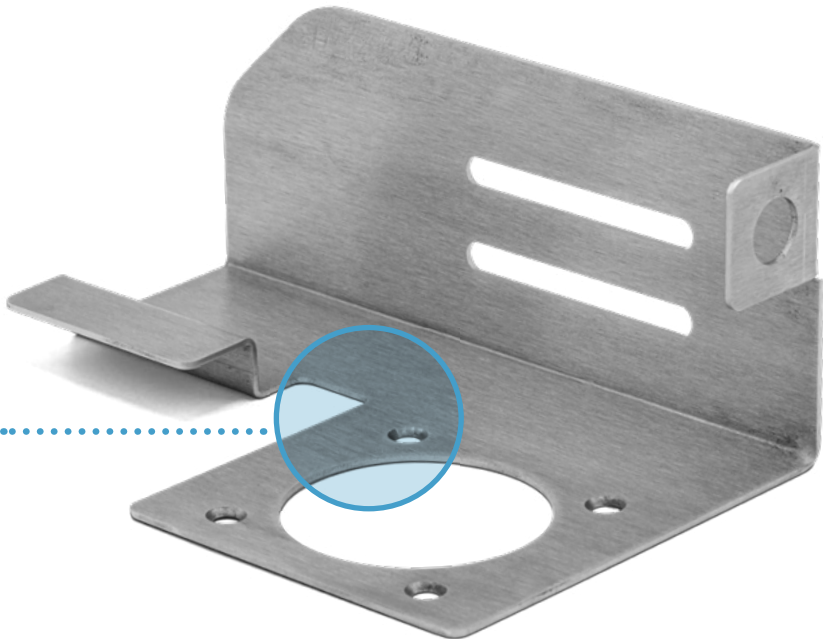
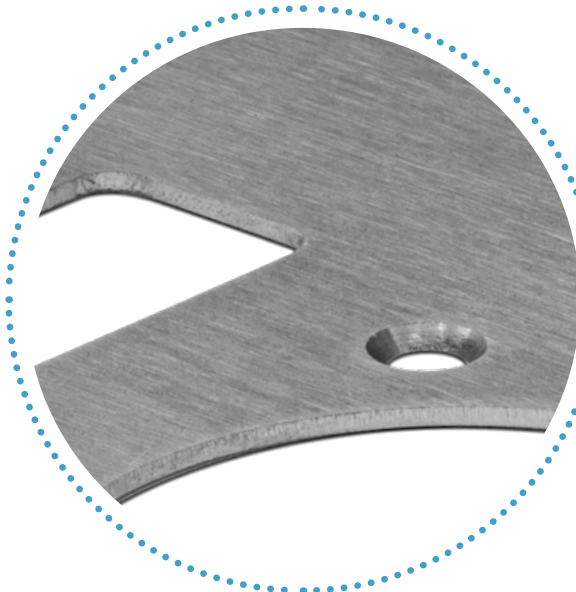


FINISH

Straight Grain

**APPEARANCE
GRADE**

Standard

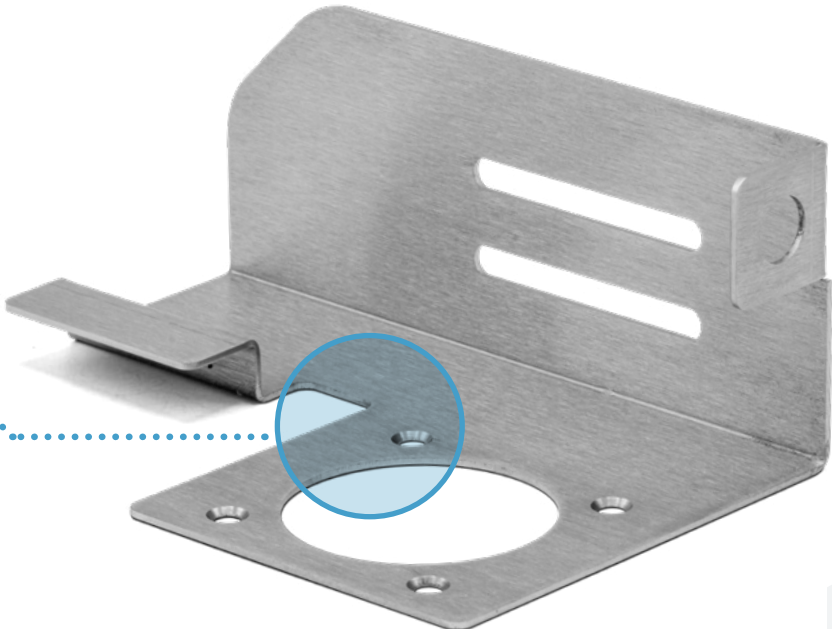
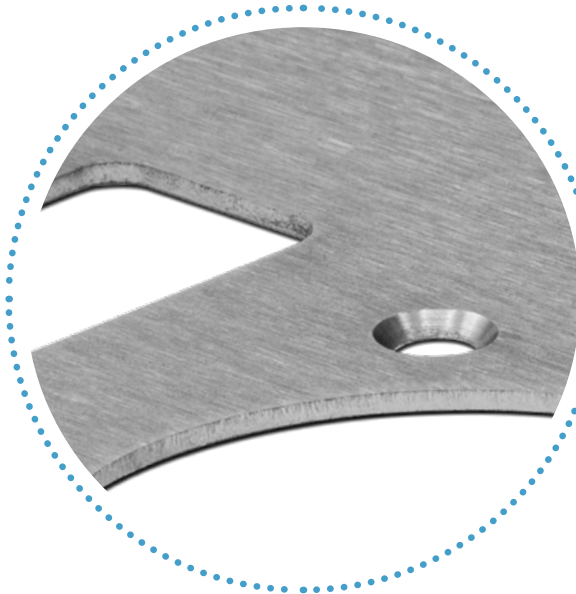


FINISH

Straight Grain

**APPEARANCE
GRADE**

Cosmetic



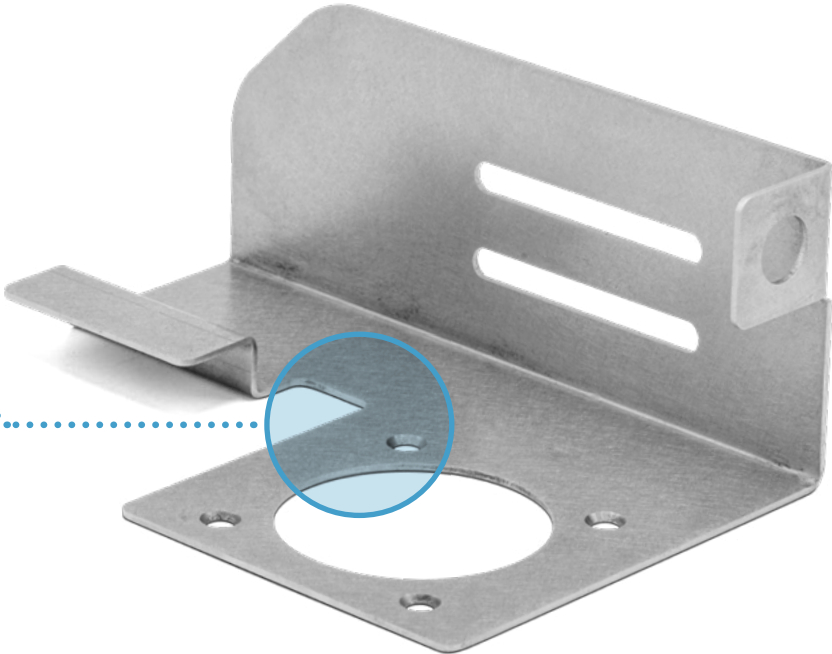
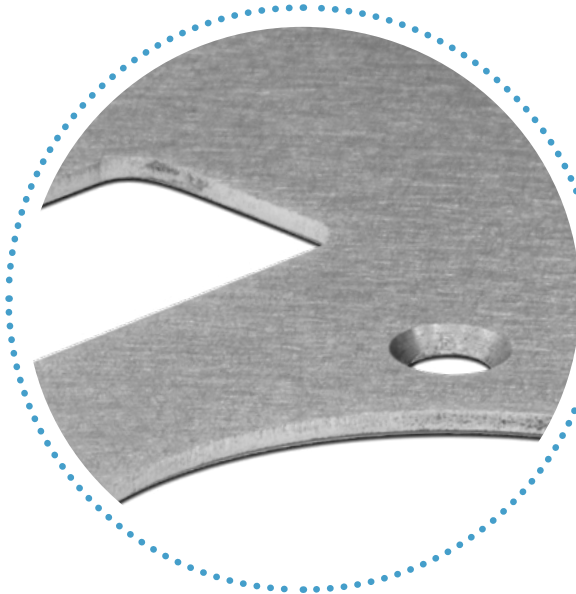
FINISH

Orbital

APPEARANCE

GRADE

Standard



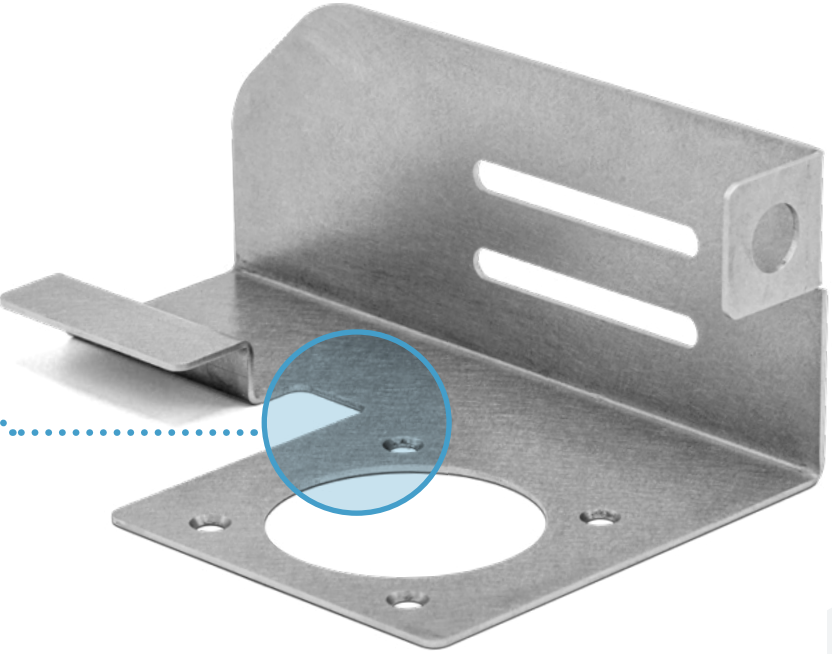
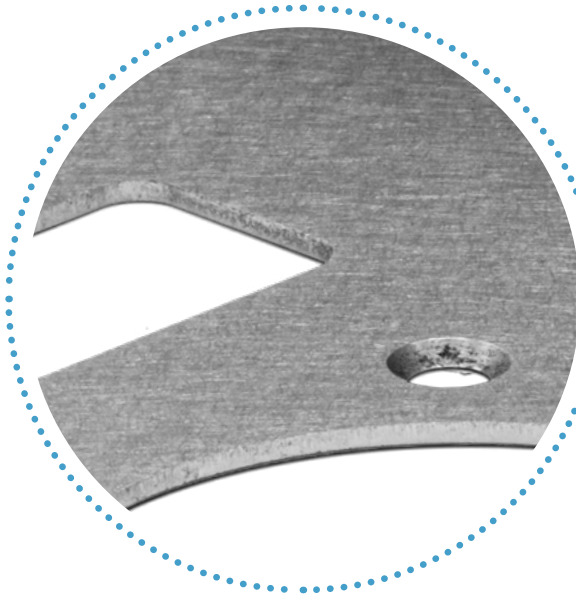
FINISH

Orbital

APPEARANCE

GRADE

Cosmetic

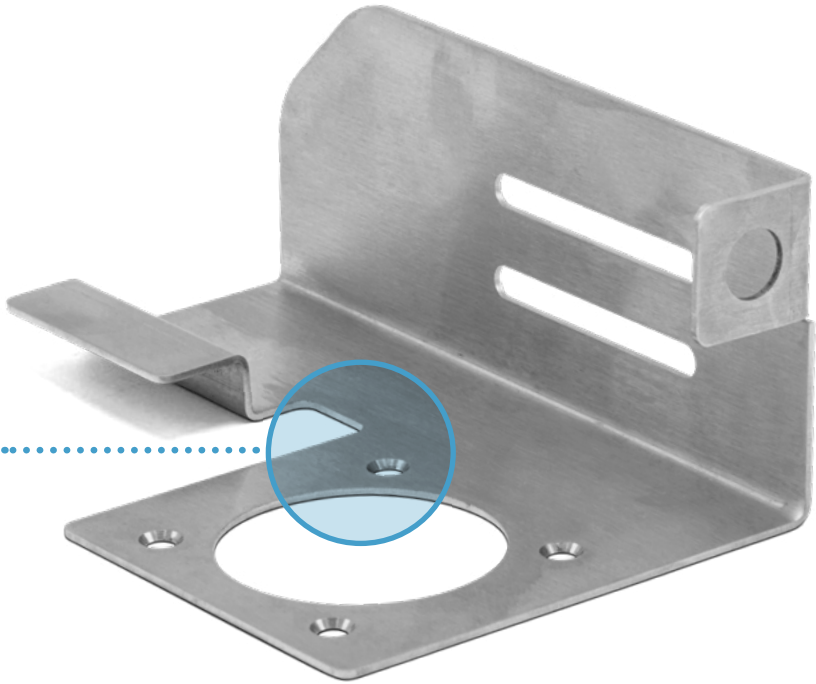
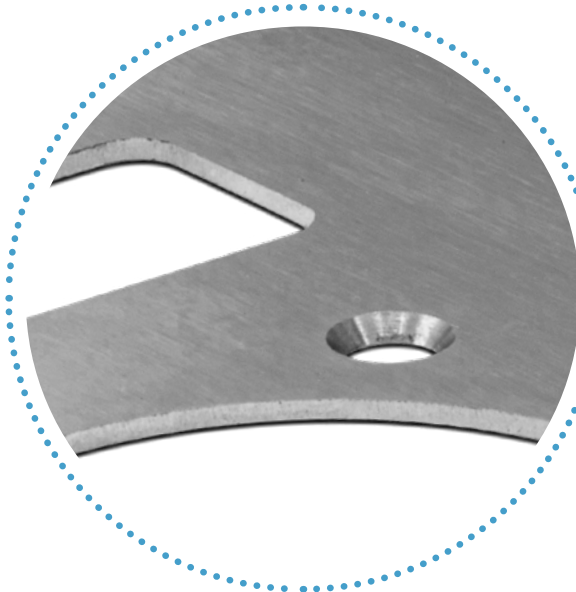


FINISH

Straight Grain

**APPEARANCE
GRADE**

Standard

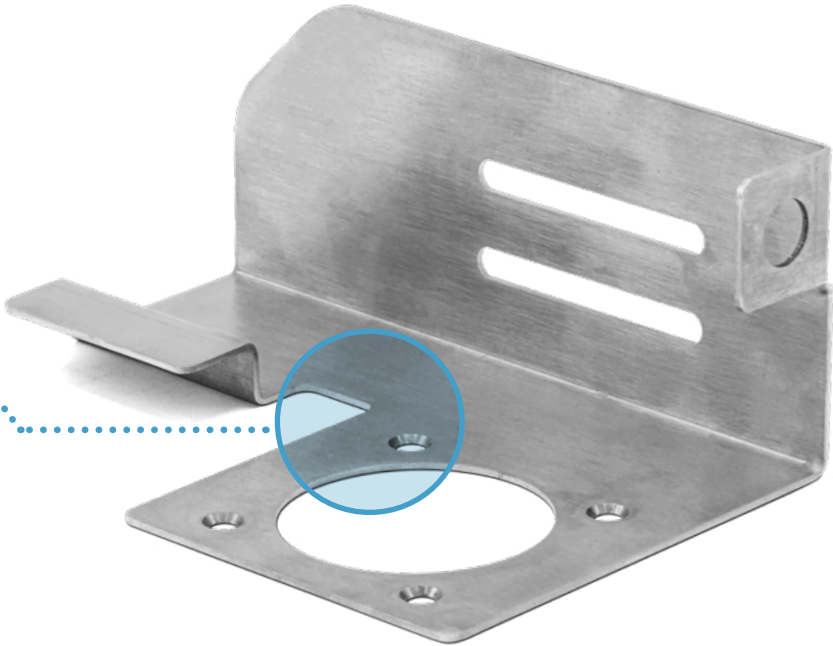
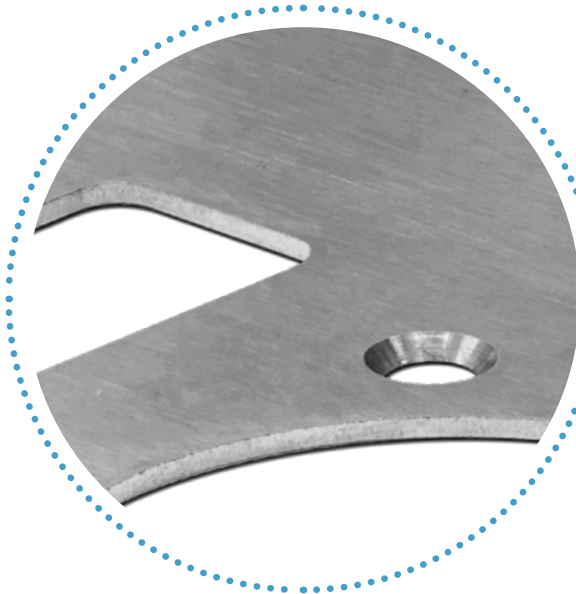


FINISH

Straight Grain

**APPEARANCE
GRADE**

Cosmetic



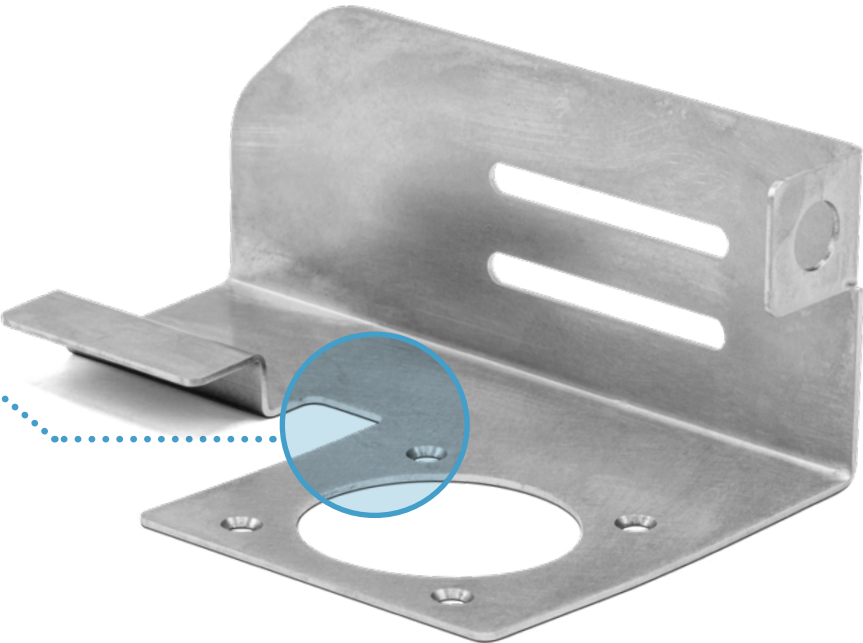
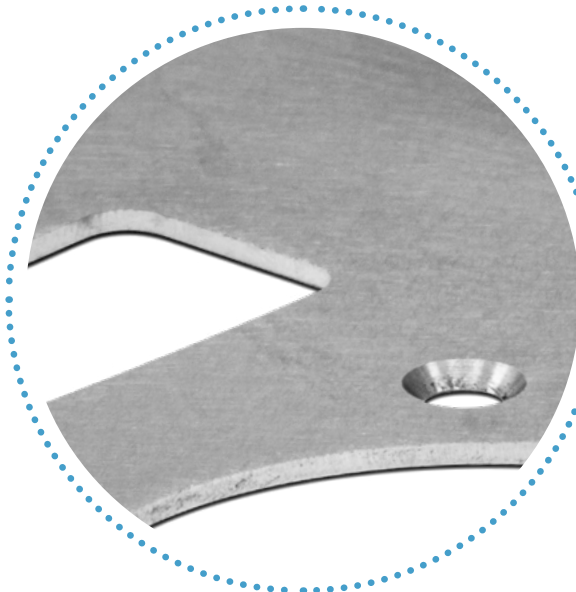
FINISH

Orbital

APPEARANCE

GRADE

Standard



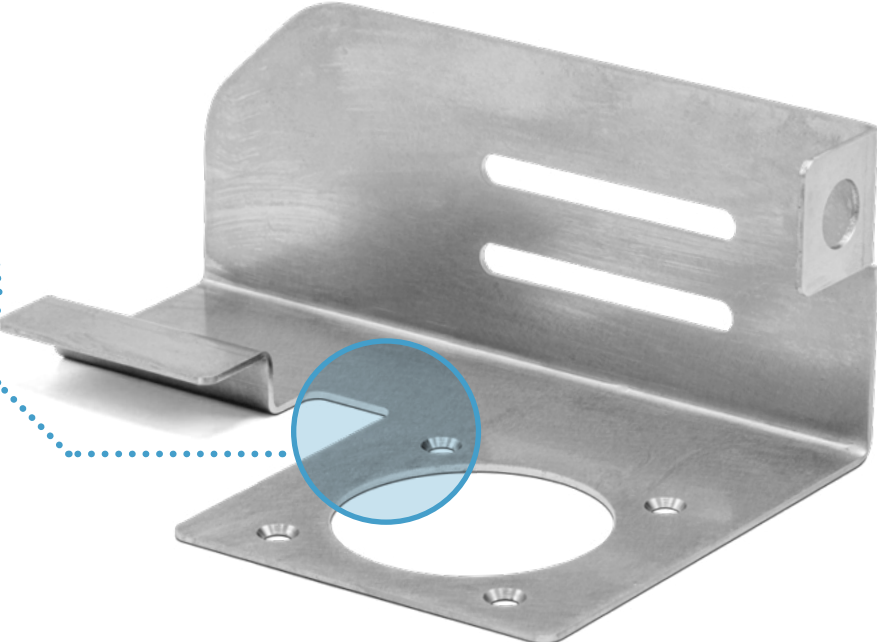
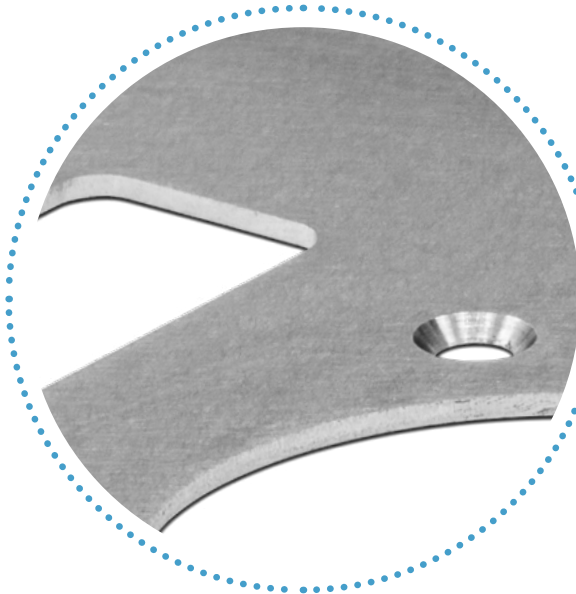
FINISH

Orbital

APPEARANCE

GRADE

Cosmetic

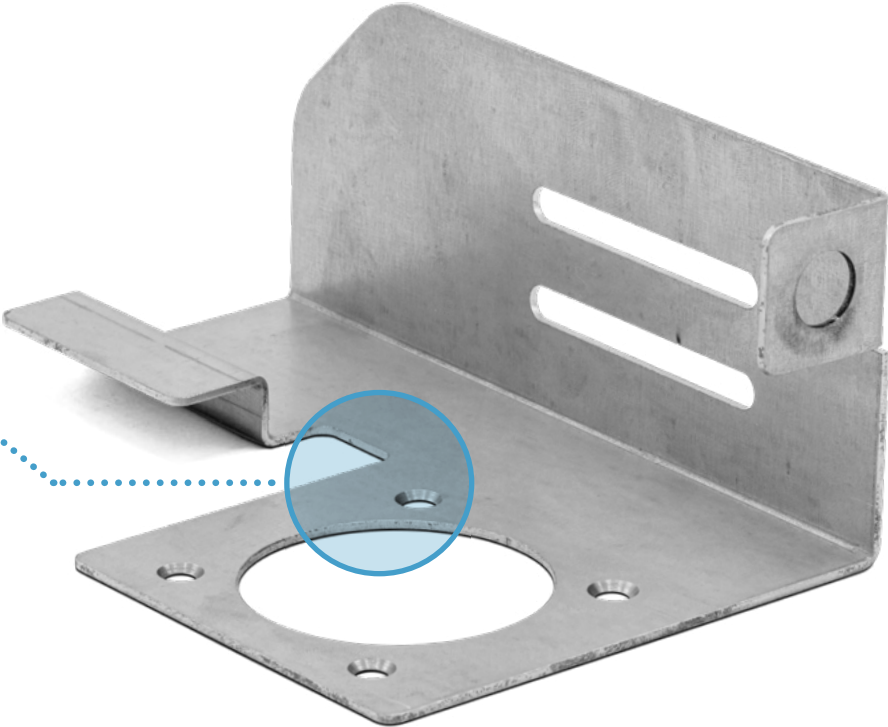
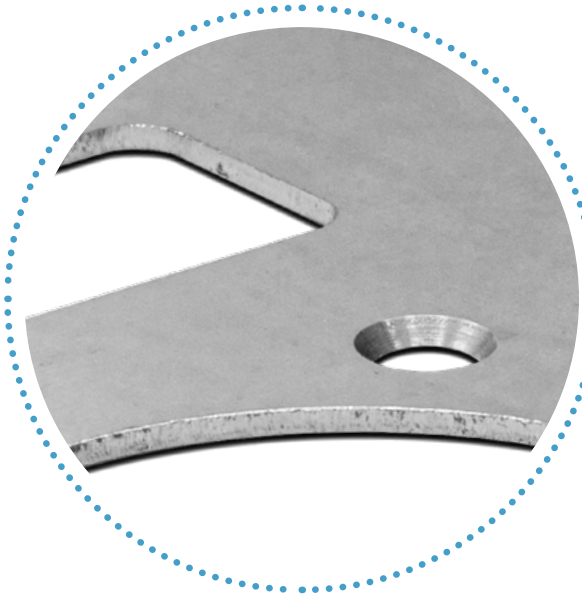


FINISH

Straight Grain

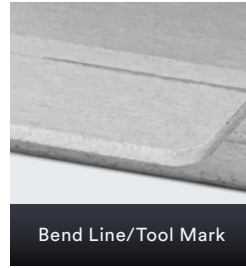
**APPEARANCE
GRADE**

Standard

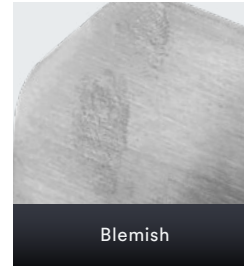


Defect Acceptance

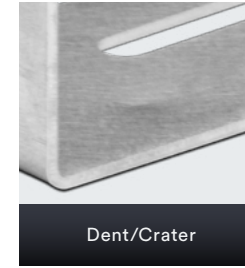
When choosing between Standard and Cosmetic appearance grades, we recommend reviewing the chart below for common appearance features and acceptable tolerances per defect.



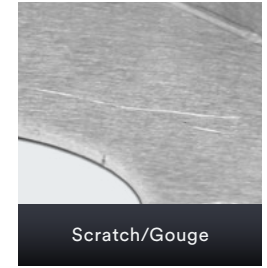
Bend Line/Tool Mark



Blemish



Dent/Crater



Scratch/Gouge

Defect	Description	Standard	Cosmetic
Bend Line/Tooling Mark	Marks made in materials when a tool leaves an impact on the surface	Accepted	Accepted, Otherwise as Requested
Bleeding	Uneven distortion in coloring of finish	Moderate	Moderate
Blemish (Smudge, Speck, Stain, Fingerprint)	A small mark or flaw on a face that does not breach the surface of the part	Moderate	Minimal
Burr	A rough ridge or edge left at the intersection of two surfaces, typically caused by processing or damage	Sharp Edge Test Pass	Sharp Edge Test Pass
Contamination	Unwanted foreign materials attached to the part	None	None
Corrosion	Oxidation or deterioration of the material	None	None
Crack/Fracture	A separation of material on the surface of the part, typically caused by a high concentration of stress	Moderate	Moderate
Dent/Crater	A surface depression	0.125 in. DIA	None
Hanging Mark	An area free of finish due to hanging the part for finishing	Minimal	Minimal
Orange Peel	Uneven or rough surface of a painted finish	Minimal	None
Overspray	Excess paint that spreads beyond the desired coverage area	Moderate	Minimal
Scratch/Gouge	A disruption in the surface caused by handling, damage, or processing that results in elongated grooves or cavities	3 in. x 0.08 in. Ball	3 in. x 0.04 in. Ball
Warping/Oil Can	Unwanted change in flatness of the part, typically due to excessive heat or stress	Moderate	Moderate





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