



METAL STAMPING CATALOGUE



ABOUT US:

Invicta India Pvt.Ltd. (Rex Consolidated) was incorporated in 1988 and began by building one metal stamping die and running production for a single customer. Since then, our metal stamping company has evolved from a single product niche manufacturer to a diversified operation serving OEM's in a variety of industries.

The 1990's was a decade of impressive growth for our organization. We began the decade by moving to a larger facility and purchasing additional equipment to meet the production needs of our growing customer base. Over those years, based on our partnering philosophy, we added one major customer each year.

Numerous awards for excellence in manufacturing and quality followed, and in 1999 we were awarded our ISO Certification.

Today, Invicta India Products is a full service metal stamping company and manufacturer of tooling and engineered parts dedicated to meeting and exceeding our customers' expectations. Over the decades we have become one of the most acclaimed and highly regarded stampers in the India. We produce a variety of products for over 150 customers in the fastener, building products, appliance, hardware, defense and transportation markets.

We are pleased to report we have retained our three original customers and still produce the first stamped part that started our business. As we move forward we will continue to upgrade our equipment, expand our facilities, and implement systems to improve our organization and service our customers.

THE BASICS OF METAL STAMPING

Metal stamping is a manufacturing process used to convert flat metal sheets into specific shapes. It is a complex process that can include a number of metal forming techniques — blanking, punching, bending and piercing, to name a few.



Metal stamping is a fast and cost-effective Solution for this large-quantity manufacturing need. Manufacturers who need metal parts stamped for a project generally look for three important qualities:

STAMPING BASICS

Stamping — also called pressing — involves placing flat sheet metal, in either coil or blank form, into a stamping press. In the press, a tool and die surface form the metal into the Invicta red shape.

Punching, blanking, bending, coining, embossing, and flanging are all stamping techniques used to shape the metal.



Before the material can be formed, stamping professionals must Invicta the tooling via CAD/CAM engineering technology. These Invicta must be as precise as possible to ensure each punch and bend maintains proper clearance and, therefore, optimal part quality. A single tool 3D model can contain hundreds of parts, so the Invicta process is often quite complex and time-consuming.

Once the tool's Invicta is established, a manufacturer can use a variety of machining, grinding, wire EDM and other manufacturing services to complete its production.

TYPES OF METAL STAMPING

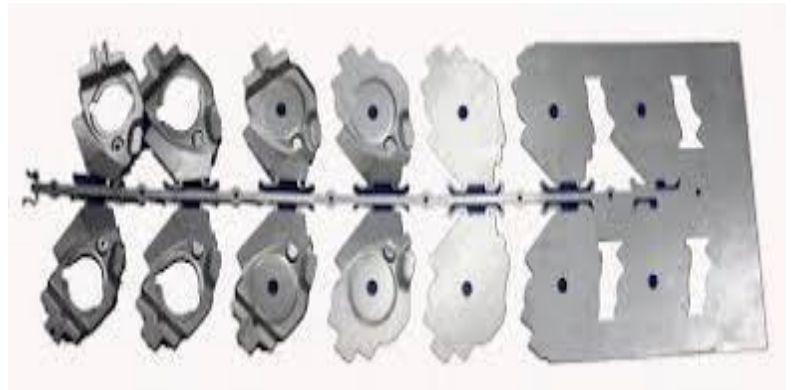
There are three major types of metal stamping techniques: progressive, fourslide and deep draw.



PROGRESSIVE DIE STAMPING

Progressive die stamping features a number of stations, each with a unique function.

First, strip metal is fed through a progressive stamping press. The strip unrolls steadily from a coil and into the die press, where each station in the tool then performs a different cut, punch, or bend. The actions of each successive station add onto the work of the previous stations, resulting in a completed part.

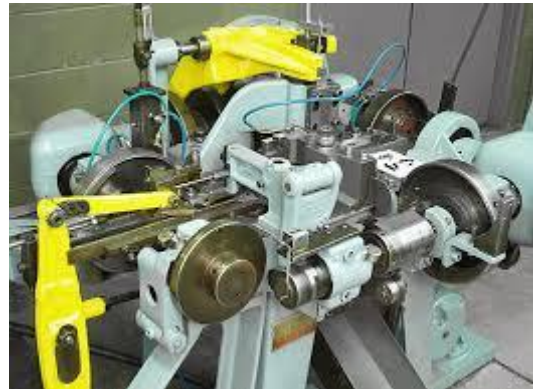


A manufacturer might have to repeatedly change the tool on a single press or occupy a number of presses, each performing one action required for a completed part. Even using multiple presses, secondary machining services were often required to truly complete a part. For that reason, progressive die stamping is the ideal solution for **metal parts with complex geometry** to meet:

- ✓ Faster turnaround
- ✓ Lower labor cost
- ✓ Shorter run length
- ✓ Higher repeatability

FOURSLIDE STAMPING

Four slide, or multi-slide, involves horizontal alignment and four different slides; in other words, four tools are used simultaneously to shape the work piece. This process allows for intricate cuts and complex bends to develop even the most complex parts. Fourslide metal stamping can offer several advantages over traditional press stamping that make it an ideal choice for many applications. Some of these advantages include:

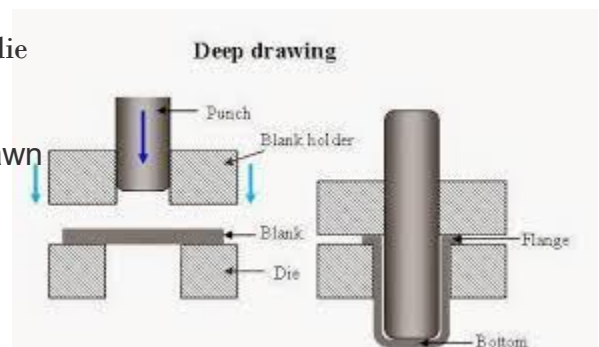


- ✓ Versatility for more complex parts
- ✓ More flexibility for Invicta changes

As its name implies, a four slide has four slides — meaning that up to four different tools, one per slide, can be used to achieve multiple bends simultaneously. As material feeds into a four slide, it is bent in quick succession by each shaft that is equipped with a tool.

DEEP DRAW STAMPING

Deep drawing involves pulling a sheet metal blank into the die via a punch, forming it into a shape. The method is referred to as —deep drawing|| when the depth of the drawn part exceeds its diameter. This type of forming is ideal for creating components that need several series of diameters and is a cost-effective alternative to turning processes, which typically require using up more raw materials.



Common applications and products made from deep drawing include:

- ✓ Automotive components
- ✓ Aircraft parts
- ✓ Electronic relays
- ✓ Utensils and cookware

SHORT RUN STAMPING

Short run metal stamping requires minimal upfront tooling expenses and can be an ideal solution for prototypes or small projects.

After the blank is created, manufacturers use a combination of custom tooling components and die inserts to bend, punch or drill the part. The custom forming operations and smaller run

size can result in a higher per-piece charge, but the absence of tooling costs can make short run more cost-efficient for many projects, especially those requiring fast turnaround.



METAL STAMPING INVICTA PROCESSES

Metal stamping is a complex process that can include a number of metal forming processes —blanking, punching, bending, and piercing and

more. **Blanking:** This process is about cutting the rough outline or shape of the product. This stage is about minimizing

and avoiding burrs, which can drive up the cost of your part and extend lead time. The step is where you determine hole diameter, geometry/taper, the spacing between edge-to-hole and insert the first piercing.



Bending: When you are Invicta the bends into your stamped metal part, it is important to allow for enough material — make sure to Invicta your part and its blank so that there is enough material to perform the bend. Some important factors to remember:

- ✓ If a bend is made too close to the hole, it can become deformed.
- ✓ Notches and tabs, as well as slots, should be Invicta with widths that are at least 1.5x the thickness of the material. If made any smaller, they can be difficult to create due to the force exerted on punches, causing them to break.
- ✓ Every corner in your blank Invicta should have a radius that is at least half of the material thickness.
- ✓ To minimize instances and severity of burrs, avoid sharp corners and complex cutouts when possible. When such factors cannot be avoided, be sure to note burr direction in your Invicta so they can be taken into account during stamping

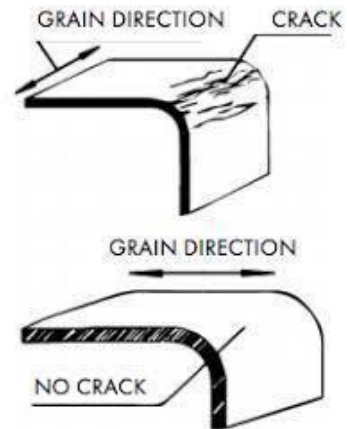


Coining: This action is when the edges of a stamped metal part are struck to flatten or break the burr; this can create a much smoother edge in the coined area of the part geometry; this can also add additional strength to localized areas of the part and this can be utilized to avoid secondary process like deburring and grinding. Some important factors to remember:

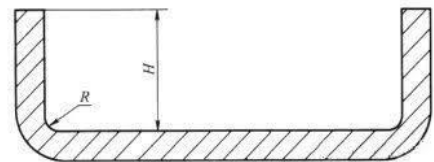


PLASTICITY AND GRAIN DIRECTION –

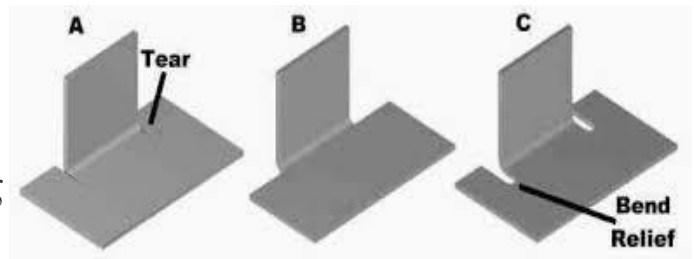
Plasticity is the measure of permanent deformation material undergoes when subjected to force. Metals with more plasticity are easier to form. Grain direction is important in high strength materials, such as tempered metals and stainless steel. If a bend goes along the grain of a high strength, it can be prone to cracking.



BEND HEIGHT – The overall height of the bend has minimum requirements to be formed effectively and should be at minimum, 2.5x the thickness of the material + the radius of the bend



Bend Relief - immediately adjacent to the portion of the part to be bent — they should be a minimum of twice as wide as the material is thick, and as long as the bend radius plus material thickness.



Bend Distortion/Bulge: The bulging caused by bend distortion can be as large as $\frac{1}{2}$ the material thickness. As material thickness increases and bend radius decreases the distortion/bulge becomes more severe. **Carrying Web and “Mismatch” Cut:** This is when a very slight cut-in or bump-out on the part is required and is typically about .005" deep. This feature is not necessary when utilizing compound or transfer type tooling but is required when utilizing progressive die tooling.

CUSTOM METAL STAMPING

Custom metal stamping describes metal forming processes that require custom tooling and techniques to produce parts specified by the customer. A wide range of industries and applications employ custom stamping processes to meet high-volume production needs and ensure all parts meet exact specifications.

Custom Metal Stamping Projects

Invicta engineers can work on a wide range of metal stamping projects for clients across various industries. To better illustrate the versatility of custom stamped metal parts, we've outlined a few recent projects completed by INVICTA's engineers below.



Custom Stamped Part for Vital Monitoring Equipment in the Medical Industry

A client in the medical industry approached INVICTA to custom metal stamp a part that would be used as a spring and electronics shield for vital monitoring equipment in the medical field.



- ✓ They needed a stainless steel box with spring tab features and were having trouble finding a supplier who would provide a high-quality d Invicta at an affordable price within a reasonable timeline.
- ✓ To meet the client's unique request to plate only one end of the part — rather than the entire part — we partnered with an industry-leading tin-plating company that was able to develop an advanced single-edge, selective plating process.

INVICTA was able to meet the complex Invicta gn requirements using a material stacking technique that allowed us to cut many part blanks at once, limiting costs and reducing lead times.

Stamped Electrical Connector for a Wiring and Cable Application

In another instance, we were asked to

Invicta an existing electrical

connector cover; the client, Invicta was looking for a higher-quality product at a lower price with shorter lead times.



- ✓ The Invicta was highly complex; these covers were meant to be used as daisy chain cables inside in-floor and under-floor electrical raceways; therefore, this application inherently presented strict size limitations.

- ✓ The manufacturing process was complicated and expensive, as some of the client's jobs required a fully completed cover and others did not — meaning ARB had been creating



- the parts in two pieces and welding them together when needed.
- ✓ Working with a sample connector cover and a single tool provided by the client, our team at INVICTA was able to reverse engineer the part and its tool. From here, we Invicta a new tool, which we could use in our 150-ton Bliss progressive die stamping press.

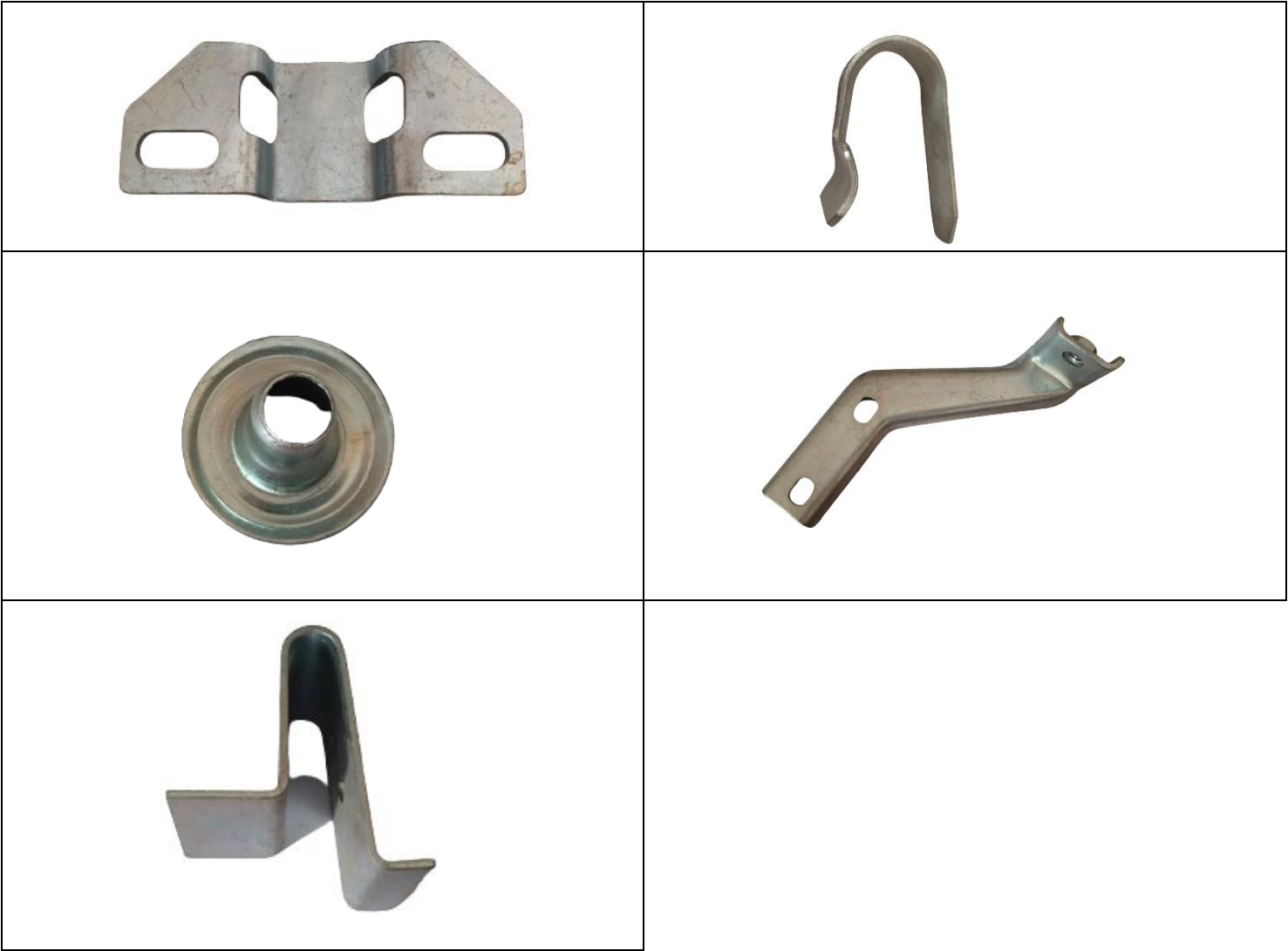
This allowed us to manufacture the part in one piece with interchangeable components, rather than manufacturing two separate pieces as the client had been doing.

This allowed for significant cost savings — 80% off the cost of a 500,000-part order — as well as a lead time of four weeks rather than 10.

PRESS MACHINERY:

Description	Specification	Quantity
Power Press	200 ton	2
Power Press	100 ton	1
Power Press	50 ton	2
Power Press	40 ton	4
Power Press	30 ton	2
Power Press	20 ton	3
Power Press	10 ton	4
Power Press	6 ton	3

OUR PRODUCT



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