

Bar Coding – Machine readable alphabetic and/or numeric information used for identification of packaged parts.

Barrel Tumbling – Process in which parts to be deburred are put together with abrasive material into a barrel and rotated for prolonged periods for the purpose of burr removal.

Bend Radius – Inside radius.

Bend Relief – Clearance notch at an end of flange to allow bending without distorting or tearing adjacent material.

Bending – Generally applied to forming. Creation of a formed feature by angular displacement of a sheet metal workpiece. See also "Drawing" and "Forming."

Blank – (1) Sheet metal stock from which a product is to be made. (2) Workpiece resulting from blanking operation.

Blanking – Die cutting of the outside shape of a part.

Bow Distortion – Out of flatness condition in sheet material commonly known as "Oil Canning" in which, with the edges of the sheet restrained, the center of the sheet can be popped back and forth but cannot be flattened without specialized equipment.

Breakout – Fractured portion of the cross section of a cut edge of stock. A condition naturally occurring during shearing, blanking, punching and other cutting operations.

Burn Mark – Heat discoloration created in the contact area of a welding electrode.

Burr – Raised, sharp edge inherent in cutting operations such as shearing, blanking, punching and drilling.

Burr Direction – Side of the stock on which burrs appear.

Burr-Free – Edge without sharp protrusions.

Burr Height – Height to which burr is raised beyond the surface of the material.

Burr Rollover – Condition of burr displacement resulting from mechanical deburring operation.

Chain Dimensioning – Drafting practice which dimensions repetitive features from each other rather than a common datum.

Clamp Marks – Slight indentations at the edge of one side of stock caused by pressure from turret press holding devices.

Coining – Compressive metal flowing action.

Compound Die – Tool used to pierce, form and blank a part at the same time, with one stroke of the press.

Concentricity – Dimensional relationship of 2 or more items sharing a common center line.

Corner – Three surfaces meeting at one point.

Corner Radius – Outside radius.

Counterboring – Machining or coining operation to generate a cylindrical flat-bottomed hole.

Countersinking – Machining or coining operation to generate a conical angle on a hole.

Cumulative Tolerance – Progressive accumulation of tolerances resulting from multiple operations or assembly of multiple parts.

Datums – Theoretically exact planes, lines or points from which other features are located on design drawings.

Deburr – To remove the sharp, knife-like edge from parts.

Dedicated Tooling – Commonly referred to as "hard tooling"—tooling made to produce a specific part.

Die – Tool with a void or cavity which is precisely fitted to a "Punch" used to shear or form sheet metal parts.

Die Clearance – Amount of space between the punch and die opening.

Die Marks – Scratches, scrub marks, indentations, galling or burnishing of sheet metal workpieces by tooling.

Drawing – (1) Engineering document depicting a part or assembly. (2) In metal-forming, the stretching or compressing of a sheet metal part into a die by a punch to create a 3-dimensional part. See also "Bending."

Ductility – Ability of a material to be bent or otherwise formed without fracture.

Edge Bulge – Condition resulting from any forming, piercing, hardware insertion or spot welding operation too close to an edge.

Edge-to-Feature – A dimension between the edge of the part and a feature.

Feature-to-Feature – Dimension between two features on a part.

Fixture – Tooling designed to locate and hold components in position.

Flange – Formed projection or rim of a part generally used for stiffness or assembly.

Flat or Matte – Coating surface which displays no gloss when observed at any angle; a perfectly diffused reflecting surface.

Formed Tab – Small flange bent at an angle from the body of a metal workpiece.

Forming – Operation converting a flat sheet metal workpiece into a three-dimensional part. See also "Bending" and "Drawing."

Gauge – (1) Instrument for measuring, testing, or registering. (2) Numeric scale for metal thickness.

Go/No-Go Gauge – Measuring device with two registration elements which determine if a feature to be measured is between two established limits.

Gouge – Surface imperfection, deeper than a scratch, often with raised edges.

Grain Direction – (1) Crystalline orientation of material in the direction of mill rolling. (2) Orientation of a surface finish generated by abrasive method.

Grinding – Process of removing material by abrasion.

Half Shearing – Partial penetration piercing, creating a locating button with a height of about 1/2 material thickness.

Hard Tooling – Tooling made for a specific part. Also called "dedicated tooling."

Hem (Dutch Bend) – Edge of material doubled over onto itself for the purpose of safe handling or to increase edge stiffness.

Hold-Down Marks – Slight indentations or scuff marks on one side of the stock which can result from the pressure of hold-down devices during shearing operations.

Hole Rollover – Rounding of the top edge of a pierced feature caused by the ductility of the metal, which flows in the direction of the applied force.

Hole-to-Form – Distance from the edge of a hole to the inside edge of a formed feature.

Hole-to-Hole – Dimension between the centers of holes.

Hydraulic Press – Machine which exerts working pressure by hydraulic means.

Inspection Criteria – Characteristics by which the part will be evaluated both dimensionally and cosmetically.

Lead Time – Time required to manufacture a product from order placement until availability.

Master Die – Universal tool receptacle for holding changeable tool systems.

Metal Thinning – Thickness reduction during any forming operation.

Model – Pre-production sample made with limited emphasis on tolerance to test a design concept. See also "Prototype."

Nesting – (1) Grouping of identical or different parts in multiples within a workpiece to conserve material. (2) In packaging, stacking of parts whose shape permits one to fit inside another.

Nibble Marks – Slight irregularities at the edge of the stock surface after progressive punching ("nibbling") operations in a turret press.

Notching – Operation in which the punch removes material from the edge or corner of a strip or blank.

Penetration – (1) Depth of a cutting operation before breakout occurs. (2) In welding, the depth of material through which fusion occurs.

Perpendicularity – Dimensional relationship of a part or datum located at right angles (90°) to a given feature.

Piercing – Punching of openings such as holes and slots in material.

Pinch Trim – Trimming excess material from a drawn part at the bottom of the stroke. Leaves drawn shell without an inside burr, but with an outside burr and a thinned edge.

Progressive Tool – Die using multiple stations or operations to produce a variety of options. Can incorporate piercing, forming, extruding and drawing, and is usually applied to high quantity production runs.

Prototype – First part of a design which is made to test tolerance capability, tooling concepts and manufacturability.

Pull Down – Area of material next to the penetrating edge of a piercing punch, or die edge of the blanking station, where the material yields, i.e., flows in the direction of the applied force creating a rounded edge. Also known as "roll-over."

Punch Press – Machine supplying compression force for reshaping materials.

Punch Side – Opposite side from burr side for pierced features; side on which the punch enters the material.

Quick Change Inserts – Tool sections or parts which may be changed without removing the entire tool from the press.

Rerolling – Final cold rolling operation, usually done to achieve specific thickness control and improved finish.

Roundness – Extent to which a feature is circular.

Run Out Flange – Feature on a formed part which is designated by the designer to absorb the tolerance accumulations created by multiple forming operations.

Scrap – Leftover, unused material relegated to recycling.

Shear-to-Feature – Shearing of an edge of stock to an exact dimension from an already existing feature.

Shearing – Cutting force applied perpendicular to material causing the material to yield and break.

Shut Height – Clearance in a press between ram and bed with ram down and adjustment up.

Slide Forming – A high-volume stamping process in which a machine with multiple slides sequentially performs various operations (e.g. – blanking, piercing, forming, etc.).

Slug – Scrap from a piercing operation.

Slug Marks – Surface defects caused by scrap being indented into the metal surface.

Spot Face – Circular flat surface as a bearing area for hardware.

Squareness – Measure of perpendicularity of adjacent edges or surfaces.

Spring Back – Partial rebounding of formed material caused by its elasticity.

Staking – Method of fastening using displaced material for retention.

Stiffening Rib – Embossed feature in a sheet metal workpiece which is added to make the part more rigid.

Stretcher Levelled – A flattening process in which a material is stretched to achieve a desired flatness tolerance.

Stripper – Mechanical hold-down device applied to the workpiece during the punching process.

Stripper Marks – Imprints on one side of the stock around pierced holes, caused by punch strippers.

Stripping – Process of disengaging tooling from the workpiece.

Strips – Sheet material, sheared into narrow long pieces.

Stroke – RAM travel from top dead center (TDC) to bottom dead center (BDC).

Tapping – Operation to create internal threads by either cutting or forming.

Tolerance – Permissible variation from a specification for any characteristic of the product.

Transfer Die – Variation of a progressive die where the part is transferred from station to station by a mechanical system. Mainly used where the part has to be free from the strip to allow operations to be performed in a free state.

Turret Press – Automatic punch press indexing the material and selecting the intended tool out of the rotary tool holding device (turret) totally by computer control for piercing, blanking and forming workpieces as programmed.

V Die – Tool used in conjunction with a V punch.

V Punch – V shaped tool used for angle forming.

Vibratory Finishing – Burr removal process in which an appropriate number of parts, depending on part size and abrasive material, is accelerated and decelerated by mechanical means inside of a drum-like enclosure.

Webs – Material between two openings or edges.

Wipe Die – Forming tool using two opposing edges, separated by one material thickness, moving past each other to form material.

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