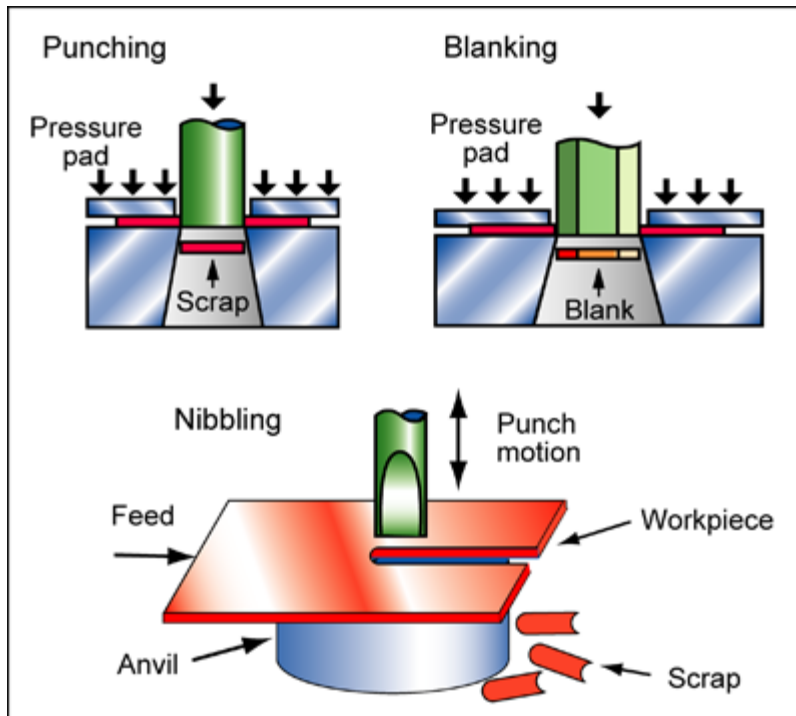


## Description

### Process schematic



### Figure caption

The processes of punching, perforating, blanking and

### The process

Sheet metal is perforated and profiled by a number of specific processes. All rely on shear-fracture of the sheet. In PUNCHING a circular or shaped hole is punched through the sheet by a hardened die. In PERFORATING an array of punches operate as one unit, creating a pattern of holes in one operation. In BLANKING a shaped disk is created by punching from a sheet by a punch with the desired shape mating with a die with the inverse shape. In NIBBLING a sheet, supported on an anvil, is cut or trimmed to a desired profile by successive bites from a small, hardened punch, with an action much like that of a sewing machine.

## Material compatibility

Metals - ferrous	✓
Metals - non-ferrous	✓
Polymers - thermoplastics	✓
Polymers - thermosets	✓

## Shape

Flat sheet	✓
Dished sheet	✓

## Economic compatibility

Relative tooling cost	medium
Relative equipment cost	high
Labor intensity	low

Economic batch size (units)	1e3	-	1e7
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### Physical and quality attributes

Range of section thickness	0.1	-	13	mm
Tolerance	0.015	-	0.8	mm
Roughness	0.5	-	12.5	µm
Surface roughness (A=v. smooth)	A			

### Process characteristics

Machining processes	✓
Cutting processes	✓
Discrete	✓

### Supporting information

#### Design guidelines

Punching and perforating are used both for functional and for aesthetic purposes. Blanking is the fastest way to make profiled blanks for further working. It is possible to create raised features called half-shears. These are punched features that are not fully sheared, giving an upstand which may be used for assembly location of other parts.

#### Technical notes

The processes can be applied to almost all non-brittle sheet materials provided they are not too hard. Carbon, stainless and low alloy steels, aluminum alloys, fiberboard, cork, wood, laminated thermosets and cardboard are all cut in this way.

#### Typical uses

PUNCHING and PERFORATING: perforated sheet metal, plastic or card. BLANKING: blanks for pressing, forming and deep drawing, cabinet panels; domestic appliance components; small machine parts, small gears and levers; washers. NIBBLING: larger, more elaborate sheet shapes often with a complex profile.

#### The environment

Lubricants and cutting fluids can pose an environmental problem. Special precautions are essential when machining toxic materials such as beryllium.

### Links

MaterialUniverse

Reference