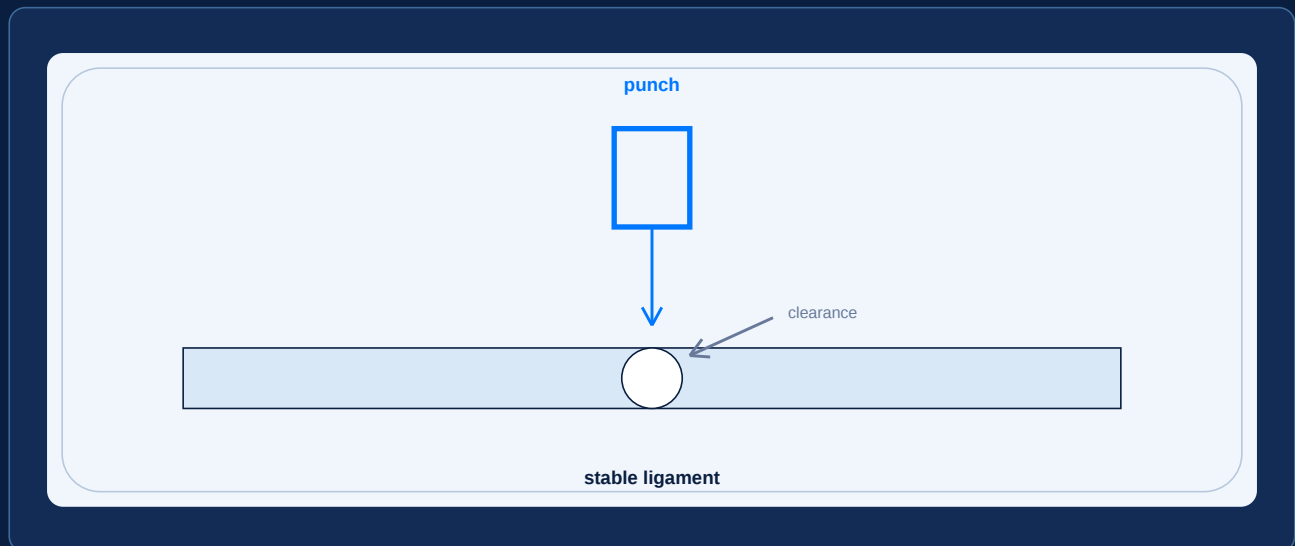


PUNCHING & FORMING GUIDE

Plan hole patterns, forms and tooling for clean, repeatable sheet parts



USE THIS GUIDE TO

reduce tearing, distortion, burrs and secondary operations before tool release.

PUNCHING & FORMING DESIGN

Design logic and guide map

ENGINEERING REFERENCE

START WITH FUNCTION

Choose hole size and spacing first, then set clearance, form radii, sequence and wear controls.

FOUR-STEP DESIGN LOGIC

01 Function

What must fit, seal, locate or remain cosmetic?

02 Process

Which process route creates the feature?

03 Setup

Where are datums, tools, supports and gauges?

04 Release

What evidence is required before approval?

GUIDE MAP

Section	Topic	Practical result
01	Hole size	Match punch diameter to material thickness.
02	Spacing and ligaments	Keep holes and forms away from edges and each other.
03	Punch clearance	Set clearance for alloy, thickness and edge quality.
04	Forms and louvers	Use radii and adequate surrounding material.
05	Sequence	Punch while access is open, then form.
06	Tool wear	Define burr limits and replacement criteria.
07	Inspection	Use gauges for hole and form position.
08	Drawing review	Release feature sequence and control plan.

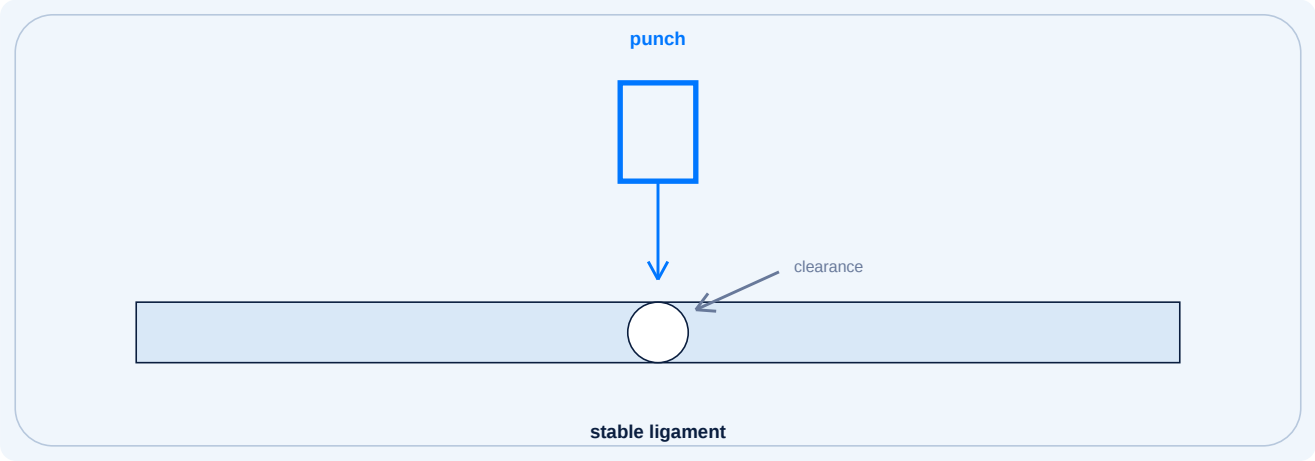
REFERENCE RULE

The drawing, purchase order and approved inspection plan remain the controlling documents.

PUNCHING & FORMING DESIGN

Hole diameter and sheet thickness set tool stress and edge quality.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Diameter	Use a hole diameter at least the material thickness where practical.	Small punches increase load, wear and slug pulling.
Roundness	Keep the feature simple when assembly allows.	Complex shapes add tool stations and burr risk.
Edge quality	State burr and rollover acceptance.	A dimension alone does not control the cut edge.

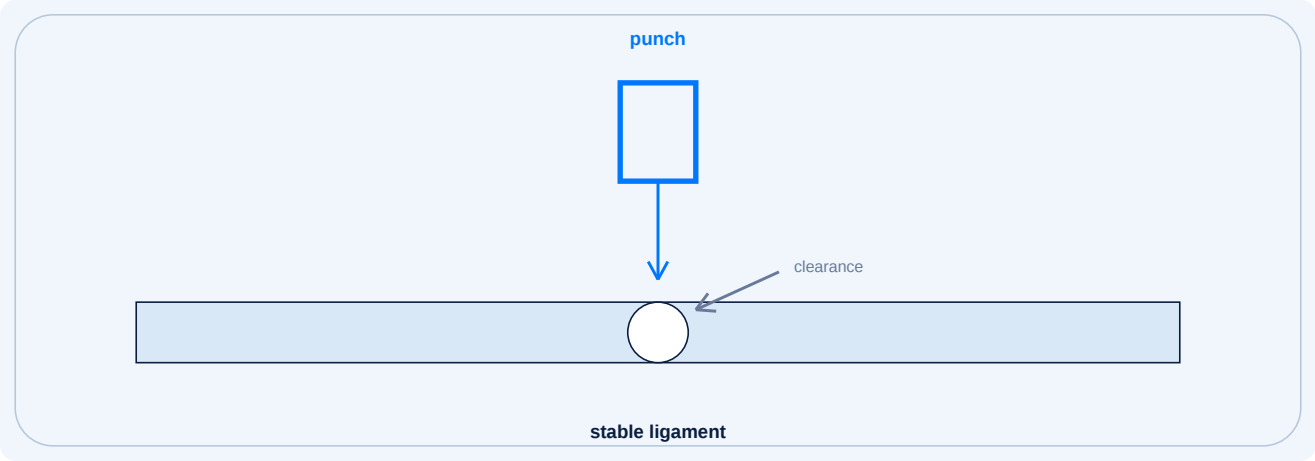
USE WHEN	AVOID
Use a hole diameter at least the material thickness where practical.	Small punches increase load, wear and slug pulling.

PROCESS CONTROL	Confirm punch size, material condition and burr limit before committing the tool.
-----------------	---

PUNCHING & FORMING DESIGN

Ligaments carry load during punching and forming.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Hole spacing	Use a stable ligament between adjacent holes.	Narrow ligaments can tear or distort.
Edge margin	Keep holes away from the blank edge.	Edge breakout reduces usable margin.
Form distance	Keep forms away from prior holes.	Forming can open or shift nearby features.

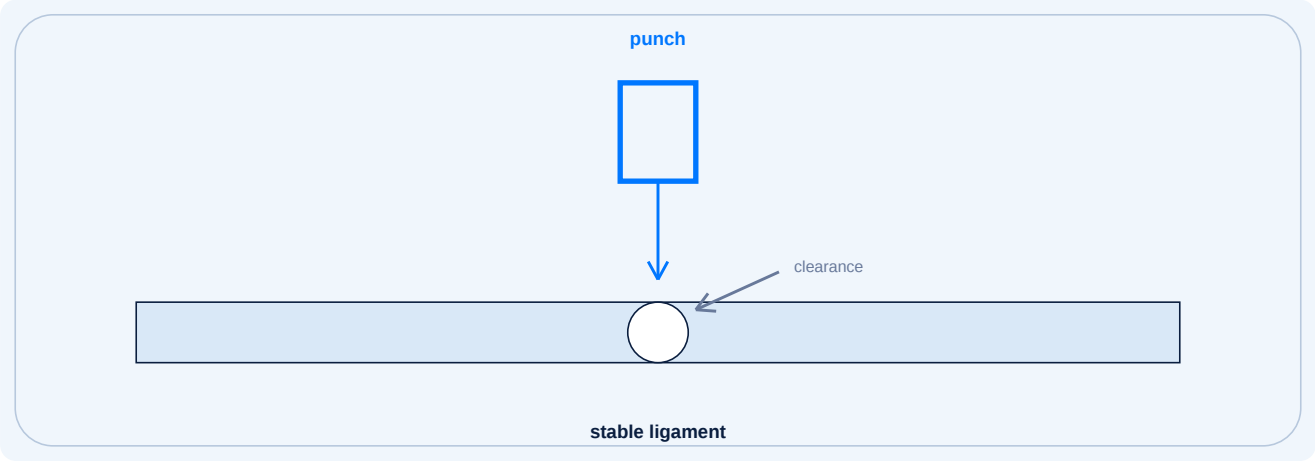
USE WHEN	AVOID
Use a stable ligament between adjacent holes.	Narrow ligaments can tear or distort.

PROCESS CONTROL	Review the tightest ligament and edge distance in the strip layout, not only the final part view.
-----------------	---

PUNCHING & FORMING DESIGN

Clearance controls burr, rollover, slug pulling and tool life.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Alloy / thickness	Set clearance by material and thickness.	Wrong clearance increases burr and premature wear.
Cut direction	Control scrap, slug and part support.	Slug pulling can damage a finished surface.
Maintenance	Define punch wear inspection.	Burr growth is often the first sign of tool wear.

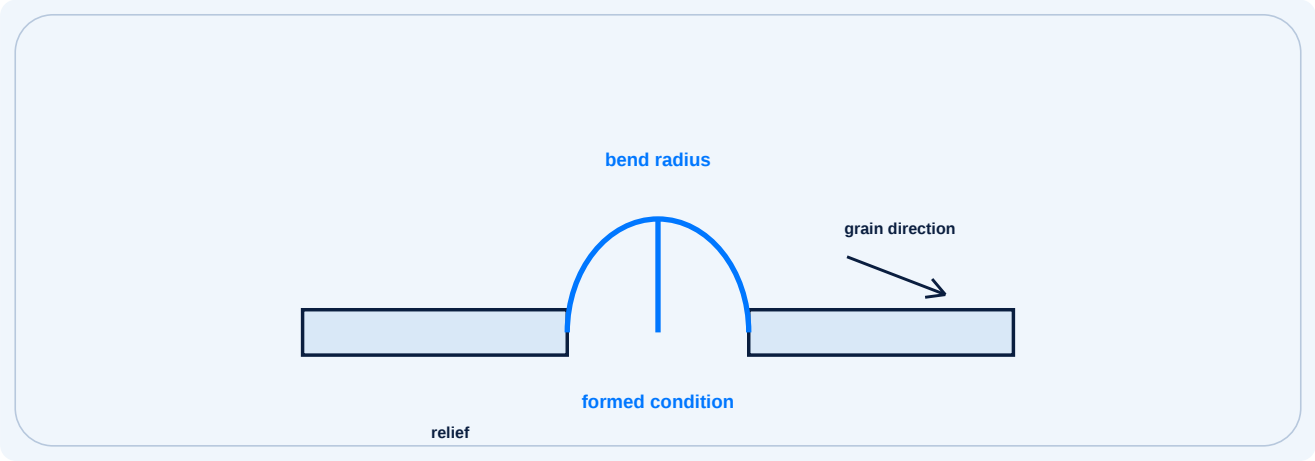
USE WHEN	AVOID
Set clearance by material and thickness.	Wrong clearance increases burr and premature wear.

PROCESS CONTROL	Record clearance assumptions and the burr inspection method in the control plan.
-----------------	--

PUNCHING & FORMING DESIGN

Form height and material flow must be designed together.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Louver	Provide lead-in, relief and wall support.	A tall louver can crack or flatten.
Emboss	Use rounded transitions and gradual depth.	Sharp forms thin the material and increase springback.
Datum	Dimension formed height from a stable face.	A flat-pattern dimension cannot control final height.

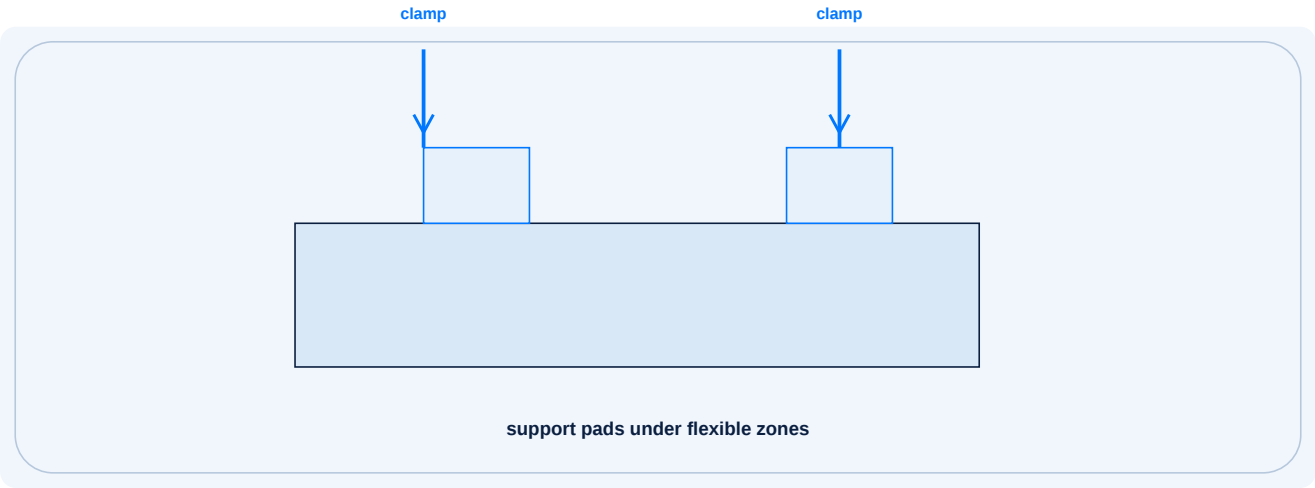
USE WHEN	AVOID
Provide lead-in, relief and wall support.	A tall louver can crack or flatten.

PROCESS CONTROL	Review form height, radius and free-state measurement with the tooling supplier.
-----------------	--

PUNCHING & FORMING DESIGN

Feature sequence avoids tool collision and protects earlier holes.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Access	Punch while both sides are accessible.	A formed wall can block the punch.
Support	Support the sheet during the form operation.	Unsupported material can distort the blank.
Order	Keep reference features early in the route.	Later forms can move the datum or gauge point.

USE WHEN

Punch while both sides are accessible.

AVOID

A formed wall can block the punch.

PROCESS CONTROL

Approve the feature sequence and strip layout before the die design is frozen.

PUNCHING & FORMING DESIGN

Wear control is part of the production design, not only maintenance.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Wear point	List punches and dies that control edge quality.	Untracked wear creates gradual nonconformance.
Replacement	Set life or condition-based limits.	A calendar-only limit may miss abnormal wear.
Reaction	Define containment and rework when burr rises.	Without a reaction plan, mixed lots can escape.

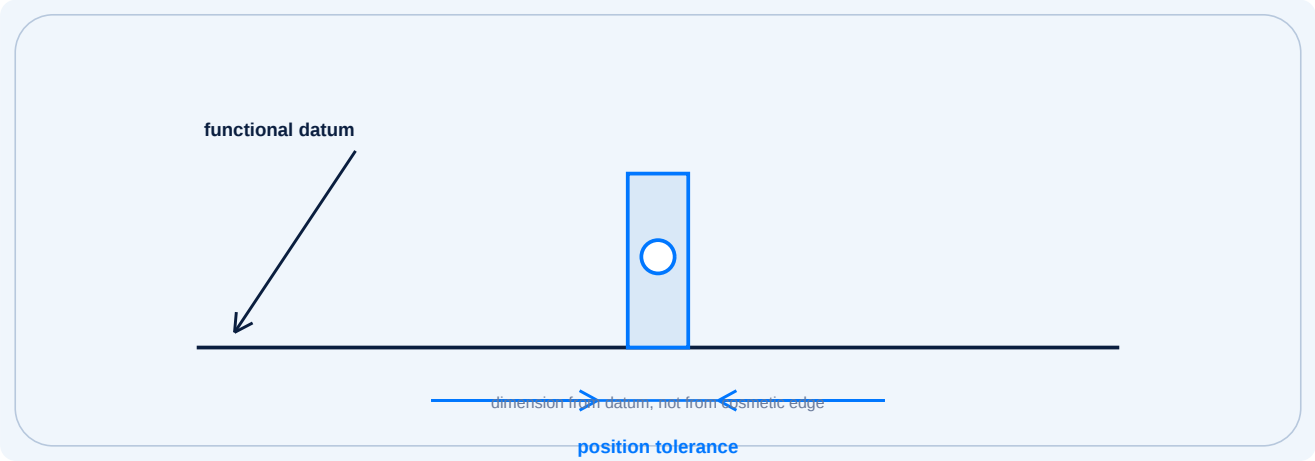
USE WHEN	AVOID
List punches and dies that control edge quality.	Untracked wear creates gradual nonconformance.

PROCESS CONTROL	Add burr checks, tool-life assumptions and a replacement criterion to the control plan.
-----------------	---

PUNCHING & FORMING DESIGN

The gauge should represent the feature function and free-state condition.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Hole position	Use a functional datum and repeatable gauge.	Flat blank inspection may miss formed drift.
Form height	Measure height and angle after forming.	Springback can change the assembly interface.
Sample	Record tool station, lot and material condition.	A result without process context is hard to reproduce.

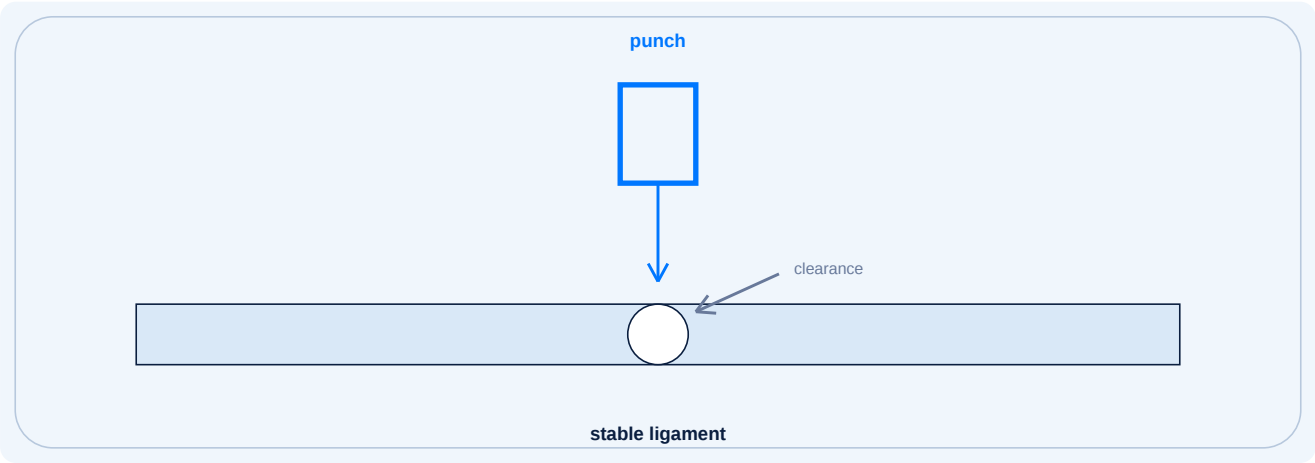
USE WHEN	AVOID
Use a functional datum and repeatable gauge.	Flat blank inspection may miss formed drift.

PROCESS CONTROL	Agree the first-article gauge plan before production start.
-----------------	---

PUNCHING & FORMING DESIGN

The drawing should make the tool and inspection intent explicit.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Geometry	Show hole, ligament, form and radius details.	Missing detail forces a tooling guess.
Process	State material, thickness, sequence and burr limit.	Process assumptions change tool design.
Evidence	List gauge, first article and wear records.	No evidence means the release decision is not auditable.

USE WHEN	AVOID
Show hole, ligament, form and radius details.	Missing detail forces a tooling guess.

PROCESS CONTROL	Send the drawing, strip layout, quantity and finish requirement for engineering feedback.
-----------------	---

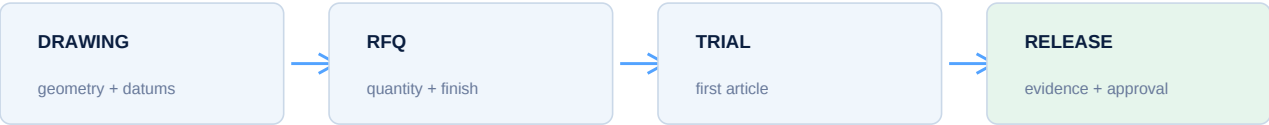
PUNCHING & FORMING DESIGN

Drawing review checklist before RFQ or production release

RELEASE CHECKLIST

- ☐ Hole diameters are suitable for sheet thickness.
- ☐ Carrier and strip-layout risks are reviewed.
- ☐ Ligaments and edge margins are adequate.
- ☐ Burr limits and deburr needs are defined.
- ☐ Punch clearance is defined by material and thickness.
- ☐ Formed height is dimensioned from a functional datum.
- ☐ Louvers, embosses and forms have radius control.
- ☐ Wear-critical tools and replacement limits are listed.
- ☐ Feature sequence is compatible with tool access.
- ☐ First-article gauge plan is included.

RELEASE PATH



DECISION RECORD

Record the drawing revision, open question, owner, target date and final customer decision in the related checklist workbook.

PUNCHING & FORMING DESIGN

RFQ and release worksheet

DRAWING INPUTS

Part number

Revision

Process

Alloy / temper

Quantity

Minimum feature

General tolerance

Critical tolerance

Critical datum

Finish

Inspection condition

Target date

CUSTOMER / SUPPLIER ACTION

Action	Owner	Due date	Decision / evidence

ENGINEERING SUPPORT

Send the 2D drawing, 3D model, quantity and finish requirement for a practical design review.

baosongprecision.com/contact-us/