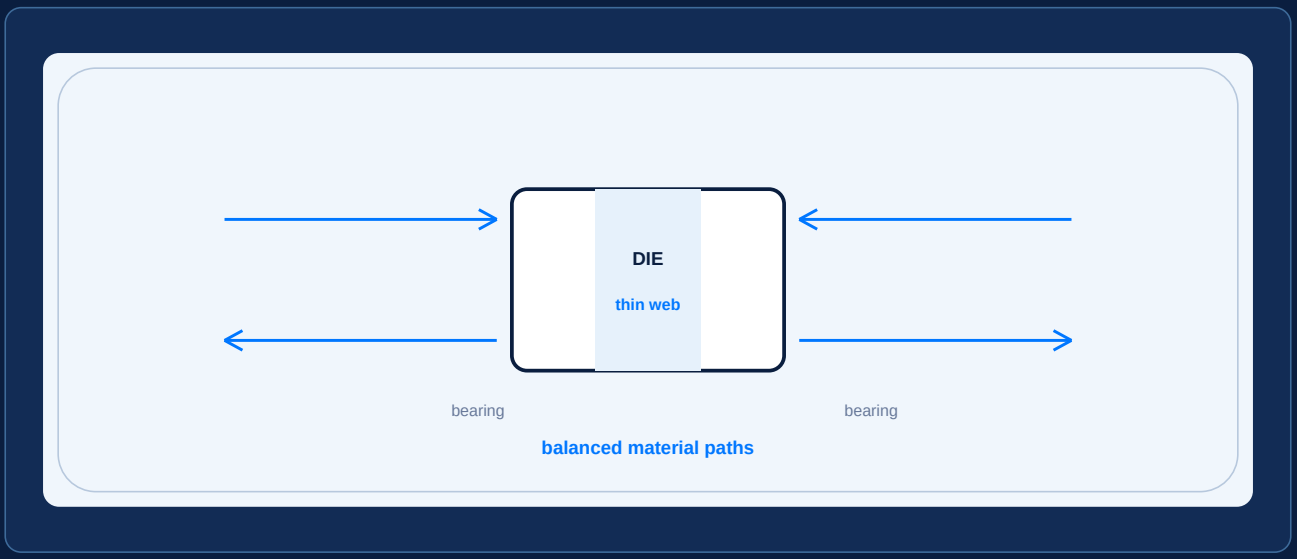
BAOSONG PRECISION

ALUMINUM EXTRUSION DIE DESIGN GUIDE

Plan profiles and tooling for stable flow, die life and repeatable quality



USE THIS GUIDE TO

review a profile before die quotation, trial and release.

ALUMINUM EXTRUSION DIE DESIGN

Design logic and guide map

ENGINEERING REFERENCE

START WITH FUNCTION

Start with function, then balance the section, control tooling loads and define the first-article correction loop.

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

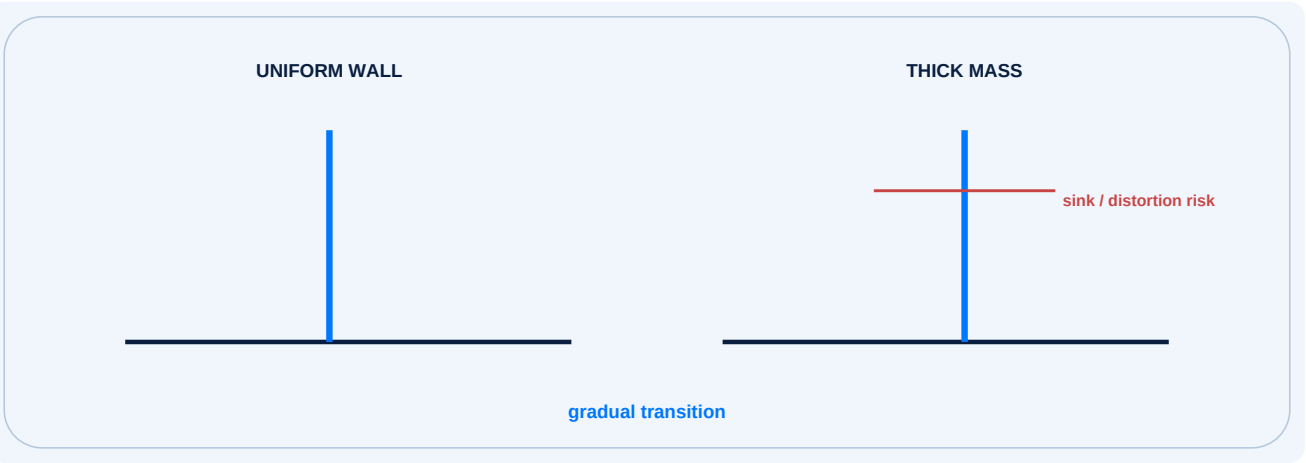
Section	Topic	Practical result
01	Profile intent	Separate functional walls, cosmetic faces and post-machined features.
02	Section balance	Balance material paths before changing bearing lengths.
03	Thin webs and hollows	Support webs, bridges and hollow chambers with practical geometry.
04	Bearing and bridge loads	Give the die designer room to tune flow and die life.
05	Cut length and straightness	Define bow, twist, cut length and handling assumptions.
06	Tolerances	Separate as-extruded limits from machined limits.
07	Trial and approval	Plan measurement, correction and ownership before production.
08	Drawing review	Release checks for profile, die and first article.

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

ALUMINUM EXTRUSION DIE DESIGN

Profile geometry should be driven by load, assembly, surface and machining needs.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Functional walls	Keep load paths and locating faces visible in the section.	A hidden function can become a difficult die or machining feature.
Cosmetic faces	Identify visible faces and acceptable die lines or weld lines.	Appearance limits applied late can force a die redesign.
Machined zones	Reserve stock and tool access on critical faces.	As-extruded surfaces should not carry CNC-level limits.

USE WHEN

Keep load paths and locating faces visible in the section.

AVOID

A hidden function can become a difficult die or machining feature.

PROCESS CONTROL

Confirm the function, visible surfaces and post-machining zones before the die designer freezes the section.

ALUMINUM EXTRUSION DIE DESIGN

Symmetry and gradual transitions reduce bow, twist and dimensional drift.

DESIGN PRINCIPLE

balanced material paths

PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Wall balance	Keep adjacent walls within a practical thickness band.	One-sided mass pulls the profile and increases die stress.
Thin web	Use the thickest web that meets function and support intersections.	Unsupported webs can tear or vary during the run.
Transitions	Blend mass changes and avoid isolated heavy pads.	Abrupt changes increase cooling and straightening variation.

USE WHEN

Keep adjacent walls within a practical thickness band.

AVOID

One-sided mass pulls the profile and increases die stress.

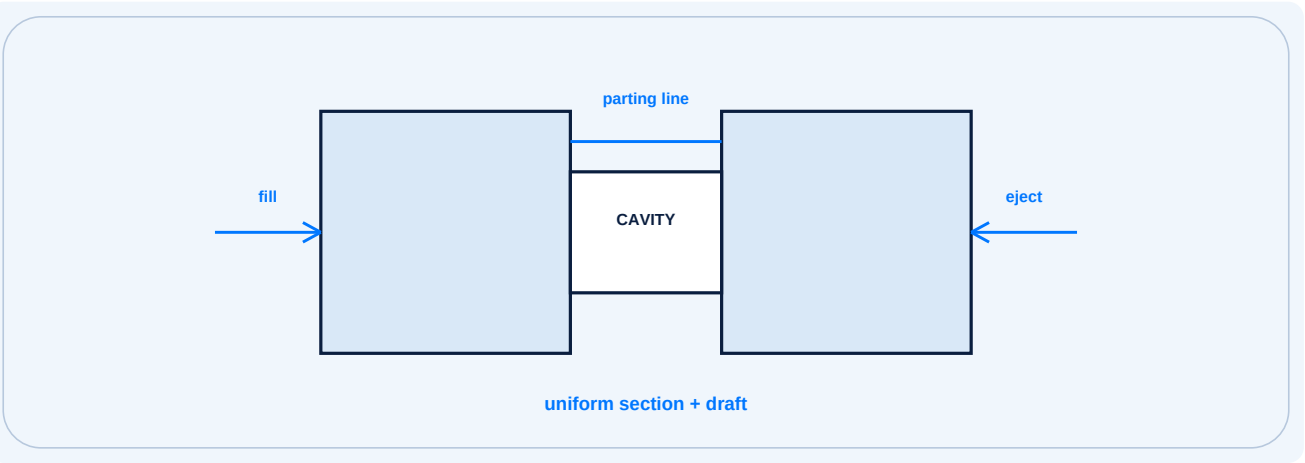
PROCESS CONTROL

Review the material path before quoting a die. A balanced section is usually easier to tune than a tight tolerance request.

ALUMINUM EXTRUSION DIE DESIGN

Hollow profiles trade weight savings for bridge load, weld quality and inspection access.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Hollow chamber	Use a clear pull and practical bridge support.	Complex bridge layouts increase tooling stress and maintenance.
Web intersection	Support webs at intersections and avoid knife edges.	Thin unsupported junctions can tear or distort.
Inspection	Show where wall thickness and weld lines will be checked.	Hidden internal variation may escape a visual review.

USE WHEN

Use a clear pull and practical bridge support.

AVOID

Complex bridge layouts increase tooling stress and maintenance.

PROCESS CONTROL

Flag hollow chambers, bridge loads and internal inspection limits during the die review, not after the first trial.

ALUMINUM EXTRUSION DIE DESIGN

Bearing length, port-hole balance and bridge support determine how the profile runs.

DESIGN PRINCIPLE

balanced material paths

PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Bearing length	Leave practical bearing control for each wall and web.	A frozen bearing layout can lock in imbalance.
Bridge load	Balance bridge areas around the section.	Local overload reduces die life and increases correction time.
Trial plan	Measure profile and feed corrections into a controlled loop.	A visual-only approval can miss systematic flow drift.

USE WHEN

Leave practical bearing control for each wall and web.

AVOID

A frozen bearing layout can lock in imbalance.

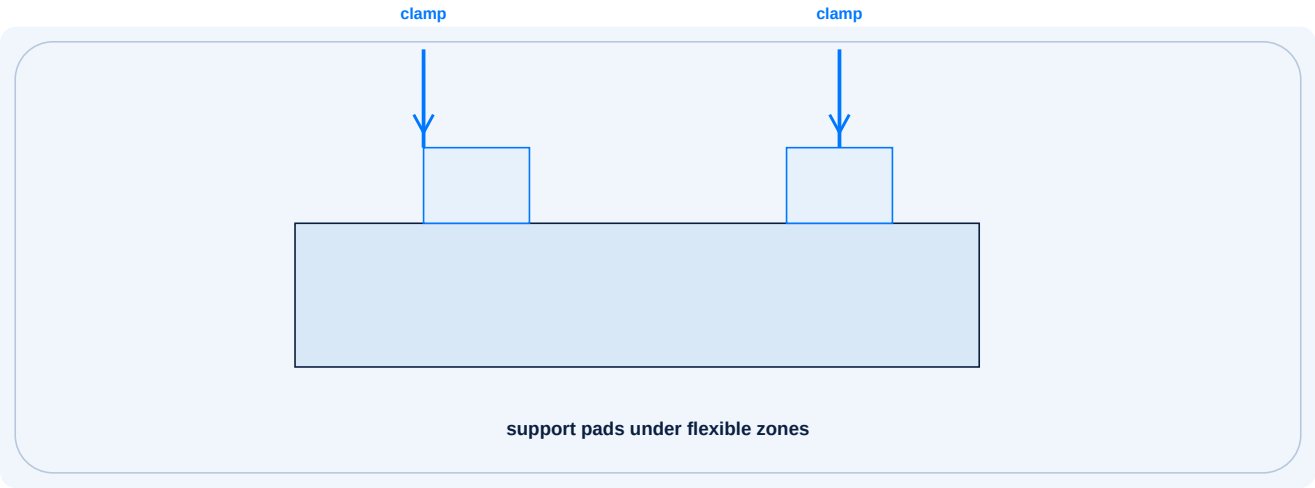
PROCESS CONTROL

Agree the die trial measurement plan, correction authority and timing before tool release.

ALUMINUM EXTRUSION DIE DESIGN

Long profiles amplify bow, twist, cut variation and handling damage.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Cut length	Define cut tolerance and saw or stretch-straightening route.	Cut variation can consume a useful assembly allowance.
Straightness	State bow and twist limits over a defined length.	Unbounded straightness creates inconsistent downstream setups.
Packing length	Coordinate profile length with trays, racks and shipping.	Handling forces can add damage or permanent bow.

USE WHEN

Define cut tolerance and saw or stretch-straightening route.

AVOID

Cut variation can consume a useful assembly allowance.

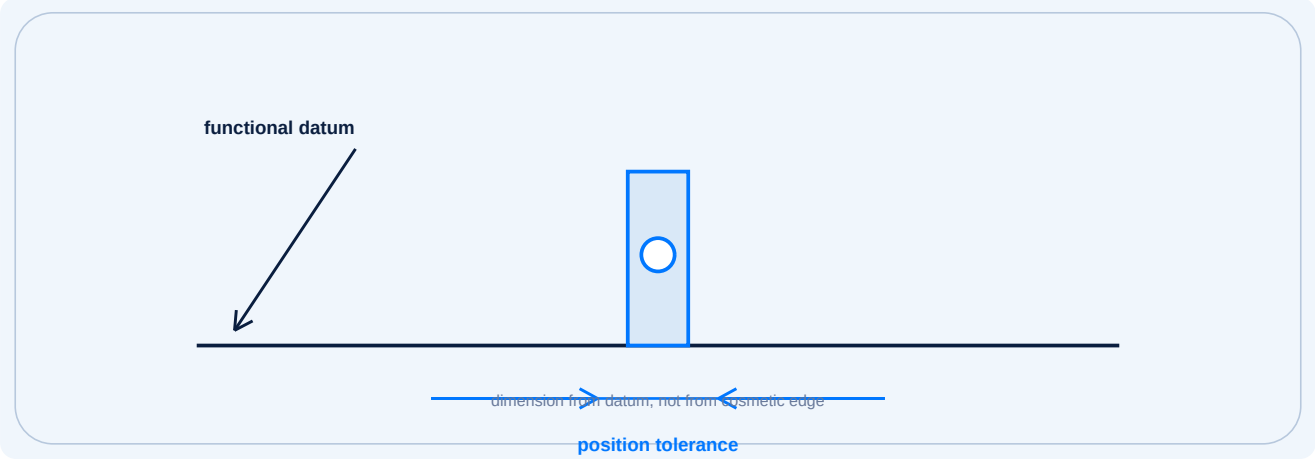
PROCESS CONTROL

Confirm cut, straightening and packaging assumptions with the actual press and handling route.

ALUMINUM EXTRUSION DIE DESIGN

Functional tolerance starts with the process capability of the feature.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Profile tolerance	Use practical profile limits by section and span.	Tight limits on every wall may make the die unstable.
Machined feature	Dimension after CNC from functional datums.	An as-extruded edge is not a stable machining datum.
Inspection	Define sample length, gauge and condition.	Different inspection methods can report different results.

USE WHEN

Use practical profile limits by section and span.

AVOID

Tight limits on every wall may make the die unstable.

PROCESS CONTROL

Use the drawing and approved inspection plan as the controlling tolerance documents.

ALUMINUM EXTRUSION DIE DESIGN

The first profile is a learning loop, not just a pass/fail sample.

DESIGN PRINCIPLE

PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Sample	Record alloy, temper, press, speed and sample length.	Missing process context makes a correction hard to repeat.
Measurement	Measure profile, bow, twist and critical surfaces.	A limited sample can hide end-of-run drift.
Correction	Assign die correction owner and approval date.	Unowned corrections delay production release.

USE WHEN

Record alloy, temper, press, speed and sample length.

AVOID

Missing process context makes a correction hard to repeat.

PROCESS CONTROL

Do not approve the die from photographs alone. Require a traceable first-article report.

ALUMINUM EXTRUSION DIE DESIGN

Use this page with the drawing and 3D model to create a supplier-ready request.

DESIGN PRINCIPLE

PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Section	Show walls, hollows, radii and cosmetic surfaces.	Ambiguous section detail creates inconsistent die assumptions.
Process	State alloy, temper, quantity and finishing route.	Process assumptions change die and tolerance decisions.
Evidence	List first article, inspection and deviation records.	No evidence means the release decision is not auditable.

USE WHEN

Show walls, hollows, radii and cosmetic surfaces.

AVOID

Ambiguous section detail creates inconsistent die assumptions.

PROCESS CONTROL

Send the drawing, model, quantity and finish requirement to BAOSONG for engineering feedback before tooling approval.

ALUMINUM EXTRUSION DIE DESIGN

Drawing review checklist before RFQ or production release

RELEASE CHECKLIST

- [ ] Profile wall balance is shown in the 2D section.
- [ ] Thin webs, hollow chambers and bridge loads are reviewed.
- [ ] Cosmetic surfaces and weld-line limits are identified.
- [ ] As-extruded and post-machined tolerances are separated.
- [ ] Cut length, bow, twist and straightness are defined.
- [ ] Alloy, temper, quantity and press assumptions are confirmed.
- [ ] First-article correction loop and die ownership are stated.
- [ ] Inspection datums and sample lengths are agreed.
- [ ] Supplier deviations have an owner and due date.
- [ ] Annual volume and packaging length are stated.

RELEASE PATH

DRAWING
geometry + datums

→

RFQ
quantity + finish

→

TRIAL
first article

→

RELEASE
evidence + approval

DECISION RECORD

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

ALUMINUM EXTRUSION DIE 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/