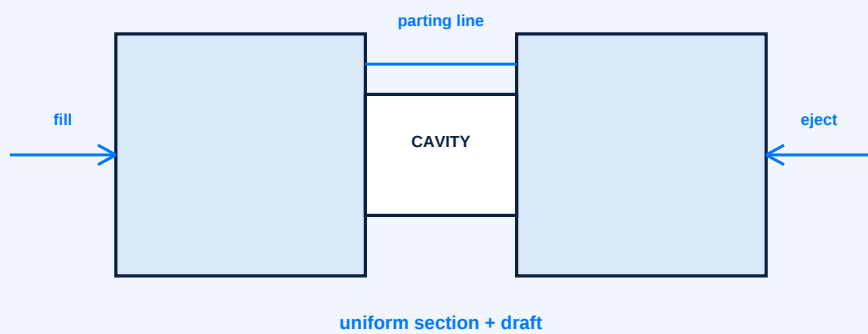


ALUMINUM DIE CASTING GUIDE

Design castable geometry for fill, ejection, stability and finishing



USE THIS GUIDE TO

align part design, die layout and post-machining before tooling approval.

ALUMINUM DIE CASTING DESIGN

Design logic and guide map

ENGINEERING REFERENCE

START WITH FUNCTION

Control wall mass, pull direction, ejection, porosity risk and machining stock as one system.

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	Wall sections	Keep mass uniform and use gradual transitions.
02	Draft and pull	Choose the opening direction before refining details.
03	Ribs and bosses	Use structure instead of isolated heavy masses.
04	Parting and ejection	Keep flash and ejector marks away from function.
05	Fill and porosity	Protect end-of-fill and machining-sensitive zones.
06	Machining stock	Reserve consistent stock on functional faces.
07	Tolerances and finish	Separate as-cast, machined and cosmetic controls.
08	Drawing review	Release checks before die quotation.

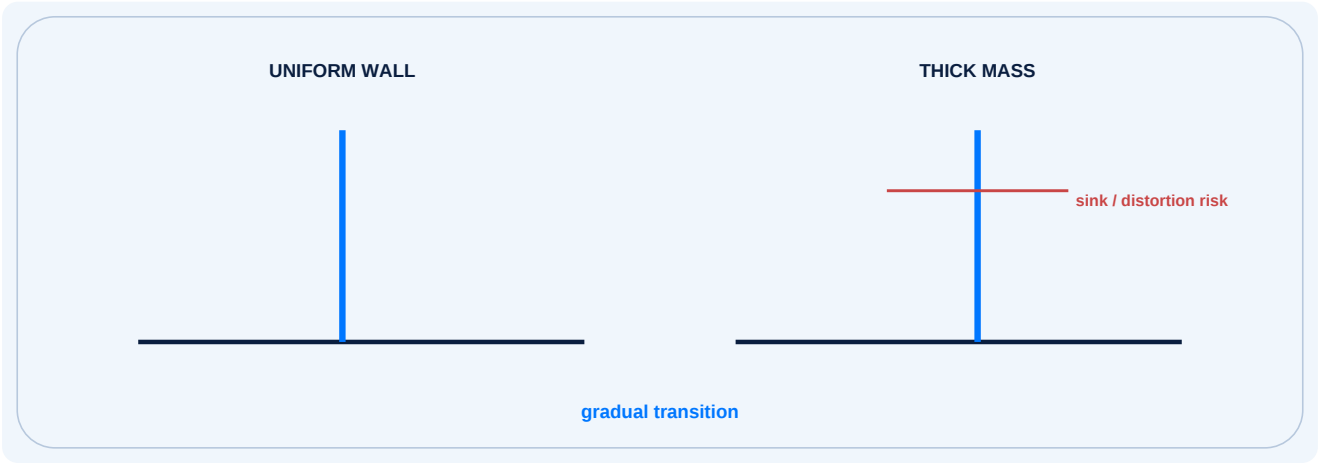
REFERENCE RULE

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

ALUMINUM DIE CASTING DESIGN

Uniform walls cool more predictably and leave more stable machining stock.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Wall thickness	Use practical uniform walls and gradual transitions.	Heavy sections increase sink, porosity and cycle time.
Corner blend	Use fillets and ribs instead of sharp mass changes.	Sharp transitions concentrate stress and heat.
Minimum wall	Identify minimum cast wall by location.	A generic wall note can miss the real thin zone.

USE WHEN

Use practical uniform walls and gradual transitions.

AVOID

Heavy sections increase sink, porosity and cycle time.

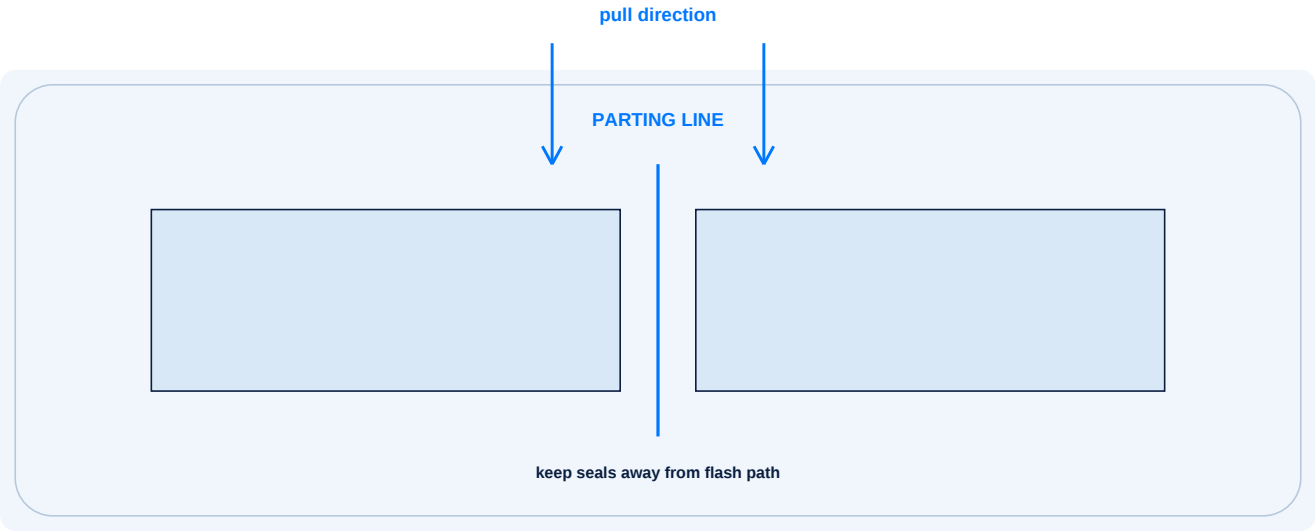
PROCESS CONTROL

Review section mass before adding tight tolerances or cosmetic requirements.

ALUMINUM DIE CASTING DESIGN

Draft is a tooling and surface requirement, not a late annotation.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Pull direction	Align walls, ribs and holes with the main opening direction.	Slides and lifters add cost and maintenance.
Draft	Increase draft for depth and texture.	Low draft causes drag marks and ejection force.
Core access	Keep cores simple and serviceable.	Complex cores increase wear and correction time.

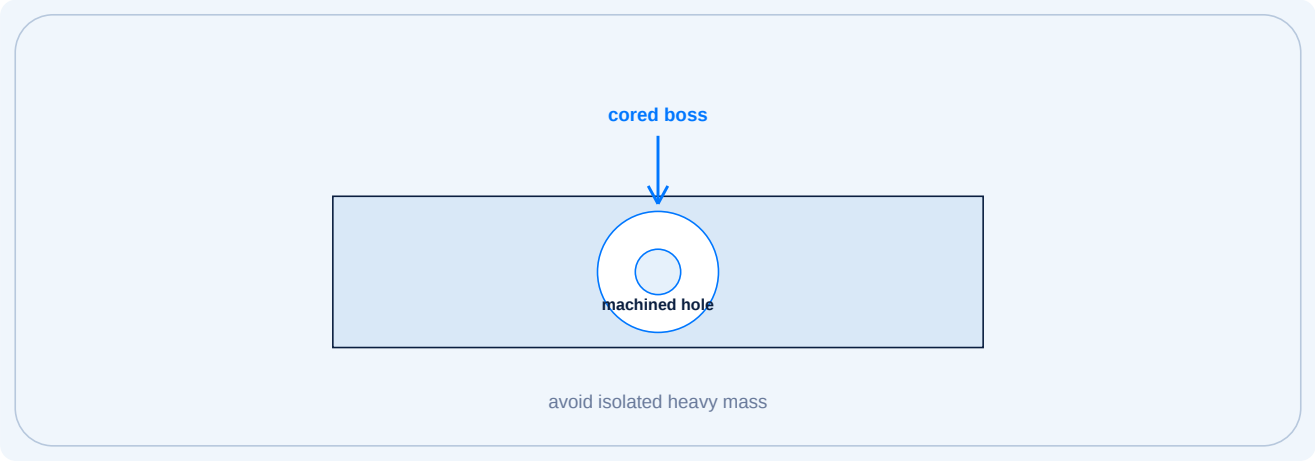
USE WHEN	AVOID
Align walls, ribs and holes with the main opening direction.	Slides and lifters add cost and maintenance.

PROCESS CONTROL	Approve the pull direction and minimum draft before the 3D design is frozen.
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ALUMINUM DIE CASTING DESIGN

Ribs and cored bosses improve stiffness without creating hot spots.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Rib proportion	Use ribs for stiffness and blend them into walls.	Over-thick ribs can behave like isolated mass.
Boss core	Hollow heavy bosses and support their base.	Solid bosses increase shrink and machining risk.
Thread zone	Reserve material around drilled or tapped features.	Breakthrough can expose porosity or reduce engagement.

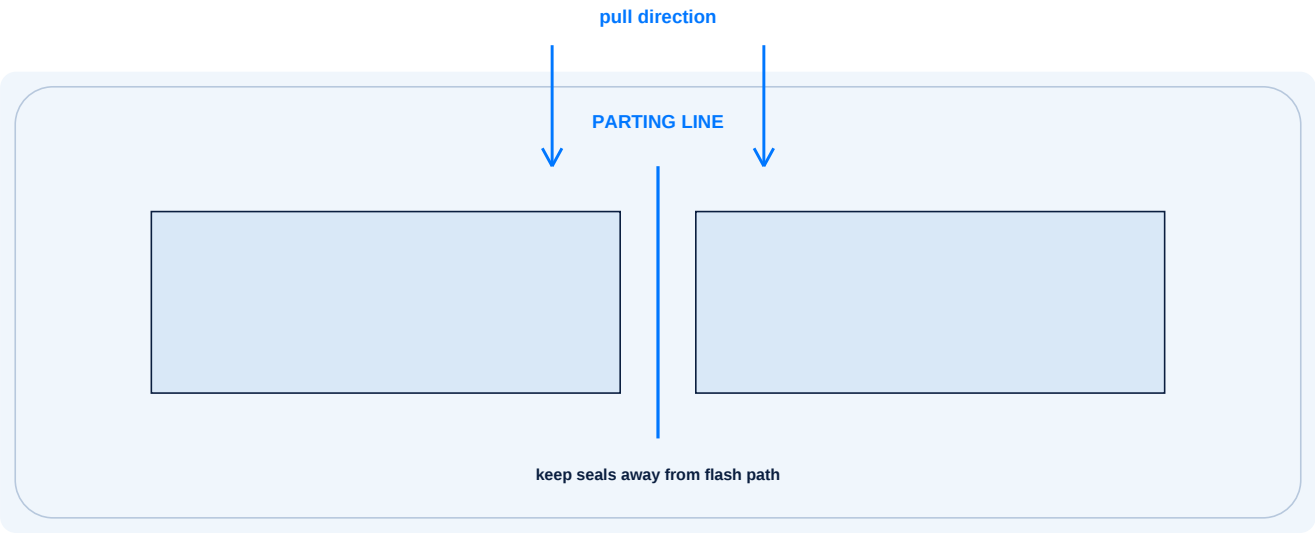
USE WHEN	AVOID
Use ribs for stiffness and blend them into walls.	Over-thick ribs can behave like isolated mass.

PROCESS CONTROL	Review rib, boss and thread geometry with machining stock and ejection in view.
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ALUMINUM DIE CASTING DESIGN

Parting, trim and ejector marks need a deliberate cosmetic and assembly strategy.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Parting line	Place it on a low-function, low-visibility surface.	Moving it late can change datums and tool cost.
Ejectors	Keep marks off seals and appearance zones.	Ejector witness can prevent assembly or fail cosmetic review.
Trim access	Leave room for trimming and clean-up.	Inaccessible flash becomes a recurring defect.

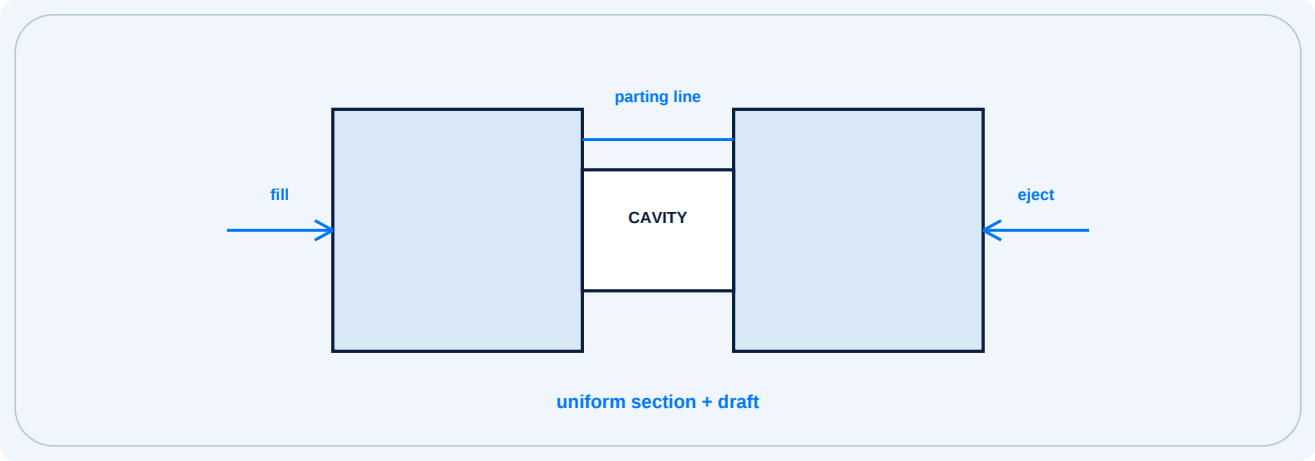
USE WHEN	AVOID
Place it on a low-function, low-visibility surface.	Moving it late can change datums and tool cost.

PROCESS CONTROL	Mark the proposed parting line and ejector zones on the drawing or review model.
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ALUMINUM DIE CASTING DESIGN

Fill, cooling and venting must be considered before final surface details.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
End of fill	Identify last-fill corners and venting needs.	Gas or cold shut risk can appear after machining.
Heavy mass	Replace heavy pads with ribs or cores.	Hot spots increase shrink and porosity.
Critical zone	Keep pressure, sealing and precision zones away from high risk.	A cosmetic repair cannot restore a porous functional face.

USE WHEN

Identify last-fill corners and venting needs.

AVOID

Gas or cold shut risk can appear after machining.

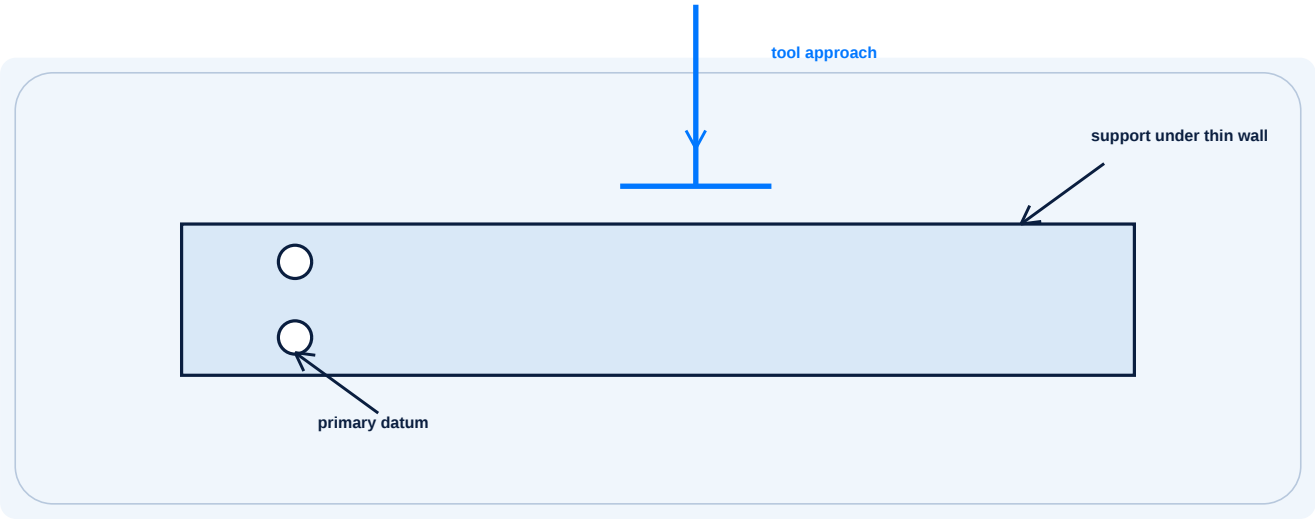
PROCESS CONTROL

Identify porosity-sensitive zones and testing requirements before die release.

ALUMINUM DIE CASTING DESIGN

Final dimensions should be created from stable stock and stable datums.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Datum pad	Add a stable cast pad for the first setup.	A thin cast edge can rock or shift.
Stock	Leave consistent stock on functional faces.	Too much stock adds time; too little can expose porosity.
Fixture	Support the part without distorting it.	Clamp force can change the final measurement.

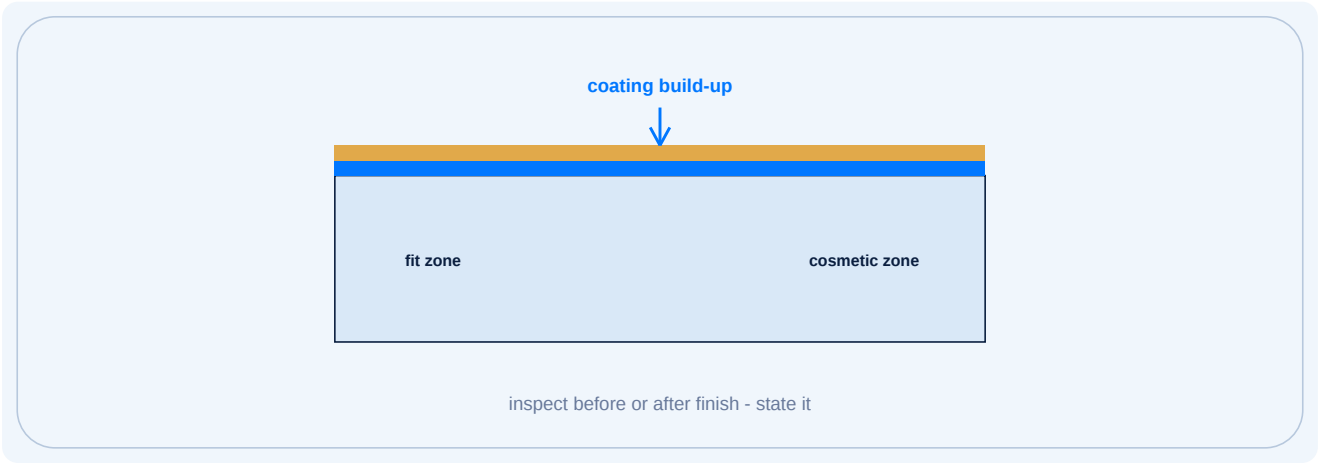
USE WHEN	AVOID
Add a stable cast pad for the first setup.	A thin cast edge can rock or shift.

PROCESS CONTROL	Review a fixture concept and stock map before the casting tool is released.
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ALUMINUM DIE CASTING DESIGN

Each process step needs its own acceptance rule.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
As-cast	Use practical cast limits by feature and span.	Tight as-cast limits can make the tool unstable.
Post-machining	Tie fit dimensions to the machined datum.	A cast edge is not a precision fit surface.
Finish	Account for anodize, powder or paint build-up.	Finish can change thread and seal conditions.

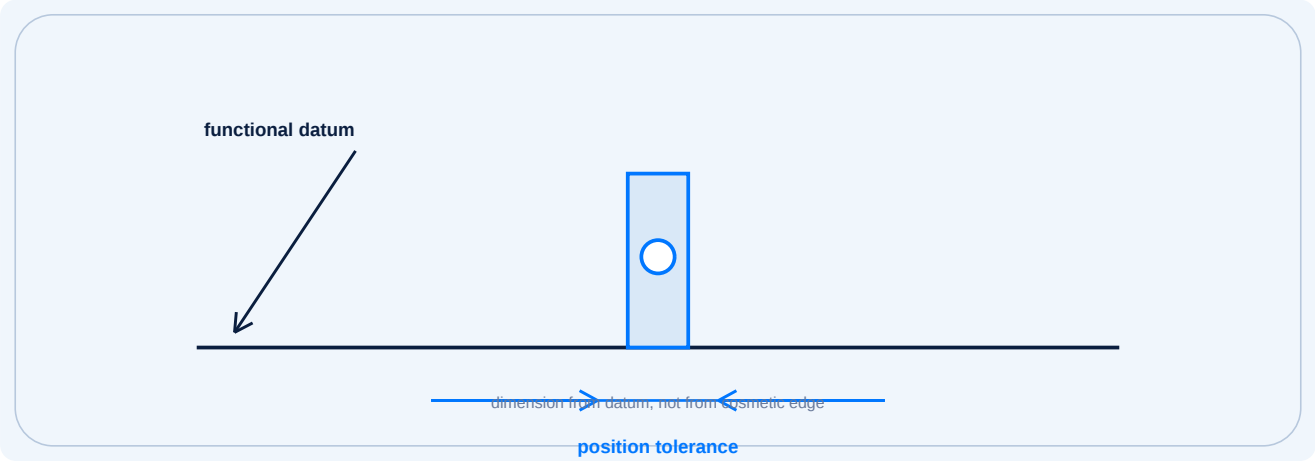
USE WHEN	AVOID
Use practical cast limits by feature and span.	Tight as-cast limits can make the tool unstable.

PROCESS CONTROL	State the final inspection condition and surface-finish acceptance method in the drawing package.
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ALUMINUM DIE CASTING DESIGN

Use a structured review to close geometry, tooling and evidence gaps.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Geometry	Show walls, ribs, bosses, draft and pull direction.	Missing intent forces the supplier to guess.
Tooling	Mark parting, ejectors, vents and slides.	Tooling assumptions can change after quotation.
Evidence	List FAI, porosity and finish records.	No record means the release decision is not auditable.

USE WHEN	AVOID
Show walls, ribs, bosses, draft and pull direction.	Missing intent forces the supplier to guess.

PROCESS CONTROL	Send the drawing, 3D model, quantity and finish requirement for an engineering review before die release.
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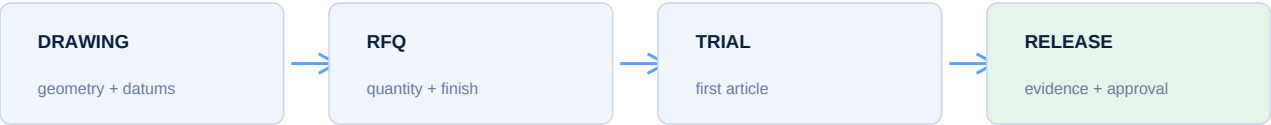
ALUMINUM DIE CASTING DESIGN

Drawing review checklist before RFQ or production release

RELEASE CHECKLIST

- ☐ Wall thickness is uniform where practical.
- ☐ Minimum wall and draft are identified.
- ☐ Ribs and bosses are designed for fill and ejection.
- ☐ Parting line and ejector zones are agreed.
- ☐ Porosity-sensitive machining zones are identified.
- ☐ Machining stock is defined on functional surfaces.
- ☐ Datums are stable on cast or machined faces.
- ☐ Finish build-up and cosmetic zones are stated.
- ☐ Inspection and FAI deliverables are listed.
- ☐ Supplier deviations have owners and dates.

RELEASE PATH



DECISION RECORD

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

ALUMINUM DIE CASTING 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/