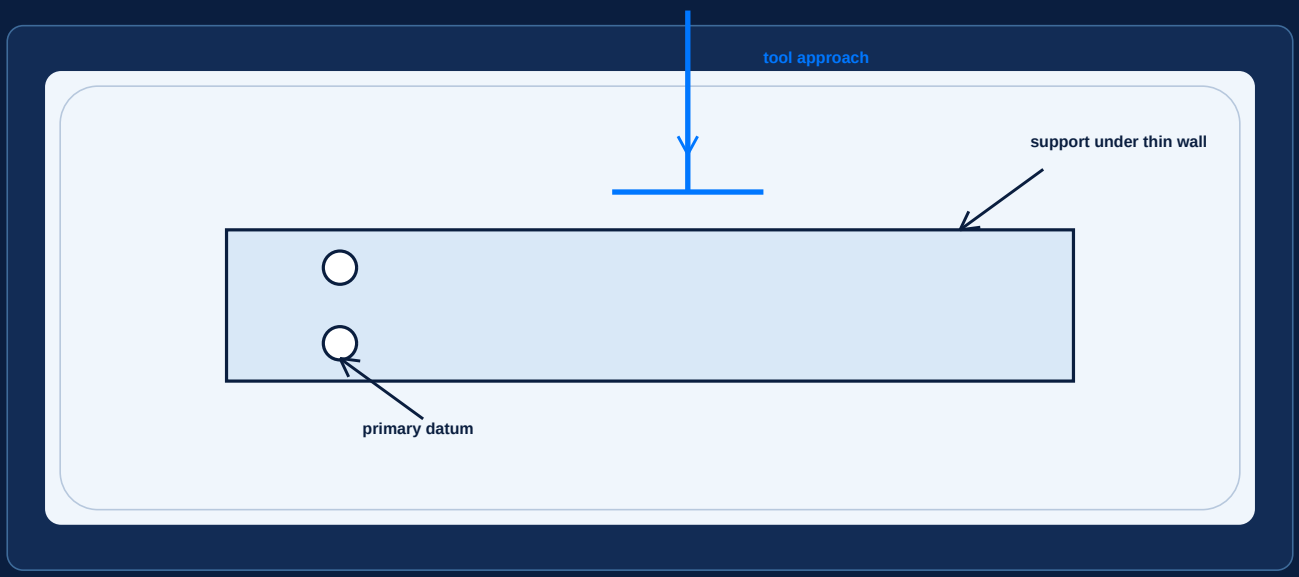
BAOSONG PRECISION

CNC MACHINING EXTRUSION GUIDE

Turn an extruded profile into a stable, inspectable machined part



USE THIS GUIDE TO

choose datums, clamps, tools and inspection methods before CNC release.

CNC MACHINING OF ALUMINUM EXTRUSIONS

Design logic and guide map

ENGINEERING REFERENCE

START WITH FUNCTION

Start with the profile datum, then plan support, feature sequence, tool access and the final measurement condition.

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

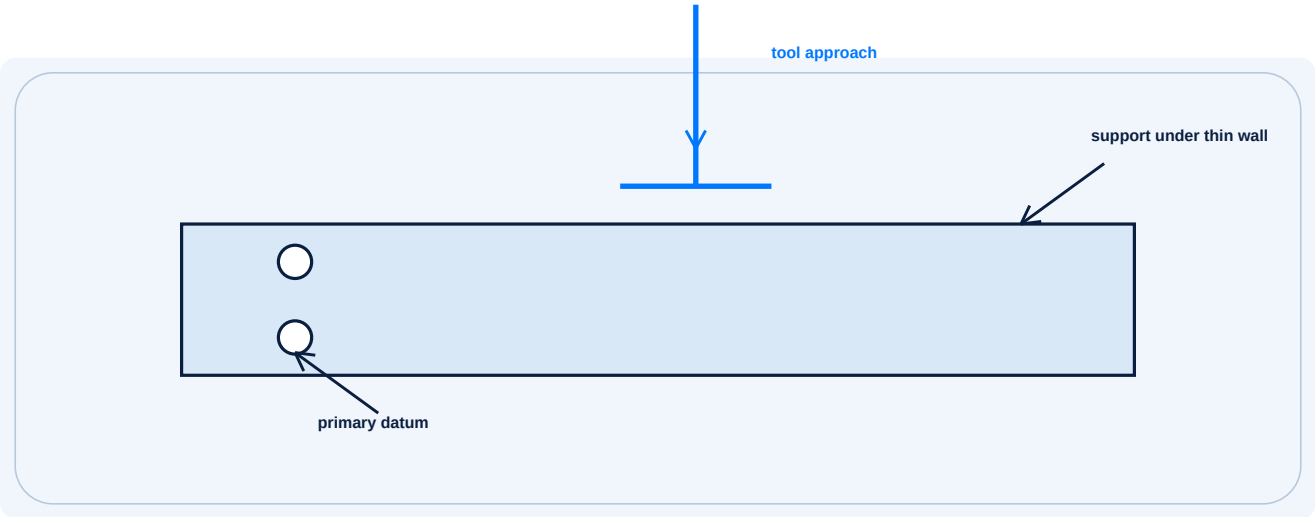
Section	Topic	Practical result
01	Datum selection	Use stable profile faces as primary datums.
02	Clamping and support	Support thin walls before cutter load is applied.
03	Cut ends and stock	Reserve facing stock and define end squareness.
04	Pockets and slots	Match widths, depths and radii to standard tools.
05	Holes and threads	Define drill, ream, bore and thread intent.
06	Tool access	Review approach directions in the fixture concept.
07	Tolerances and finish	Separate general, fit and cosmetic requirements.
08	Inspection	Use the same datum logic for fixture, gauge and CMM.

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

CNC MACHINING OF ALUMINUM EXTRUSIONS

A repeatable CNC result starts with a datum scheme that works in the fixture.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Primary datum	Use the broadest stable face and machine it first.	A thin lip or cosmetic edge can shift between setups.
Secondary datum	Use a face that controls assembly orientation.	A changing profile edge can create position drift.
Datum chain	Dimension critical features from functional datums.	Long chains add stack-up and hide the controlling interface.

USE WHEN

Use the broadest stable face and machine it first.

AVOID

A thin lip or cosmetic edge can shift between setups.

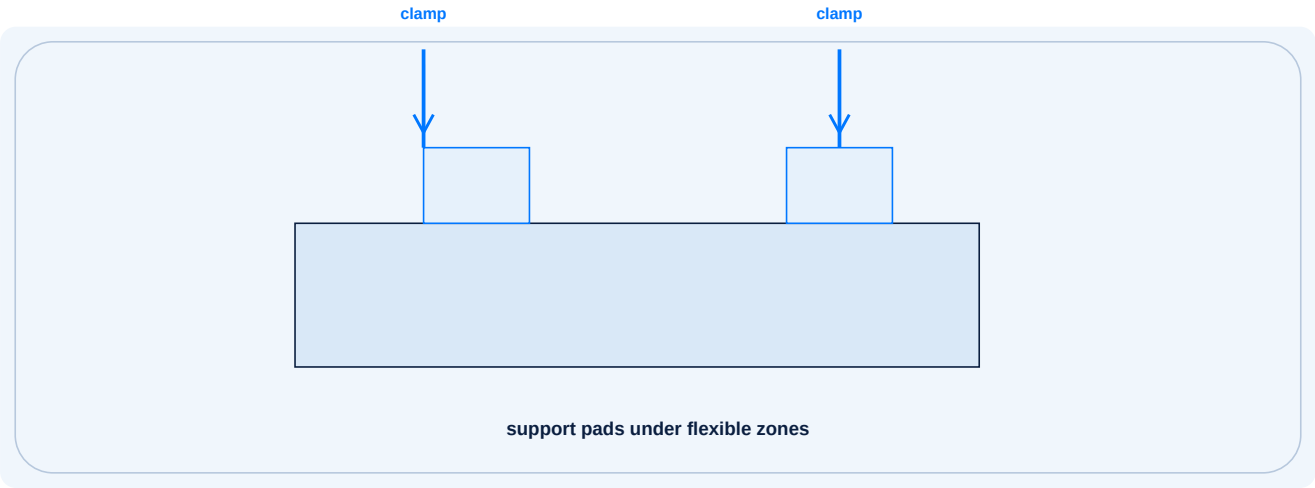
PROCESS CONTROL

Review the fixture concept and datum chain before adding tight hole or pocket tolerances.

CNC MACHINING OF ALUMINUM EXTRUSIONS

Support must be designed for the wall that will remain after machining.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Soft jaws	Match jaws to the profile and protect cosmetic faces.	Hard point contact can dent or move a thin wall.
Support pads	Place support under flexible webs and pockets.	Unsupported walls deflect during milling.
Clamp sequence	Clamp after locating the functional datum.	Over-restraint can create a false measurement.

USE WHEN

Match jaws to the profile and protect cosmetic faces.

AVOID

Hard point contact can dent or move a thin wall.

PROCESS CONTROL

Define clamping force, support points and release condition for critical thin-wall parts.

CNC MACHINING OF ALUMINUM EXTRUSIONS

End faces often need facing stock before they can function as datums.

DESIGN PRINCIPLE

PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Facing stock	Leave practical stock for saw and extrusion variation.	Too little stock leaves a non-square or damaged end.
End squareness	Dimension end squareness only when assembly needs it.	Uncontrolled end conditions accumulate in long assemblies.
Cut length	Separate saw tolerance from final machined length.	A single length tolerance can hide two process steps.

USE WHEN

Leave practical stock for saw and extrusion variation.

AVOID

Too little stock leaves a non-square or damaged end.

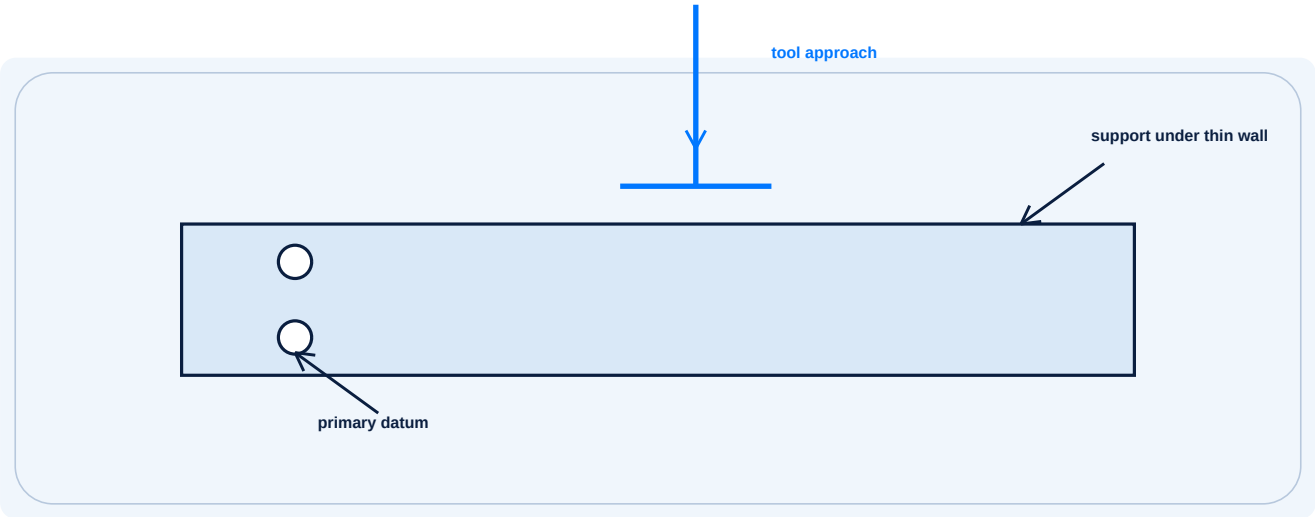
PROCESS CONTROL

State the saw, facing and final length sequence so the supplier prices the correct operation.

CNC MACHINING OF ALUMINUM EXTRUSIONS

Tool diameter, depth and wall support determine pocket stability.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Slot width	Use standard cutter widths where possible.	Non-standard widths can add tool changes and burr risk.
Pocket depth	Control depth-to-diameter ratio and wall height.	Deep narrow pockets increase deflection and chatter.
Inside radius	Match radius to cutter size and corner function.	A sharp corner request can force EDM or a small weak tool.

USE WHEN

Use standard cutter widths where possible.

AVOID

Non-standard widths can add tool changes and burr risk.

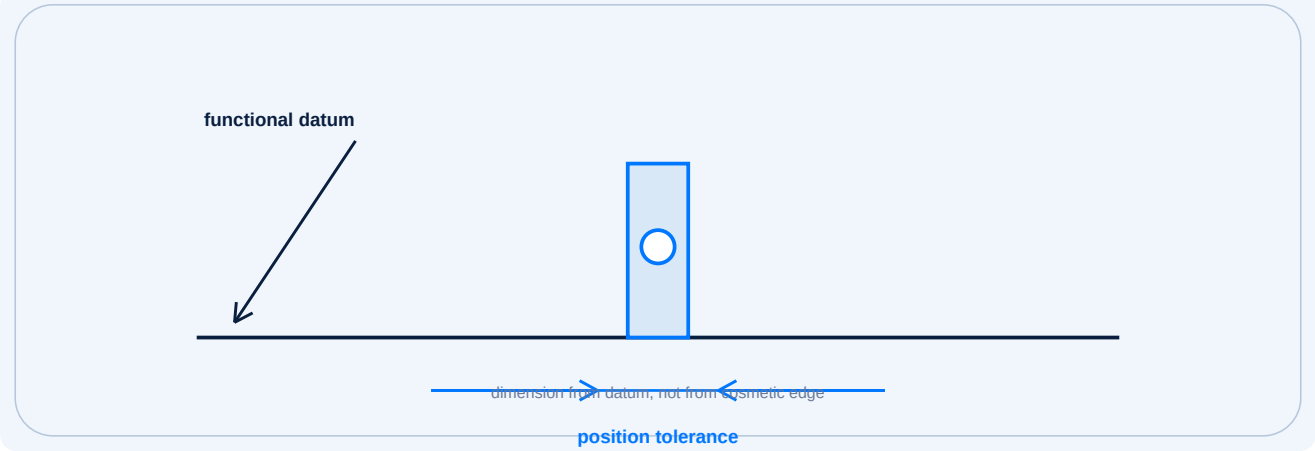
PROCESS CONTROL

Add the cutter diameter or corner-radius intent when the feature is functionally important.

CNC MACHINING OF ALUMINUM EXTRUSIONS

Nominal diameter alone does not define a reliable hole.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Drill / ream	State whether the hole is drilled, reamed or bored.	Different processes have different size and finish capability.
Thread	Define thread class, depth and runout relief.	A blind thread without relief can fail gauge inspection.
Hole position	Dimension from functional datums and fixture access.	A profile edge is not a repeatable hole datum.

USE WHEN

State whether the hole is drilled, reamed or bored.

AVOID

Different processes have different size and finish capability.

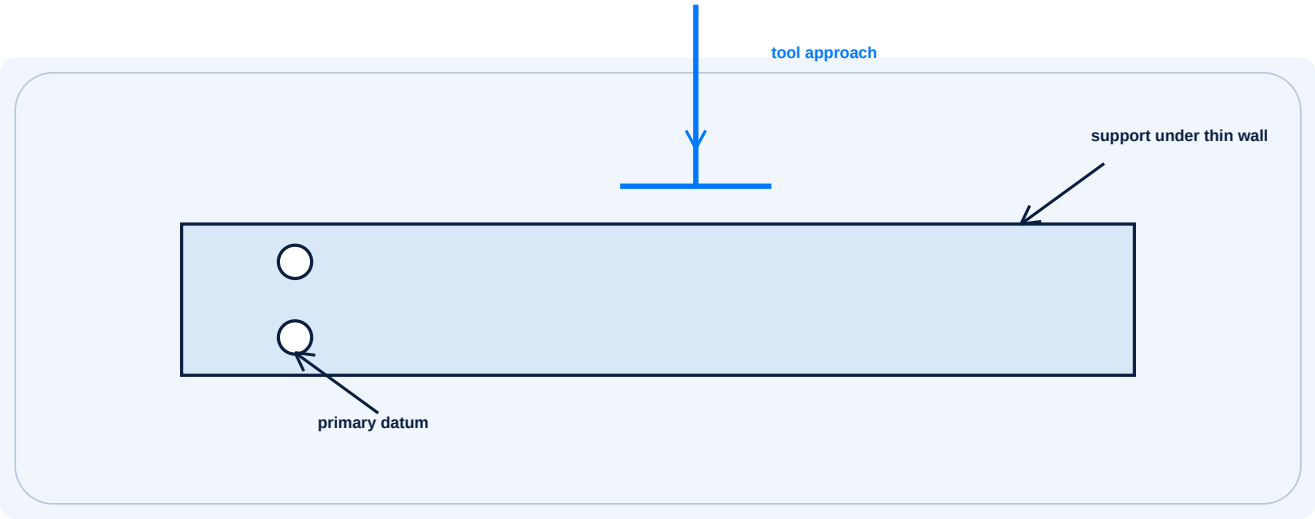
PROCESS CONTROL

For critical holes, agree tool, gauge, thread and inspection method with the supplier.

CNC MACHINING OF ALUMINUM EXTRUSIONS

A feature is only manufacturable if the tool, clamp and gauge can reach it.

DESIGN PRINCIPLE



PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Approach	Keep cutter and drill axes clear of walls and clamps.	CAD visibility does not guarantee machine access.
Reach	Limit deep tools and unsupported overhangs.	Long tools increase chatter and size variation.
Gauge access	Reserve a path for CMM or functional gauge contact.	An inaccessible feature cannot be verified repeatably.

USE WHEN

Keep cutter and drill axes clear of walls and clamps.

AVOID

CAD visibility does not guarantee machine access.

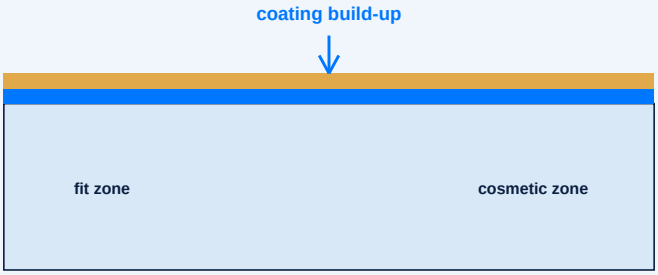
PROCESS CONTROL

Include a fixture or tool-access review for every critical feature before quotation.

CNC MACHINING OF ALUMINUM EXTRUSIONS

General, fit and cosmetic requirements need different control plans.

DESIGN PRINCIPLE



inspect before or after finish - state it

PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
General linear	Use practical limits by span and process.	A tight limit on every dimension adds cost without function.
Fit feature	Use a tighter limit only with a defined tool and gauge.	Thermal state and setup repeatability may dominate.
Surface finish	State Ra, direction and cosmetic zone where needed.	Random toolpath direction can change appearance.

USE WHEN

Use practical limits by span and process.

AVOID

A tight limit on every dimension adds cost without function.

PROCESS CONTROL

Separate functional tolerance from appearance and finish requirements in the drawing block.

CNC MACHINING OF ALUMINUM EXTRUSIONS

Inspection should repeat the functional setup, not a convenient but different reference.

DESIGN PRINCIPLE

PRACTICAL DESIGN CHECKS

Feature / condition	Useful action	Risk / decision
Condition	State free-state, restrained-state and temperature.	A fixture can hide spring-back or clamp distortion.
Datum logic	Use the same datums for fixture, gauge and CMM.	Different references produce conflicting results.
Report	List tool, lot, finish and sample information.	A number without process context is hard to reproduce.

USE WHEN

State free-state, restrained-state and temperature.

AVOID

A fixture can hide spring-back or clamp distortion.

PROCESS CONTROL

Agree the first-article report and inspection condition before production release.

CNC MACHINING OF ALUMINUM EXTRUSIONS

Drawing review checklist before RFQ or production release

RELEASE CHECKLIST

- [ ] Primary and secondary datums are stable on the extrusion.
- [ ] Facing stock is included at cut ends.
- [ ] Thin walls are supported during clamping.
- [ ] Slot widths and internal radii are tool-accessible.
- [ ] Critical holes have a defined machining process.
- [ ] Extrusion and CNC tolerances are separated.
- [ ] Cosmetic faces and machining marks are identified.
- [ ] Inspection condition before or after finish is stated.
- [ ] Cut length and end squareness are specified.
- [ ] Profile orientation is clear in the CNC drawing.

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.

CNC MACHINING OF ALUMINUM EXTRUSIONS

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/