

Bearing Length in an Aluminum Extrusion Die

The bearing, or die land, is the short parallel land at the exit of the die, and it sets the size, shape, finish, speed and life of the extrusion. The tables below give what the bearing controls, the three parameters that decide its length at a point on the opening, and the choke and relief cuts used to trim it.

Reference only. This is a reference summary of published practice and it is not a specification of ours. The values are reproduced from the source. What a particular press produces depends on the press, the shape, the alloy and the run. Final design is confirmed on the job.

What the bearing controls

What the bearing sets	How it does it
Size	It holds the final cross section while the metal leaves the die, so a longer land on one side pulls that side back
Shape	It balances the flow between thick and thin parts of the profile, and an unbalanced bearing distorts the shape
Surface finish	It controls how much the hot metal rubs on the die steel as it passes, so it sets die lines and pick up
Extrusion speed	Friction at the land is what retards the metal, so the total bearing length caps the ram speed the die will run at
Die life	The bearing is the part of the die in sliding contact with hot aluminum, so it is the part that wears out

The functions of the die bearing. Size, shape, finish and speed are the four the source names first, and die life follows because the bearing is the surface that slides against hot aluminum.

Why the bearing length changes across one die

Parameter	Effect on bearing length	Reason
Distance of the opening from the centre of the billet	Longer bearing further out	Friction at the billet and container interface slows the metal near the surface, so the bearing has to be longer near the edge to hold that metal back and even out the flow
Section thickness at that point	Shorter bearing in a thin section	A thin section leaves the die through a small opening and flows slowly, so its bearing is reduced to let it catch up
Pocket shape and size in front of the opening	Bearing set to match the pocket	The pocket is what feeds the opening, and how it is shaped decides how much metal arrives at each part of the bearing

The three parameters that set the bearing length at a point on the die opening. The first two are properties of the shape and its position in the die, and the third is the designer's main tool for changing the flow.

Choke and relief, the two cuts that trim the bearing

Feature	Where it is cut	Usual amount	What it does
Choke	Front of the bearing, on the billet side	An angle of up to 3 degrees	The metal is slowed as it enters, which fills out the die aperture and holds the dimensions. It is used on hard 2000 and 7000 series alloys
Relief	Back of the bearing, on the exit side	An angle up to 7 degrees	The effective bearing gets shorter, so the metal speeds up as it leaves. It is the opposite adjustment to a choke
Bearing width at a junction	Where one bearing length meets another	Blended, never left as a sharp step	A sharp change in bearing length makes the metal flow unevenly, and the result is a streak on the extrusion

Choke, relief and the blending of a bearing. Choking the front of the bearing is the standard treatment for hard alloys, where the aim is to fill the aperture and hold the dimensions. Relief at the back does the opposite, shortening the effective bearing and letting the metal run faster.

The single-bearing die

Where this leaves a die steel order

Aobo Steel, tool steel supplier

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