

Aluminum Extrusion Die Types and Tooling

An aluminum extrusion die is a stack of tools, and each one carries a different load. The tables below give the function of every part of the stack, the die types used for solid and hollow shapes, and the way the tooling changes when a press moves from a soft 6000 series alloy to a hard 2000 or 7000 series alloy.

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.

The parts of the die stack and what each one does

Tool	Function
Die	Makes the shape of the extrusion
Die holder or ring	Holds the die with the feeder plate and the backer
Die backer	Supports the die to prevent collapse or fracture
Bolster	Transmits the extrusion load from the die to the pressure ring
Pressure ring	Transmits the load from the bolster to the press platen and prevents bolster deflection
Die carrier or slide	Holds the complete die set, the die ring and the bolster, in the press
Bridge, spider or porthole die	Special die to make a hollow shape with a welding joint along the length of the shape
Feeder plate	Sits in front of the die to balance the metal flow and to make a continuous extrusion
Liner	Protects an expensive and large container from thermal and mechanical stress
Stem	Fitted with the main ram to push the billet through the container and liner
Dummy pad	Protects the expensive stem, fitted to it or floating in front of it

Functions of the individual tools used for extrusion of soft and medium grade alloys with the conventional direct process. Every part in the list is a wearing part, and the grade chosen for each one is set by the load it carries rather than by the die itself.

Solid dies and hollow dies

Die type	Shapes made	Note
Solid flat-face die	Solid and semihollow shapes	Plain bearing on a flat die face
Feeder plate die, also called housing die	Solid shapes larger than the billet	A welding chamber in front of the die balances the flow and allows continuous extrusion
Recess die	Solid shapes	A single stage cavity, called the recess, sits in front of the die opening
Single-bearing die, equal bearing die	Solid shapes at higher speed	Several converging cavity stages hold one bearing length over the opening
Porthole, bridge and spider die	Hollow and semihollow shapes	The metal splits into ports, flows round the bridges, and rewelds in the welding chamber

The die types described in the chapter. Whether a shop uses a flat-face, feeder plate or recess die for a given solid shape comes down to the shape, its size against the billet, and the flow balance the die maker wants.

The tooling changes when the alloy changes

Item	Soft and medium grade alloys	Hard alloys
Die	Solid flat-face, feeder plate, recess or single-bearing, often run as a multihole die	Solid flat-face die of greater thickness with a larger bearing and a small choke in front of it
Dummy pad	Fixed expandable type dummy pad	Loose solid dummy, or loose hollow dummy for seamless tube
Die set	Feeder plate, die, backer, die ring, bolster and pressure pad	Solid die, backer, die ring, bolster and pressure pad, with no feeder plate
Run style	Billet on billet, so the press runs continuously, usually with a puller system	Each extrusion is run separately
Hollow sections	Welding chamber die, which is the porthole, bridge or spider type	Seamless type, over a pierced or fixed mandrel carried through a hollow stem

Tooling practice for soft and medium grade alloys against hard alloys. The change from a feeder plate die to a plain solid die is the largest single difference between the two practices, and it follows directly from how readily the alloy flows.

How metal moves through a hollow die

Where this leaves a die steel order

Aobo Steel, tool steel supplier

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