

Die Casting Die Component Materials and Hardness

A die casting die is built from several parts that work under different conditions, and the material and working hardness are specified part by part. The two lists below give the usual choice for the cavity inserts, the holder blocks and the injection components.

Reference only. Values are reproduced from the source named under each table and are a reference summary of published practice rather than a specification of ours. They describe the materials and hardnesses the trade normally works with rather than a specification for a particular die, so confirm against the material test certificate before ordering.

Cavity inserts and holder blocks

Component	Typical material	Hardness
Cavity inserts for Al and Mg castings	H13	hardened to 44 to 48 HRC
Cavity inserts for Zn castings	P20 prehardened	30 HRC
Cavity inserts for long-run Zn castings	H13	hardened to 44 to 46 HRC
Cavity inserts for Cu castings	H20, H21, H22	hardened to 44 to 48 HRC
Holder blocks	4140 prehardened	30 HRC

Source, Table 1, Recommended Materials for Die Components, printed page 254 of Tool Materials for Molds and Dies, Application and Performance, edited by G. Krauss and H. Nordberg, PDF page 261 of the copy consulted. The figures were read from the page image rather than from the scanned text layer.

The hardness given is the level the part is put into service at, not a heat treatment instruction. H20, H21 and H22 are tungsten hot work grades, listed for copper castings because copper is poured hotter than zinc or aluminium. The holder block is a support part rather than a working surface, which is why it is only prehardened.

Injection components, sprue to plunger

Component	Metal being cast	Material and condition
Sprue spreader	Zinc	H13 hardened to 42 to 46 HRC
Sprue bushing	Zinc	H13 hardened to 42 to 46 HRC
Nozzle and adapter	Zinc	H13 hardened to 46 to 48 HRC, nitrided
Shot sleeve	Aluminum	H13 hardened to 46 to 48 HRC, nitrided
Shot pad	Aluminum	H13 hardened to 46 to 48 HRC, nitrided
Plunger tip	Aluminum	Beryllium copper hardened to 38 to 42 HRC

Source, Table 2, Typical Materials for Injection Components, printed page 254 of the same book, PDF page 261 of the copy consulted. Read from the page image rather than from the scanned text layer.

The metal being cast is listed for every row because the aluminium side of a die runs hotter than the zinc side and the specification changes with it. The plunger tip is the one component not specified in tool steel, and the beryllium copper is chosen so heat leaves the tip rather than for wear resistance.

One grade carries most of the list. H13 appears in the cavity for aluminium, magnesium and long-run zinc castings, and every injection component except the plunger tip is H13 as well. The hardness figures are deliberately not uniform. Sprue spreader and sprue bushing are listed at 42 to 46 HRC, softer than the 46 to 48 HRC specified for the nozzle, shot sleeve and shot pad, and those three are nitrided on top of the hardened core. The plunger tip is the one part not specified in tool steel, and the beryllium copper at 38 to 42 HRC is chosen so heat leaves the tip rather than for wear resistance.

Aobo Steel, tool steel supplier

Aobo Steel supplies tool steel to distributors and mold, tool and die shops, including D2, D3, O1, O2, A2, S7, H13, H11, H10, H21, M2, M42, L6, P20 and 420 and 440C stainless. Forged or hot rolled, annealed or pre-hardened, cut to your sizes, with test certificates.

Compiled from Tool Materials for Molds and Dies, Application and Performance (G. Krauss and H. Nordberg, eds.), the chapter on die casting die fabrication, Tables 1 and 2 on printed page 254.

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