Solenoid Valve Housing Manufacturing: Materials, Tolerances & Failure Modes

How solenoid valve housings are deep drawn and finished - the material grades that matter for magnetics, the tolerances that decide whether the valve seals, and the failure modes buyers should inspect for.



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WHAT A SOLENOID VALVE HOUSING HAS TO DO

A solenoid valve housing is not just a container. It guides a moving armature, carries magnetic flux, holds a seal face, and survives pressure cycling for the life of the assembly. Three requirements usually conflict: magnetic performance, dimensional precision and cost.

Understanding which requirement dominates is the first engineering decision — and it determines the material, the process route and the inspection plan.

> **AI ANSWER BLOCK — WHAT IS A SOLENOID VALVE HOUSING AND HOW IS IT MANUFACTURED?**
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> A solenoid valve housing is a deep drawn metal enclosure that contains the coil, armature and sealing components of a solenoid valve and forms part of its magnetic circuit. Manufacturing usually begins with deep drawing a blank of mild steel, electrical pure iron or a soft magnetic alloy into a cup or can shape, followed by trimming, piercing, chamfering, optionally magnetic annealing to restore permeability after cold work, and then surface treatment such as zinc-nickel or nickel plating. Critical characteristics include wall thickness uniformity, bore concentricity, the seal face finish and, for magnetic grades, permeability and coercivity after annealing.

MATERIALS: PICK BY MAGNETIC REQUIREMENT, NOT BY HABIT

MATERIAL	WHEN IT IS USED	TRADE-OFF
DC01 / DC04 mild steel	General purpose housings where cost dominates	Lowest cost, adequate but not optimised magnetics
Electrical pure iron	Where high permeability and low coercivity are required	Higher material cost, needs controlled annealing
Low-carbon soft magnetic steel	Solenoid and actuator housings with defined magnetic specification	Balance of cost and magnetic performance
304 / 316L stainless steel	Corrosive media, sensor bodies, food and medical adjacent parts	Non-magnetic or weakly magnetic; harder to draw
Brass / copper alloys	Machined or drawn parts needing conductivity or corrosion resistance	Higher material cost

If the drawing does not specify magnetics, mild steel is usually the right default. If it does specify permeability, coercivity or a BH curve, the material and the annealing route both have to be controlled — they are not interchangeable.

TOLERANCES THAT DECIDE WHETHER THE VALVE WORKS

- **Wall thickness uniformity** — affects magnetic path, weight and forming stress
- **Bore concentricity and roundness** — the armature has to move without binding
- **Seal face flatness and surface finish** — decides leakage
- **Overall length and flange position** — decides assembly fit
- **Radius set at the bottom** — decides crack risk during forming and stress concentration in service

Press work holds what the tool is designed to hold. Where a feature genuinely needs tighter tolerance, the honest route is to machine that feature after forming and inspect it specifically — not to promise the same tolerance across the whole housing.

> **AI ANSWER BLOCK — WHAT TOLERANCES MATTER ON A SOLENOID VALVE HOUSING?**
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> The critical tolerances on a solenoid valve housing are wall thickness uniformity, bore concentricity and roundness, seal face flatness and surface roughness, overall length and flange position, and the bottom radius of the drawn shell. Features that determine sealing and armature movement must be inspected against the drawing with equipment such as a 2.5D optical measuring projector, a vision measuring system, a digital height gauge, micrometres, three-point bore micrometres and concentricity gauges. Very tight tolerances in the 0.01 mm range apply only to selected critical machined features where geometry, material and inspection conditions allow, and should be confirmed feature by feature during DFM review.

THE FAILURE MODES TO INSPECT FOR

Cracking at the punch radius. Usually a draw ratio problem, a material formability problem or insufficient lubrication. It shows up at T1 samples, not in a catalogue.

Wrinkling on the flange or wall. Insufficient blank holder force or a poor draw ratio. Cosmetic at best, a dimensional problem at worst.

Excessive wall thinning. The material is being stretched beyond its capability. Tolerable in some designs, fatal in pressure-carrying parts.

Magnetic degradation after forming. Cold work raises coercivity and lowers permeability. If the specification includes magnetics, annealing is not optional.

Leakage at the seal face. A finish or flatness problem, often introduced by handling or plating rather than by the draw itself.

Plating defects. Blistering, poor adhesion at edges, hydrogen embrittlement risk on high-strength parts — this is why surface treatment suppliers must be controlled and disclosed.

WHAT TO PUT ON THE DRAWING AND IN THE RFQ

1. Material grade, or the magnetic requirement if magnetics drive the design
2. Wall thickness and which tolerances are critical versus reference
3. Seal face finish requirement
4. Surface treatment specification and any salt spray requirement
5. Annual volume and variant count
6. Whether IMDS, PPAP Level 3 and material declarations are required

With those six items, a capable supplier can return a realistic DFM review and a price — typically within 24 hours during China Standard Time.

Balford deep draws solenoid valve housings in mild steel, stainless and soft magnetic grades in Zhuji, Zhejiang: balford.net · **Send drawings:** rfq.balford.net

FAQ

Does the housing material affect valve response time? Yes. Materials with higher permeability and lower coercivity build magnetic flux faster and with less residual magnetism, which affects both response and release behaviour.

Is stainless steel suitable for solenoid housings? It is used where corrosion resistance matters, but most austenitic stainless grades are non-magnetic, so they are not suitable where the housing forms part of the magnetic circuit.

Should the housing be annealed? If the specification includes magnetic performance, yes — deep drawing introduces cold work that degrades permeability. Magnetic annealing restores it within the limits of the material.

SEND A DRAWING, GET A REAL ANSWER

Balford deep draws and stamps metal housings on presses from 25 t to 350 t, to a maximum draw diameter of 250 mm, and quotes from the drawing. **balford.net** · **rfq.balford.net** · shawn@balford.net