A Motor Housing Rarely Fails Inspection. It Fails At Assembly.

Wall thickness and concentricity on a drawn motor housing decide whether the rotor fits and the bearing seats - not whether the part passes a dimensional report.



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Motor housings and end caps look like simple parts on a drawing. They behave badly in assembly for three reasons: wall thickness, concentricity, and stack height. All three are decided by the drawing process, not by the inspection room - which is why they have to be designed into the tool rather than sorted out afterwards.

Wall thickness is the first one. It is set by the blank diameter, the draw ratio, the die clearance, the blank holder force and the lubrication, and by whether someone decided to thin the wall on purpose through ironing. Material thins where it is stretched over a radius and thickens where it is compressed, so a nominal 1.0 mm wall is a starting point, not a measurement.

Where a housing carries a stator, a bearing seat or a magnet, the inside wall is often an ironed surface. A punch pushes the drawn cup through a die with controlled clearance, thinning the wall deliberately. The result is better thickness uniformity and a better surface finish, and the cold work also raises the material strength. If ironing is not specified, the tool has to carry a reference wall with local critical thickness instead - a different tool, a different price.

Concentricity between the bore and the outside diameter is a tooling characteristic, not a part characteristic. It is set by die and punch alignment, by the accuracy of the blank and the strip feed, and by how the part is trimmed. That matters over time: concentricity degrades with wear and moves after every sharpening unless the tool is realigned. The practical check on the shop floor is a concentricity gauge on a sample per run, not a full CMM layout on every batch.

Stack height is where most programmes get caught. A motor stack is the housing, the end cap, any spacer or shim. Each part carries its own tolerance, and those tolerances add up. A stack-up done before the tool is cut takes an afternoon; the same problem discovered at assembly turns into a sorting exercise and a rework negotiation. If the assembly is sensitive, the answer is to define the stack height allocation between the parts, not to tighten everything.

So when the drawing goes out, put four things on it: wall thickness and the section where it is measured, whether ironing is required or a reference wall is acceptable, concentricity and roundness with a clear datum, and the stack height with the assembly allowance across the mating parts.

Motor housings fail at assembly, not at inspection. Ask for the stack-up to be part of the DFM review, and the thickness and concentricity questions get answered before the tool is cut.

The longer version, including how ironing changes the tool and what to specify, is here: https://balford.net/motor-housing-end-cap-stamping-wall-thickness/

I am the founder of Balford, a deep drawing and metal stamping manufacturer in Zhuji, China. We deep draw and stamp metal housings on presses from 25 t to 350 t, to a maximum draw diameter of 250 mm, and quote from the drawing.

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