Aluminium die casting defects: causes and remedies

A troubleshooting chart for the shop floor and the quality office

Defect	What it looks like	Likely causes	Remedies
Gas porosity	Smooth, rounded holes, often near the surface or in last areas to fill	Air trapped during fill; hydrogen in the melt; steam from excess die spray	Optimise slow shot and venting; add overflows; degas and check density index; reduce spray; consider vacuum
Shrinkage porosity	Irregular, jagged voids in thick sections	Thick sections not fed; low intensification; hot spots	Uniform walls; intensification and squeeze pins; local cooling; review gate position
Cold shut	Visible line where two metal fronts met	Metal or die too cold; slow fill; long flow path	Raise die and metal temperature; increase fast shot speed; move gates; add overflows
Misrun	Incomplete casting, missing sections	Metal freezes before filling; insufficient shot weight	Increase metal and die temperature and fill speed; check shot weight and venting
Flash	Thin fins at parting line, slides or pins	Low clamping force; worn or dirty die faces; excess pressure	Clean and repair faces; check clamp tonnage; adjust intensification
Soldering	Aluminium stuck to die, torn surface	Die too hot; low iron in alloy; poor release agent; erosion	Control die temperature; correct alloy iron; improve spray; coat the area
Blisters	Raised bubbles, often after heating	Gas trapped just under the skin	Reduce trapped air and spray; avoid solution heat treatment of HPDC parts
Hot tear or crack	Ragged cracks at section changes	Restrained shrinkage; sharp corners; ejecting too early or too hot	Add radii; balance cooling; adjust dwell time; check ejection
Inclusions	Hard spots or oxide films on machined faces	Dross, oxides, sludge or refractory in the melt	Clean charge; gentle skimming; flux; control sludge factor; filter where possible
Sink marks	Shallow depressions over thick sections	Local shrinkage near the surface	Core out thick sections; improve feeding and cooling
Heat check marks	Raised network pattern on the surface	Cracked die surface from thermal fatigue	Repair and polish the die; preheat; stress relieve
Drag marks	Scratches along the direction of ejection	Insufficient draft; die damage; soldering	Increase draft; polish; improve spray
Distortion	Part out of flatness or position	Uneven cooling; early ejection; poor handling	Balance cooling; adjust dwell; fixtures for trimming and machining
Flow marks	Swirl or lines on the surface	Low die temperature; turbulent fill	Raise die temperature; adjust gate and fill speed

Approach: locate the defect (section, X ray or CT), classify it (gas or shrinkage, oxide or sludge), correlate with shot, die temperature and melt records, change one variable at a time, then lock the fix into the control plan. Full guide: alcasttech.in/insights/die-casting-defects-troubleshooting