## Description

### Image

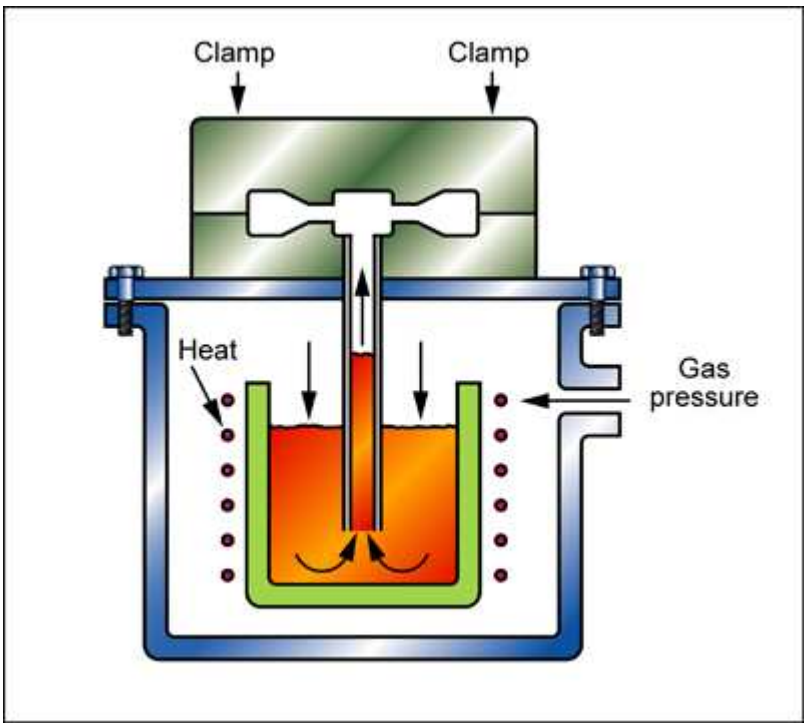
### Image caption

(1) Mold for Carbon Frame © Felt LLC at Wikimedia Commons (CC BY-SA 3.0) (2) Wheel rim © Granta Design (3) Wheel rim © Andy G at Pixabay [Public domain]

### The process

In LOW PRESSURE DIE CASTING, molten metal is displaced upwards into a die by low pressure gas. The die cavity is filled slowly upwards which minimizes entrained air and gives high soundness. Such castings have better metallurgical integrity than conventional die castings, and they can be heat-treated. The process has most of the benefits of die casting without the disadvantages. The dies are made from cast iron which is comparatively cheap and easy to machine. Tool steel inserts may be used for high production runs of complex castings. Tooling costs are about half those for pressure die casting. The process is only suitable for low melting point alloys (Tm < 950 C). Shapes are of average complexity and undercuts are possible but expensive.

### Process schematic




### Figure caption

Low pressure die casting.

**Tradenames**

LP die casting

## Material compatibility

| | |
|---|---|
| Metals - non-ferrous | ✓ |

## Shape

| | |
|---|---|
| Circular prismatic | ✓ |
| Non-circular prismatic | ✓ |
| Solid 3-D | ✓ |
| Hollow 3-D | ✓ |

## Economic compatibility

| | | | | |
|---|---|---|---|---|
| Relative tooling cost | medium | | | |
| Relative equipment cost | medium | | | |
| Labor intensity | medium | | | |
| Economic batch size (units) | 2e3 | - | 1e5 | |

## Physical and quality attributes

| | | | | |
|---|---|---|---|---|
| Mass range | 11 | - | 55.1 | lb |
| Range of section thickness | 157 | - | 394 | mil |
| Tolerance | 15.7 | - | 31.5 | mil |
| Roughness | 0.0709 | - | 0.248 | mil |
| Surface roughness (A=v. smooth) | B | | | |

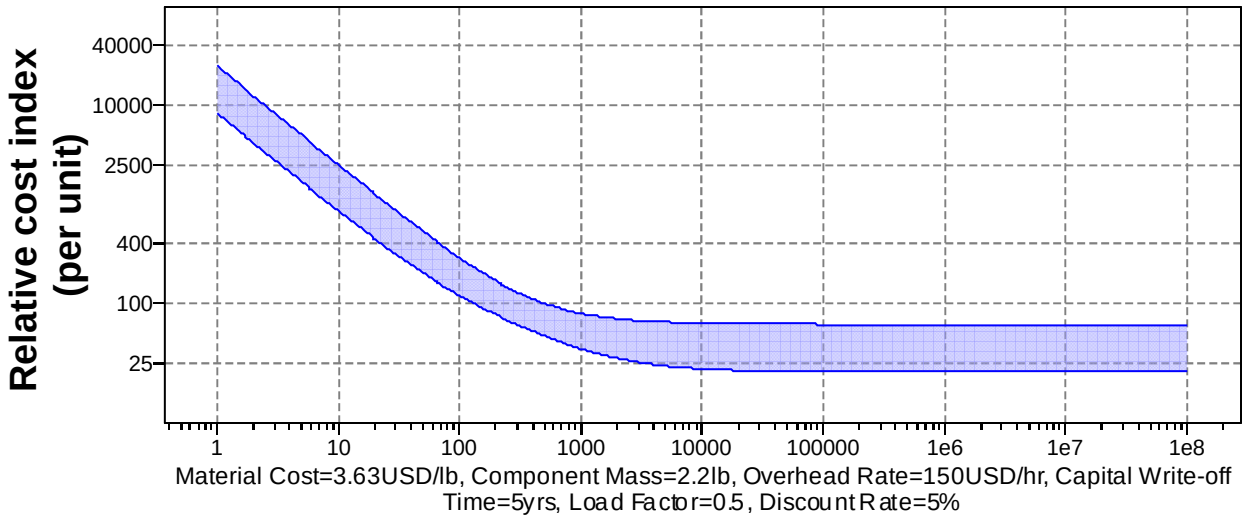
## Process characteristics

| | |
|---|---|
| Primary shaping processes | ✓ |
| Discrete | ✓ |

## Cost model and defaults

| | | | | |
|---|---|---|---|---|
| Relative cost index (per unit) | 35.2 | - | 79.8 | |

Parameters: Material Cost = 3.63USD/lb, Component Mass = 2.2lb, Batch Size = 1e3, Overhead Rate = 150USD/hr, Discount Rate = 5%, Capital Write-off Time = 5yrs, Load Factor = 0.5




| | | | | |
|---|---|---|---|---|
| Capital cost | 1.64e4 | - | 1.64e5 | USD |
| Material utilization fraction | 0.8 | - | 0.85 | |
| Production rate (units) | 3 | - | 15 | /hr |
| Tooling cost | 8.2e3 | - | 2.46e4 | USD |
| Tool life (units) | 3e4 | - | 1e5 | |

## Supporting information

### Design guidelines

Low pressure die casting is best for castings with low surface area/volume ratio. Sand cores can be used.

### Technical notes

The process is suitable for low melting point alloys. It is predominantly used for aluminum alloys. It gives good surface definition and better metallurgical integrity than die-casting. A general taper of 2 to 3 deg is required to allow extraction from the mold.

### Typical uses

Automotive wheels and cylinder heads, gearbox and clutch covers, transmission and differential housings, electric motor stators, transformer covers and heat sinks.

### The economics

Tooling cost range covers small, simple to large, complex

## Links

MaterialUniverse

Reference