

Metal Casting versus Forging Comparison Chart

Introduction:

There are many things to explore when choosing among a forging or casting process for your metal product(s). The chart below is intended to be used as a general guideline and should not be considered as 100% accurate information that cannot be deviated beyond what is listed in the table. All data is relative and may change based on your specific needs. For example, the "cost per piece" may be higher during a high volume production run due to the increased labor requirement. However, the "cost per piece" may actually be lower during a small volume production run after taking into account the cost of the tooling itself.

| | | Size Range | Surface Texture | Tooling Cost | Tolerances / Reproducibility (refer to DCTG table) | Cost per Piece | Potential for Internal Defects | Suited for High Volume Production | Processes ability to handle complex designs | Wide Range of Alloy Materials Used |
|-------------------------|--------------------------------|--------------------|-----------------|--------------|--|----------------|--------------------------------|-----------------------------------|---|------------------------------------|
| Metal Forging Processes | Open Die | 1 LB - 1000 LBS | Smooth | HIGHER | Approx. ±0.17" | MEDIUM | LOW | GOOD | GOOD | BEST |
| | Closed Die | < 200 LBS | Smooth | HIGHER | Approx. ±0.065" | MEDIUM | LOW | BEST | GOOD | BEST |
| Metal Casting Processes | Green Sand Mold | 1 LB - 2000 LBS | Rough | LOWER | DCTG 11 - DCTG 14 | HIGHER | MEDIUM | FAIR | BEST | BEST |
| | No-Bake Mold | 1 LB - 10000 LBS | Smooth | MEDIUM | DCTG 3 to DCTG 8 | MEDIUM | MEDIUM | GOOD | GOOD | BEST |
| | Resin Shell Mold | 1 LB - 10000 LBS | Smooth | HIGHER | DCTG 8 - DCTG 12 | MEDIUM | LOW | FAIR | GOOD | BEST |
| | Permanent Mold | 1 LB - 100 LBS | Fine | MEDIUM | DCTG 3 to DCTG 8 | MEDIUM | LOW | GOOD | GOOD | GOOD |
| | Die Cast | Approx. 75 LBS MAX | Fine | HIGHER | DCTG 3 to DCTG 8 | LOWER | HIGH | BEST | FAIR | FAIR |
| | Investment Cast (lost wax) | Approx. 75 LBS MAX | Fine | MEDIUM | DCTG 3 to DCTG 8 | HIGHER | MEDIUM | FAIR | BEST | BEST |
| | Expandable Pattern (lost foam) | 1 LB - 1000 LBS | Smooth | LOWER | DCTG 8 - DCTG 12 | MEDIUM | HIGH | GOOD | GOOD | GOOD |
| | Vacuum ("V") Process Mold | 1 LB - 2000 LBS | Fine | MEDIUM | DCTG 8 - DCTG 12 | HIGHER | LOW | FAIR | GOOD | GOOD |
| | Centrifugal Mold | 1 LB - 100 LBS | Fine | MEDIUM | DCTG 8 - DCTG 12 | MEDIUM | LOW | BEST | FAIR | GOOD |

DCTG Tolerance Details:

| | | Linear Dimensional Tolerance for Dimensional Casting Tolerance Grade (DCTG) per ISO 8062-3: 2007(E) | | | | | | | | | | | | | | |
|--|---------|---|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| Nominal dimensions related to the moulded part | | DCTG 1 | DCTG 2 | DCTG 3 | DCTG 4 | DCTG 5 | DCTG 6 | DCTG 7 | DCTG 8 | DCTG 9 | DCTG 10 | DCTG 11 | DCTG 12 | DCTG 13 | DCTG 14 | DCTG 15 |
| - | ≤ 10 | 0.09 | 0.13 | 0.18 | 0.26 | 0.36 | 0.52 | 0.74 | 1 | 1.5 | 2 | 2.8 | 4.2 | - | - | - |
| > 10 | ≤ 16 | 0.1 | 0.14 | 0.2 | 0.28 | 0.38 | 0.54 | 0.78 | 1.1 | 1.6 | 2.2 | 3 | 4.4 | - | - | - |
| > 16 | ≤ 25 | 0.11 | 0.15 | 0.22 | 0.3 | 0.42 | 0.58 | 0.82 | 1.2 | 1.7 | 2.4 | 3.2 | 4.6 | 6 | 8 | 10 |
| > 25 | ≤ 40 | 0.12 | 0.17 | 0.24 | 0.32 | 0.46 | 0.64 | 0.9 | 1.3 | 1.8 | 2.6 | 3.6 | 5 | 7 | 9 | 11 |
| > 40 | ≤ 63 | 0.13 | 0.18 | 0.26 | 0.36 | 0.5 | 0.7 | 1 | 1.4 | 2 | 2.8 | 4 | 5.6 | 8 | 10 | 12 |
| > 63 | ≤ 100 | 0.14 | 0.2 | 0.28 | 0.4 | 0.56 | 0.78 | 1.1 | 1.6 | 2.2 | 3.2 | 4.4 | 6 | 9 | 11 | 14 |
| > 100 | ≤ 160 | 0.15 | 0.22 | 0.3 | 0.44 | 0.62 | 0.88 | 1.2 | 1.8 | 2.5 | 3.6 | 5 | 7 | 10 | 12 | 16 |
| > 160 | ≤ 250 | - | 0.24 | 0.34 | 0.5 | 0.7 | 1 | 1.4 | 2 | 2.8 | 4 | 5.6 | 8 | 11 | 14 | 18 |
| > 250 | ≤ 400 | - | - | 0.4 | 0.56 | 0.78 | 1.1 | 1.6 | 2.2 | 3.2 | 4.4 | 6.2 | 9 | 12 | 16 | 20 |
| > 400 | ≤ 630 | - | - | - | 0.64 | 0.9 | 1.2 | 1.8 | 2.6 | 3.6 | 5 | 7 | 10 | 14 | 18 | 22 |
| > 630 | ≤ 1000 | - | - | - | - | 1 | 1.4 | 2 | 2.8 | 4 | 6 | 8 | 11 | 16 | 20 | 25 |
| > 1000 | ≤ 1600 | - | - | - | - | - | 1.6 | 2.2 | 3.2 | 4.6 | 7 | 9 | 13 | 18 | 23 | 29 |
| > 1600 | ≤ 2500 | - | - | - | - | - | - | 2.6 | 3.8 | 5.4 | 8 | 10 | 15 | 21 | 26 | 33 |
| > 2500 | ≤ 4000 | - | - | - | - | - | - | - | 4.4 | 6.2 | 9 | 12 | 17 | 24 | 30 | 38 |
| > 4000 | ≤ 6300 | - | - | - | - | - | - | - | - | 7 | 10 | 14 | 20 | 28 | 35 | 44 |
| > 6300 | ≤ 10000 | - | - | - | - | - | - | - | - | - | 11 | 16 | 23 | 32 | 40 | 50 |

* Dimensions in millimeters

These tolerance grades DCTGs are referenced in the castings and forging comparison chart.