

MIM Case Study—Banjo Fitting



Application: All-terrain vehicles brake system

Functional requirements: structurally intact; withstand 13.8 Mpa (2,000 PSI) pressure (proof test)

Competing technology: Machining

Overall size: Overall length 40 mm, bolt retain section 13.5 mm

I.D. 2.0 mm, wall thickness as thin as 0.7 mm

Part weight: 11.6 grams (barbed), 15.0 grams (straight)

Material: MIM-17-4 PH, H-1100 heat treat

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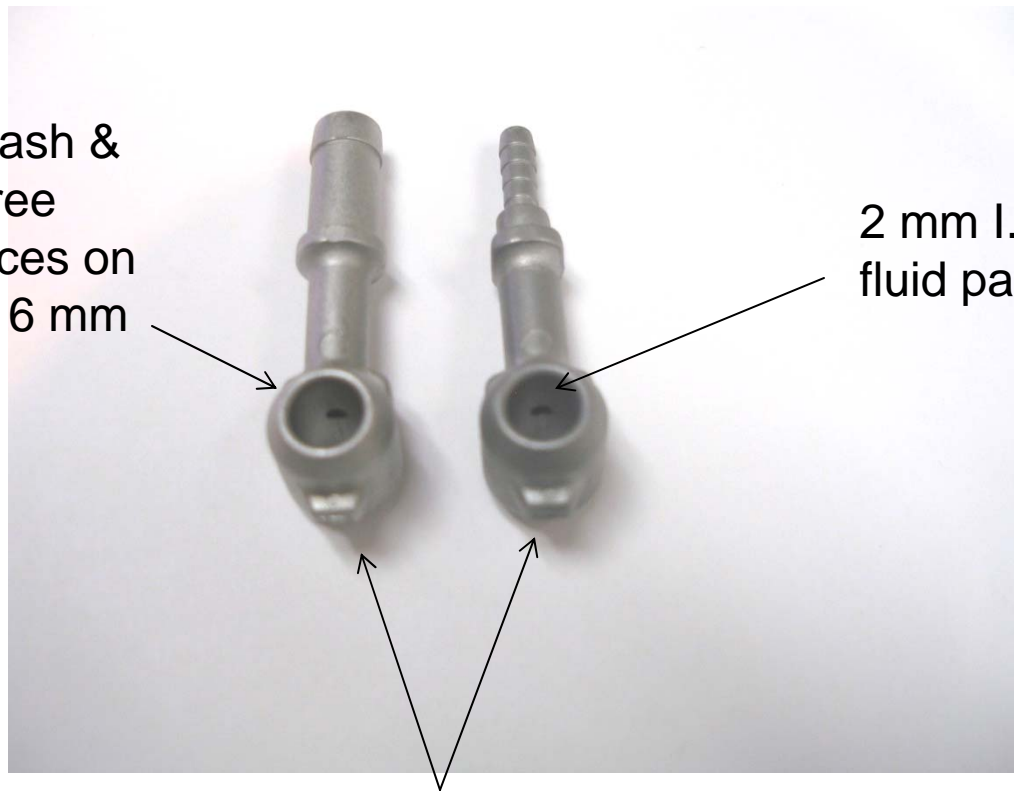
Key Requirements:

1. Hermetic at 2,000 psi
2. Free fluid passage in the 2 mm I.D.
3. Bolt sealing surfaces free of flash and parting line
4. Make both part types in same mold base
5. Reasonable corrosion resistance

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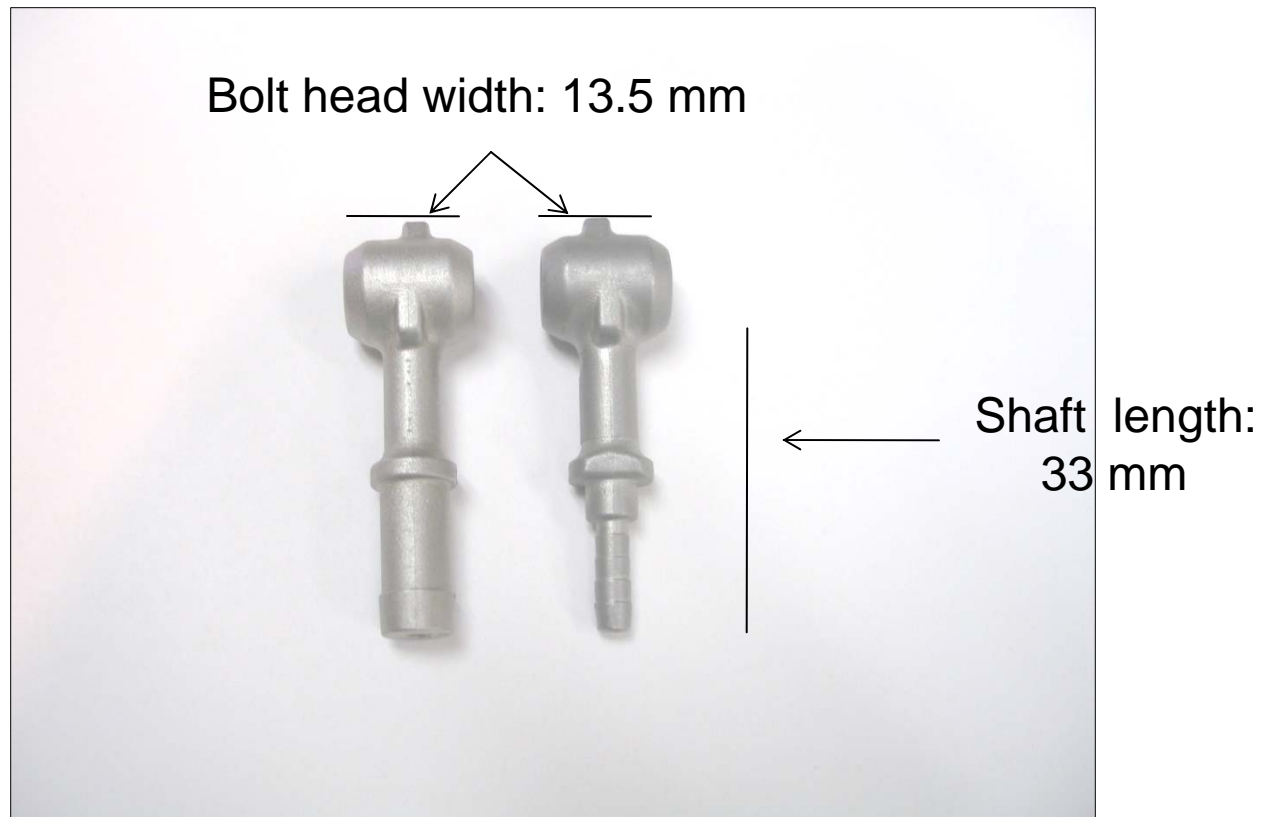
Contoured, flash & parting-line free sealing surfaces on both sides of 6 mm bolt hole

2 mm I.D. for hydraulic fluid passage



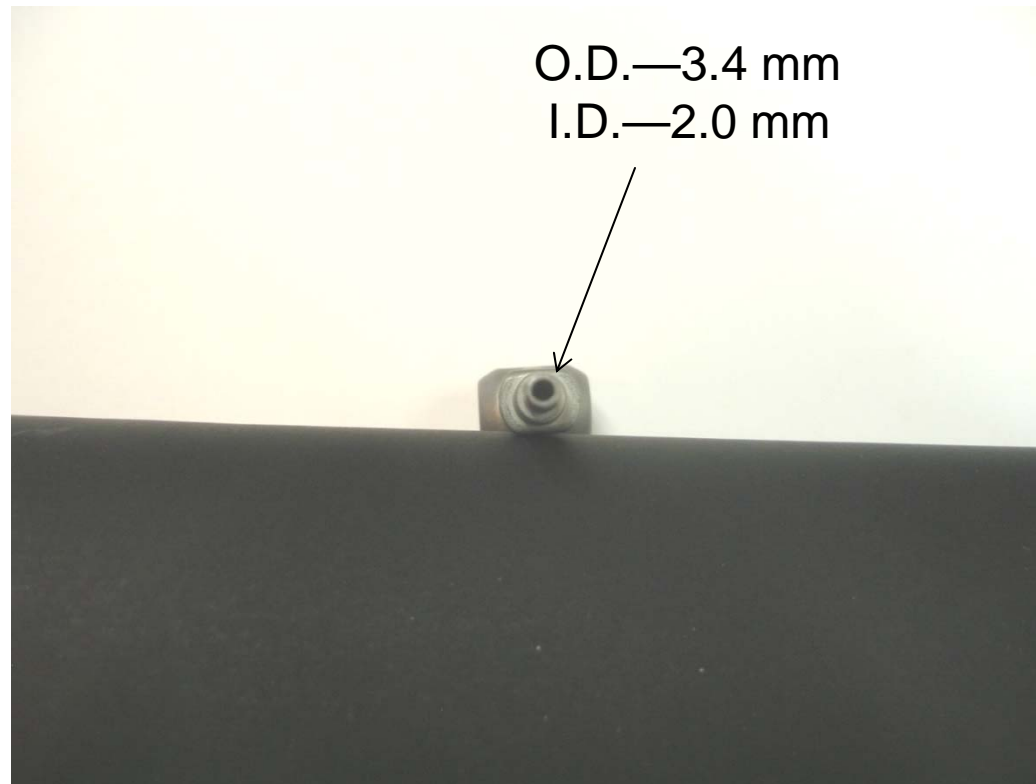
Gate

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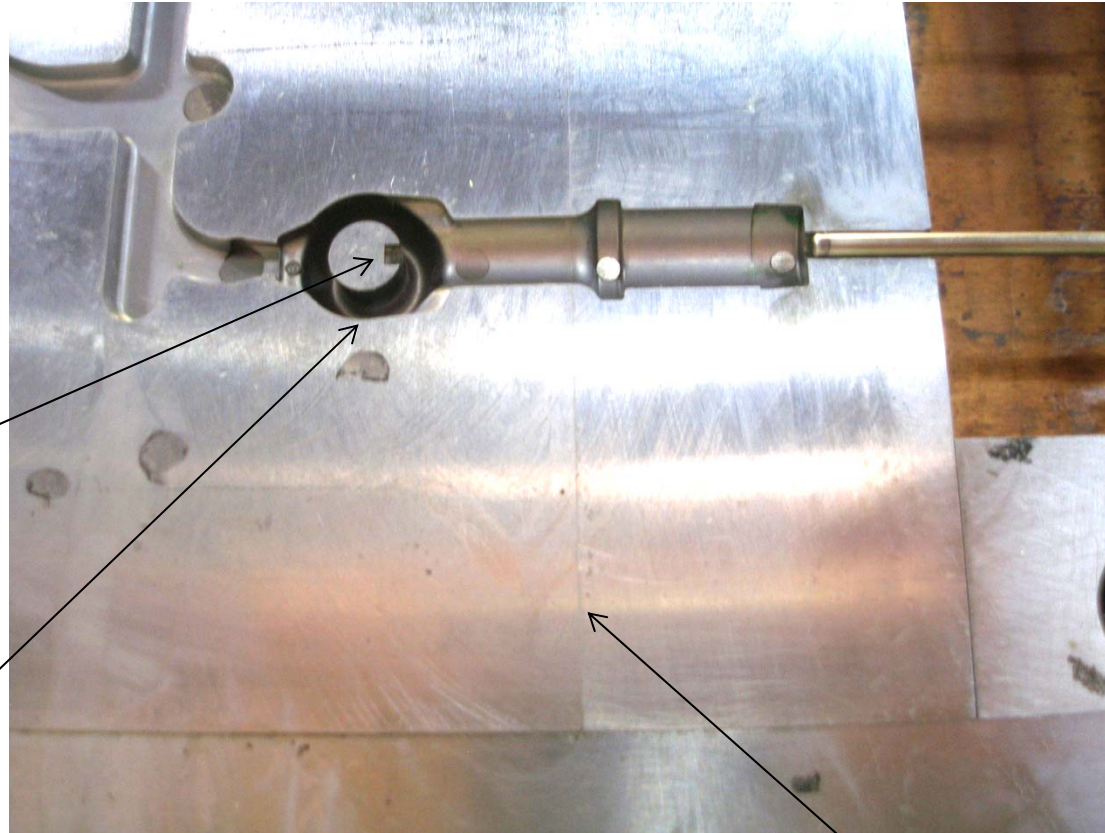


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Thin wall on barbed component needed to withstand 2,000 psi & maintain hermeticity



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Notch in 6 mm bolt I.D. pins (both sides of tool) captures 2 mm I.D. pin

Parting line in center of 6 mm bolt hole creates smooth surfaces for crush washers

Interchangeable tooling insert that allows both barbed & straight features to be molded

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- Why MIM?
 - 17-4 material more than adequate for strength & corrosion requirements
 - 2 mm I.D., difficult to machine, is straightforward for MIM (straightness not an issue)
 - Molded bolt hole surfaces create smooth mating surfaces for crush washers
 - Both part types easily made in the same tooling
 - MIM consistency created few problems in production

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- Conclusion
 - Application worked well for MIM
 - An example of how some of the “easy” attributes of MIM can be very useful to end users