

MACHINED INVESTMENT CASTING

APPLICATION

Oil and gas: Gas flow control systems

MATERIAL

ASTM A351 Gr. CF3M stainless steel

MANUFACTURING PROCESSES

Investment casting
Machining (CNC 3-axis horizontal)
Surface preparation (electro-polishing, cleaning)

REQUIRED TESTING

Material certification (ASTM)
Porosity detection (section/micro-polish)

TOLERANCES

General Tolerances

- Linear ± 0.010 in
- Angular $\pm 1^\circ$

Critical Tolerances

- Surface roughness 32 rms
 - Linear ± 0.005 in
 - Surface roughness 16 rms
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Gas Regulator Housing



Challenge: A manufacturer of gas flow control systems wanted to reduce costs by sourcing an intricately designed stainless steel regulator housing overseas. Measuring only 2.4 x 1.9 x 3.5 cm, this component presented a number of challenges. Its small size, tight tolerances and complex design required highly accurate casting and machining processes. Because it housed electronics and a sensitive optical flow device, the locations and dimensions of critical features were crucial to the part's functionality. Misalignment or the failure to meet the precise tolerances would cause the optical device to incorrectly measure the flow of gas and the control system would fail. Moreover, a metal-to-metal seal meant casting porosity had to be eliminated due to the potential for gas leaks.

Solution: Due to differences in the types of equipment typically available in China, the established manufacturing process used by domestic suppliers could not be duplicated overseas. UGS had to develop a new process for manufacturing the highly intricate component.

Gas Regulator Housing

Using our fully developed manufacturing base and in-country technical staff, we identified a partner who could provide high-quality castings and perform the complicated precision machining. Together we engineered a highly reliable gating and feeding system designed to ensure dimensional accuracy and eliminate porosity in the CF3M investment castings. We then developed a series of machining steps to meet the tight tolerances necessary for the regulator housing to properly function within the flow control system. We also identified a second partner to perform cleaning and electro-polishing.

Lastly, because this complex part includes multiple critical dimensions, threads and metal-to-metal fits, we developed and validated gauging and inspection processes to ensure compliance to the client's requirements.

In the end, UGS manufactured a high-quality product on time and with an overall cost savings of 30 percent.