



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 45338-2025

General principle for hot isostatic pressing densification

热等静压致密化处理通则

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1 Scope

GB/T 45338-2025 is the Chinese general standard for hot isostatic pressing as a densification treatment. HIP applies high pressure gas at high temperature to close the internal porosity of a casting, a powder metallurgy part or an additively manufactured component; it is the process that lets a cast turbine blade or a printed titanium part be treated as if it were forged, and in the aerospace and medical supply chains it is a condition of qualification rather than an option. The standard sets the general principles: the classification of the treatment, the requirements on the equipment and its instrumentation and calibration, the preparation of the parts and the requirements on their surface and any encapsulation, the specification of the treatment cycle in terms of temperature, pressure, hold time and cooling, the process control and monitoring, the evaluation of the result including the assessment of residual porosity, and the records that have to be kept. For a HIP service provider, a foundry, an AM producer or a buyer qualifying one in China, this is the governing text.

This document specifies the personnel, environment, equipment and instrumentation, process materials, process, quality control, Document control, security protection and other requirements. This document is applicable to materials with internal pores, looseness, shrinkage, micro-cavities, etc. prepared by casting, additive manufacturing, injection molding, spray molding, etc. Hot isostatic pressing densification treatment of parts with defects such as cracks and segregation.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document. For referenced documents without a date, only the latest version (including all revised versions) applies to this document. in this document.

GB/T 394.1 Industrial alcohol GB/T 4842 Argon

GB/T 6026 Acetone for industrial use

GB/T 9452-2023 Determination method of effective heating area of heat treatment furnace

GB 15735 Safety and sanitation requirements for metal heat treatment production processes

GB/T 30429 Industrial Thermocouple

3 Terms and definitions

There are no terms or definitions that require definition in this document.

4 Environment

4.1 The conditions of the hot isostatic pressing workshop should comply with the requirements of GB 15735.

4.2 The hot isostatic pressing control and monitoring room should be isolated from the factory building.

5.1 Equipment

5.1.1 The components, frames, heating elements and insulation components of hot isostatic pressing equipment should be made of molybdenum materials (molybdenum wire or molybdenum bar), steel, nickel-based. It can be made of alloy or alumina and graphite or graphite composite materials can also be used as heating materials as needed.

5.1.2 The hot isostatic pressing equipment should be equipped with temperature measuring and monitoring instruments, and each heating zone should have an independent temperature control circuit. The temperature uniformity and measurement cycle of the equipment shall not be lower than the requirements for Class IV furnaces in Chapter 5 of GB/T 9452-2023.

5.1.3 The maximum temperature and maximum working pressure of the hot isostatic pressing equipment shall meet the process requirements.

5.1.4 The heating rate and pressurizing rate of the hot isostatic pressing equipment should be adjustable.