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**Method for evaluation of blow
formability by bulging test on
metallic superplastic materials**

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from The Foundation of Osaka Science & Technology Center (OSTEC)/ Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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Method for evaluation of blow formability by bulging test on metallic superplastic materials

Introduction In the case of forming metallic superplastic thin sheet materials, the gas blow forming method using gas pressure is popularly practiced. This Japanese Industrial Standard has been prepared to test and evaluate the blow formability by forming a hemisphere shape through the bulging of the superplastic formings of the metallic superplastic thin sheet materials which are the object this Standard.

1 Scope This Standard specifies the test and evaluation methods of the blow forming with a superplastic bulge forming under the superplastic condition for metallic superplastic sheet materials of 3 mm or under in thickness.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) shall be applied.

JIS C 1602 *Thermocouples*

JIS H 7007 *Glossary of terms used in metallic superplastic materials*

JIS Z 8401 *Guide to the rounding of numbers*

JIS Z 8704 *Temperature measurement—Electrical methods*

3 Definitions For the purposes of this Standard, the definitions given in **JIS H 7007** and the following definitions apply:

- a) **mould forming bead**: the continuous concave and convex on the forming mould which is set so as not to decrease the gas pressure established during the forming.
- b) **forming pressure (P)**: the gas pressure to blow forming with a definite pressure (Pa).
- c) **forming temperature (T)**: the mould forming temperature (K) at forming.
- d) **thickness reducing rate at the peak (ε_t)**: percent of the peak thickness reducing rate to the original thickness at the stage of bulge forming to a hemisphere (%).
- e) **hemisphere forming period (τ)**: time required to reach the height equivalent to a hemisphere ($H \cong R$) at the specified gas pressure (min).

4 Testing equipment

4.1 Constitution of testing equipment The bulge forming test equipment shall consist of as follows (one example of the bulge forming test equipment is shown in Fig. 1):

- a) **Forming mould** Composed of the top and bottom moulds.

- b) **Heating apparatus** An apparatus to heat the forming mould and test specimen to reach the uniform temperature of forming.
- c) **Gas pressuring apparatus** An apparatus to develop the gas pressure while controlling the pressure at the bulge form testing.
- d) **Locking apparatus** An apparatus to develop the pressure in the forming mould.

Information : There is an up-blow (see Fig. 1) and down-blow in the direction of the gas pressure blow. In the case of down-blow forming, it is easily influenced by the effect of gravity, and it is preferable to apply up-blow forming for the material of a low forming resistance.

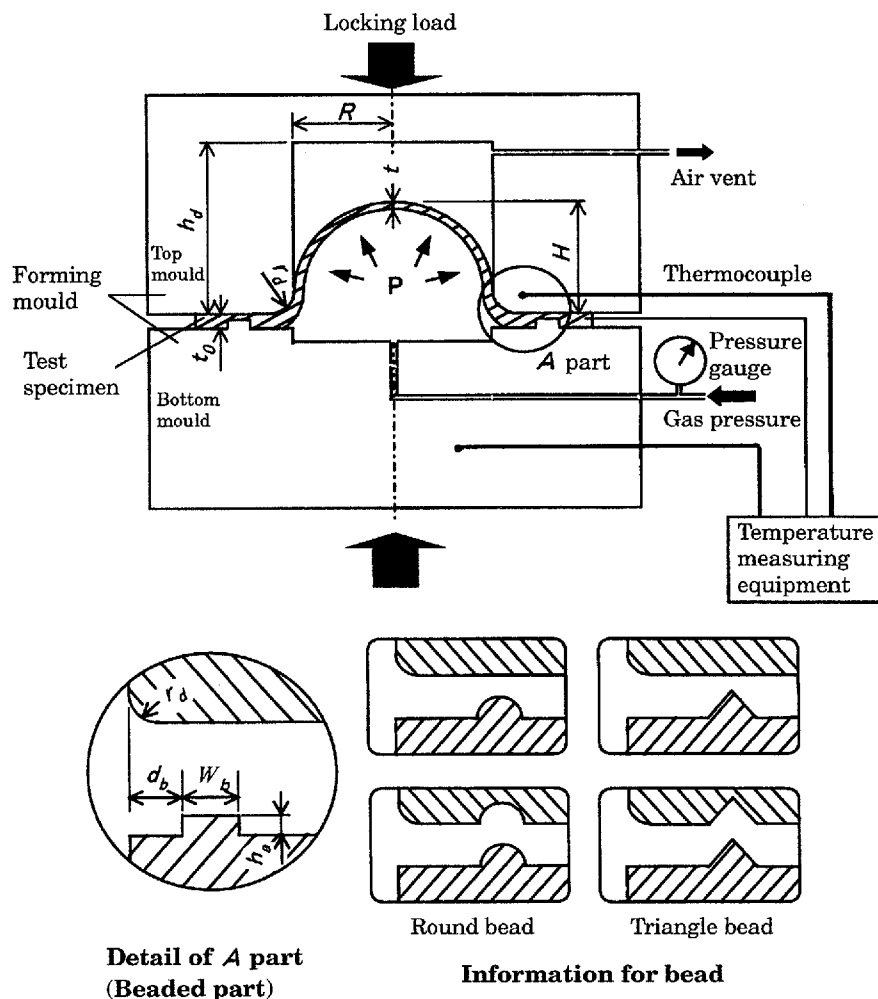


Fig. 1 Bulge forming test equipment (example)

R : the radius of forming mould	h_d : the depth of forming mould
r_d : the shoulder radius of forming mould	t_0 : the thickness of test piece (before forming)
H : the height of forming	t : the sheet thickness at the peak
w_b : the width of bead	h_b : the height of bead
d_b : the distance between the inner diameter of forming mould and the first bead	