

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS B 6901 : 1998

**Heat treatment furnaces of metals —
Test methods of effective working
zone and effective treating zone**

ICS 25.200

Descriptors : heating equipment, heat treatment, metalworking, thermal efficiency,
testing

Reference number : JIS B 6901 : 1998 (E)

Foreword

- 1 This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently JIS B 6901:1987 is replaced with JIS B 6901:1998.

In this revision, test method for effective working zone, holding temperature tolerances of heating equipment, etc. have been amended; and test method for effective treating zone of plasma heat treatment equipment, and holding temperature tolerances and judging methods for effective working zone and effective treating zone of heating equipment are added.

- 2 Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Date of Establishment: 1987-10-01

Date of Revision: 1998-03-20

Date of Public Notice in Official Gazette: 1998-03-20

Investigated by: Japanese Industrial Standards Committee

Divisional Council on Machine Elements

JIS B 6901 :1998, First English edition published in 1998-08

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 1998

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

Heat treatment furnaces of metals—Test methods of effective working zone and effective treating zone

1 Scope This Japanese Industrial Standard specifies the test methods for the effective working zone of the heat treatment furnaces of metals (hereafter referred to as “heat treatment furnaces”). As to the test methods for the effective treating zone of plasma heat treatment heating equipment, refer to the Annex 1. As to the holding temperature tolerances of heating equipment, refer to the Annex 2, and as to the judging methods on the effective working zone and effective treating zone, refer to the Annex. 3.

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 indicated below shall be applied.

JIS B 6905	<i>Heat treatment for metal products—Vocabulary</i>
JIS C 1602	<i>Thermocouples</i>
JIS C 1605	<i>Mineral insulated thermocouples</i>
JIS C 1610	<i>Extension and compensating cables for thermocouples</i>
JIS Z 8704	<i>Temperature measurement—Electrical methods</i>

3 Definitions For the purposes of this Standard, the definitions given in JIS B 6905 and the following definitions apply.

- a) **materials to be processed** The parts or materials to be subjected to processing. The parts mean the metallic products of mechanical parts, jigs, tools, moulds, etc. made of iron and steel and nonferrous metal. The materials mean the metallic material and semi-products by rolling, casting and forging.
- b) **target temperature** That temperature to be determined according to the types of heat treatment and material to be processed, as the heating target of the material to be processed.
- c) **holding temperature** When the material to be processed is to be heated, the temperature of the material to be processed or either of heating atmosphere or hot bath, during a necessary duration is being maintained, often the target temperature has been attained.
- d) **effective working zone of heating equipment** That charging region in a heating equipment capable of holding the materials to be processed within a permissible range of temperature.
- e) **effective treating zone of plasma equipment** In a heating equipment of plasma heat treatment, that charging region which has been established by the temperature measurement of similar shaped article in advance, in order to be capable of holding within a permissible range of temperature required for the heating temperature, according to the purposes of the heat treatment, allowing the material to be processed to generate uniform discharge.

- f) **no load test** That test to carry out the temperature measurement of the effective working zone, without charging the material to be processed into the heating equipment.
- g) **load test** That test to carry out the temperature measurements of the effective working zone and effective treating zone, by charging the materials to be tested or those in lieu of these into the heating equipment.
- h) **heating equipment** In a heat treatment furnace of metals, that equipment to heat the material to be processed, in order to carry out the heat treatment.

4 Grades of temperature measuring systems The grades of the temperature measuring systems shall be in accordance with Table 1, according to the classes of holding temperature tolerances specified in Annex 2.

Table 1 Grades of temperature measuring systems

Class of holding temperature tolerances	Grade of temperature measuring system
1	As agreed between the parties concerned
2	Grade A or grade B
3	
4	
5	
6	Grade A, grade B or grade C
7	

Remarks : The grades of temperature measuring systems using thermocouples shall be Grade A : $\pm 1^\circ\text{C}$, Grade B : $\pm 0.5\%$ of measuring range and Grade C : $\pm 1\%$ to 1.5% of measuring range in accordance with **JIS Z 8704**.

5 Temperature measuring equipments

5.1 Constitution The temperature measuring equipment shall be constituted of a thermocouple or a detector composed of this and compensating conductors, potentiometer, measuring instrument of digital voltmeter on the like, standard conductors and change-over switch.

5.2 Detectors The detectors shall be in accordance with the following:

- a) **thermocouple** The thermocouple shall be selected from Tables 2 and 3 according to the tolerances of target temperature and holding temperature. The normal limit and reference thermoelectromotive force of thermocouples shall be in accordance with the provisions of **JIS C 1602** and **JIS C 1605**.

Table 2 Thermocouples

Unit : °C

Type	Temperature range	Class	Tolerances
B	600 or over to and excluding 1 700	2	$\pm 0.0025 \cdot [t]$
	600 or over to and excluding 800	3	± 4
	800 or over to and excluding 1 700		$\pm 0.005 \cdot [t]$
R	0 or over to and excluding 1 100	1	± 1
	0 or over to and excluding 600	2	± 1.5
	600 or over to and excluding 1 600		$\pm 0.0025 \cdot [t]$
N K	-40 or over to and excluding +375	1	± 1.5
	375 or over to and excluding 1 000		$\pm 0.004 \cdot [t]$
	-40 or over to and excluding +333	2	± 2.5
	333 or over to and excluding 1 200		$\pm 0.0075 \cdot [t]$

Remarks 1 **JIS C 1602** shall be referred to.

2 “t” indicates the measuring temperature.

Table 3 Metal sheathed thermocouple

Unit : °C

Type	Temperature range	Class	Tolerances
SN SK	-40 or over to and excluding +375	1	± 1.5
	375 or over to and excluding 1 000		$\pm 0.004 \cdot [t]$
	-40 or over to and excluding +333	2	± 2.5
	333 or over to and excluding 1 200		$\pm 0.0075 \cdot [t]$

Remarks 1 **JIS C 1605** shall be referred to.

2 t indicates the measuring temperature.

- b) **compensating lead wires** The compensating lead wires shall be selected from Table 4 according to the measuring environments.

Table 4 Compensating lead wires

Type of combined thermocouple	Type of compensating lead wire	Using division (symbol)	Compensating contact temperature °C	Class	Tolerances of compensating lead wire (μV)
B	BC	General use (G)	0 to +100	—	—
R	RCA	General use (G)	0 to +100	2	± 30
	RCB	Heat resisting use (H)	0 to +200		± 60
K	KX	General use (G)	-25 to +200	1	± 60
		Heat resisting use (H)		2	± 100
N	NC	General use (G)	0 to +150	2	± 100

Remarks 1 **JIS C 1610** shall be referred to.

2 As to the use of other compensating lead wire than given in Table 4, it shall be as agreed between the parties concerned.

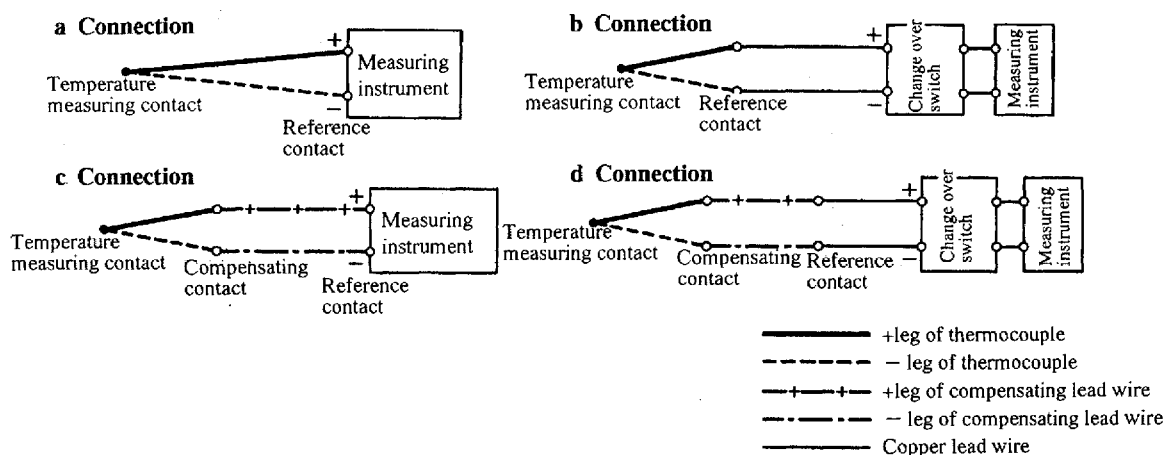
5.3 Measuring instruments The Types of measuring instruments shall be as specified in **10.5 (Measuring instruments)** of **JIS Z 8704**.

5.4 Reference contact The reference contact shall be as specified in **10.3 (Reference contact)** of **JIS Z 8704**.

5.5 Changeover switch The changeover switch shall be that of being used for changing over when the temperature at several places are to be measured by means of one set of measuring instrument, and be that of an appropriate structure of manual or automatic.

5.6 Connection system of measuring circuit The connection system of the measuring circuit by the thermocouple, measuring instrument, reference contact, change over switch, copper lead wire and compensating lead wire shall be a, b, c or d connection of Fig. 1.

Remarks : The changeover switch may be omitted (See Fig. 1 of **JIS Z 8704**).

**Fig. 1 Connection system of measuring circuit**