

JIS

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS Z 3881 : 2014

(JRJI)

**Standard qualification procedure for gas
pressure welding technique of steel bars
for concrete reinforcement**

ICS 25.160.01

Reference number : JIS Z 3881 : 2014 (E)

Z 3881 : 2014

Date of Establishment: 1972-08-27

Date of Revision: 2014-06-25

Date of Public Notice in Official Gazette: 2014-06-25

Investigated by: Japanese Industrial Standards Committee
Standards Board
Technical Committee on Welding

JIS Z 3881 : 2014, First English edition published in 2016-05

Translated and published by: Japanese Standards Association
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Printed in Japan

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry and the Minister of Land, Infrastructure, Transport and Tourism through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Reinforcing Bar Joints Institute (JRJI) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS Z 3881:2009** is replaced with this Standard.

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Standard qualification procedure for gas pressure welding technique of steel bars for concrete reinforcement

1 Scope

This Japanese Industrial Standard specifies the standard qualification procedure for gas pressure welding technique of steel bars for concrete reinforcement (hereafter referred to as “reinforcing bars”) specified in **JIS G 3112**, which are heated with oxygen/gas flame and jointed with mechanical pressure, using manual gas pressure welding, automatic gas pressure welding and gas pressure welding by hot trimming.

2 Normative references

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

JIS B 6801 *Manual blowpipes for welding, cutting and heating*

JIS G 3112 *Steel bars for concrete reinforcement*

JIS K 1101 *Oxygen*

JIS K 1902 *Dissolved acetylene*

JIS Z 2248 *Metallic materials — Bend test*

JIS Z 3001-1 *Welding and allied processes — Vocabulary — Part 1 : General*

JIS Z 3001-2 *Welding and allied processes — Vocabulary — Part 2 : Welding processes*

JIS Z 3120 *Method and acceptance criteria of test for gas pressure welded joint of steel bars for concrete reinforcement*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS Z 3001-1**, **JIS Z 3001-2**, **JIS Z 3120**, and the following apply.

3.1 test material

steel bar for concrete reinforcement, prepared for a given test

3.2 test piece

material subjected to gas pressure welding, or pressure weld subjected to hot trimming

3.3 bend test piece

pressure weld processed to the specified dimensions or that subjected to hot trimming

so that it can be used for bend test

4 Classification, type and targeted reinforcing bar of performance qualification

4.1 Classification of performance qualification

Performance qualification shall be classified into three categories, i.e. manual gas pressure welding, automatic gas pressure welding, and gas pressure welding by hot trimming.

4.2 Type and targeted reinforcing bar of performance qualification

The performance qualification comprises four types : 1, 2, 3 and 4. Targeted reinforcing bars of individual types are as given in Table 1.

Table 1 Type and targeted reinforcing bar of performance qualification

Type of performance qualification	Targeted reinforcing bar of gas pressure welding	
	Classification of reinforcing bar	Diameter of reinforcing bar
Type 1	SR235, SR295, SD295A, SD295B, SD345 and SD390 specified in JIS G 3112	Diameter 25 mm or under Nominal designation D25 or under
Type 2		Diameter 32 mm or under Nominal designation D32 or under
Type 3	SR235, SR295, SD295A, SD295B, SD345, SD390 and SD490 specified in JIS G 3112	Diameter 38 mm or under Nominal designation D38 or under
Type 4		Diameter 50 mm or under Nominal designation D51 or under

5 Test methods

Performance qualification shall consist of appearance test and bend test.

6 Preparation of test pieces

6.1 Preparation method of test pieces

The preparation method of test pieces according to the classification and type of performance qualification shall be as given in Table 2.

Table 2 Preparation method of test pieces according to the classification and type of performance qualification

Classification of performance qualification	Type of performance qualification	Preparation method of test pieces
Manual gas pressure welding	Types 1, 2, 3 and 4	Manual gas pressure welding
Automatic gas pressure welding	Types 2, 3 and 4	Automatic gas pressure welding
Gas pressure welding by hot trimming	Types 1, 2, 3 and 4	Gas pressure welding by hot trimming

6.2 Type of test material

Steel bars to be used for test materials shall be of grades SD345 and SD390 specified in JIS G 3112.

6.3 Quantity of test materials

Designation, classification, length and number of test materials shall be as given in Table 3, to be sorted out according to the classification and type of performance qualification.

Table 3 Designation, classification, length and number of test materials

Classification of performance qualification	Type of performance qualification	Designation	Classification	Length mm	Number		(informative) Number of test pieces to be prepared	
Manual gas pressure welding	Type 1	D25	SD345	250±10	10		5	
	Type 2	D32	SD390	300±10	10		5	
	Type 3	D38		300±10	10		5	
	Type 4	D51		350±10	10		5	
Automatic gas pressure welding	Type 2	D25	SD345	250±10	4	Total 8	2	Total 4
		D32	SD390	300±10	4		2	
	Type 3	D25	SD345	250±10	4	Total 12	2	Total 6
		D32	SD390	300±10	4		2	
		D38		300±10	4		2	
	Type 4	D25	SD345	250±10	4	Total 16	2	Total 8
		D32	SD390	300±10	4		2	
		D38		300±10	4		2	
D51			350±10	4	2			
Gas pressure welding by hot trimming	Type 1	D25	SD345	250±10	10		5	
	Type 2	D32	SD390	300±10	10		5	
	Type 3	D38		300±10	10		5	
	Type 4	D51		350±10	10		5	

7 Gases to be used for test

Gases to be used for test shall be of quality meeting the specifications in **JIS K 1101** for oxygen, or **JIS K 1902** for acetylene. Any other gases shall be of appropriate quality for gas pressure welding.

8 Gas pressure welding apparatus

8.1 Manual gas pressure welding apparatus

Manual gas pressure welding apparatus and its accessories shall be as follows.

- a) For pressurizer, use an electric pump which can apply at least 30 MPa of pressure on nominal cross-sectional area of a test material.
- b) Use a heating blowpipe in accordance with **JIS B 6801**.

8.2 Automatic gas pressure welding apparatus

Automatic gas pressure welding apparatus and its accessories shall be as follows.

- a) Use the apparatus which can automatically control processes of heating, pressure application, and burner operations.
- b) For pressurizer, use an electric pump which can apply at least 30 MPa of pressure on nominal cross-sectional area of a test material.
- c) Use a heating blowpipe in accordance with **JIS B 6801**.

8.3 Apparatus for gas pressure welding by hot trimming

Apparatus for gas pressure welding by hot trimming and its accessories shall be as follows.

- a) Use the apparatus whose gas pressure welder has a shearing blade to remove the convex of the weld immediately after the pressure welding.
- b) For pressurizer, use an electric pump which can apply at least 30 MPa of pressure on nominal cross-sectional area of a test material.
- c) Use a heating blowpipe in accordance with **JIS B 6801**.

9 Assessment

9.1 Appearance test

9.1.1 Implementation

The appearance test shall be carried out on all test pieces.

9.1.2 Items to be assessed

The following items shall be inspected visually or measured.

- a) **Items to be assessed in manual and automatic gas pressure welding**
 - 1) Shape of convex on the pressure weld (diameter and length)
 - 2) Position of pressured surface of the pressure weld (displacement of the surface)

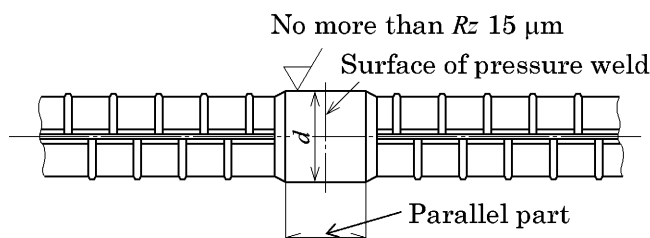
- 3) Deformation of the pressure weld (eccentricity, bending and partial convex)
 - 4) State of the surface of convex on the pressure weld (significant sagging, cratering, cracking by overheating)
- b) **Items to be assessed in gas pressure welding by hot trimming**
- 1) Shape of pressure weld after trimming (length of convex)
 - 2) State of surface of pressure weld after trimming (cracking, cratering, surface irregularity by overheating at the position corresponding to the surface of the pressure weld)

9.2 Bend test

9.2.1 Preparation of bend test pieces

From test pieces made by manual or automatic gas pressure welding, the bend test pieces shall be prepared to the dimensions given in Table 4. The surface roughness at the parallel parts of bend test pieces shall be no more than $Rz\ 15\ \mu\text{m}$. The test pieces made by gas pressure welding by hot trimming shall be used directly as bend test pieces.

Table 4 Dimensions of bend test piece in manual and automatic gas pressure welding



Designation of bend test piece	Length of bend test piece mm	Diameter at parallel part d mm
D25	450 or more	28.0 ± 0.1
D32	500 or more	35.0 ± 0.1
D38	500 or more	42.0 ± 0.1
D51	600 or more	56.0 ± 0.1

9.2.2 Number of bend test pieces

The number of bend test pieces shall be specified according to the classification and type of performance qualification, and shall be as given in Table 5.

Table 5 Number of bend test pieces

Classification of performance qualification	Type of performance qualification	Designation of bend test piece	Number of bend test pieces	
Manual gas pressure welding	Type 1	D25	5	
	Type 2	D32	5	
	Type 3	D38	5	
	Type 4	D51	5	
Automatic gas pressure welding	Type 2	D25	2	Total 4
		D32	2	
	Type 3	D25	2	Total 6
		D32	2	
		D38	2	
	Type 4	D25	2	Total 8
		D32	2	
		D38	2	
		D51	2	
	Gas pressure welding by hot trimming	Type 1	D25	5
Type 2		D32	5	
Type 3		D38	5	
Type 4		D51	5	

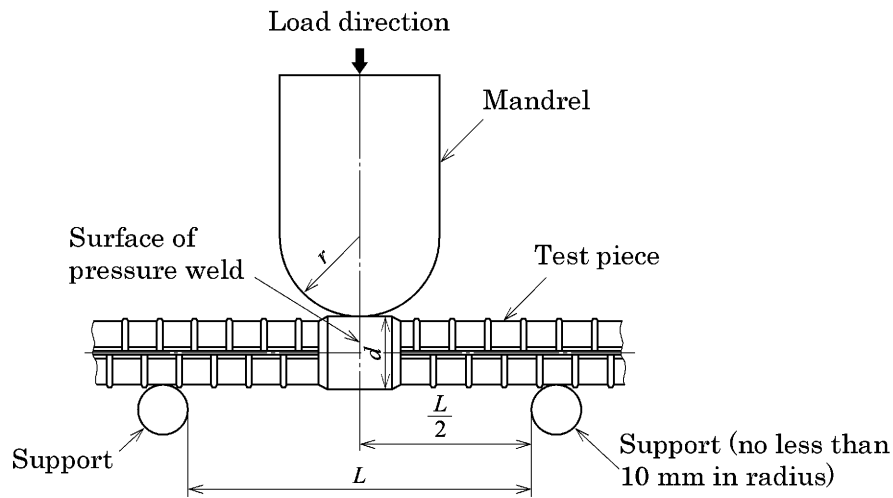
9.2.3 Procedures

The procedures of bend test shall be as specified in **JIS Z 2248**. The bending angle shall be 90°.

In the bend test, the surface of pressure weld shall be placed halfway between two supports.

9.2.4 Bend test jig

The bend test jig shall be as shown in Figure 1. The bending radius shall be as given in **JIS G 3112**.



$$L = 2r + 3d$$

where, L : distance between two supports (mm)
 r : bending radius (mm)
 d : diameter at parallele part (mm)

Figure 1 Bend test jig

10 Acceptance criteria

In performance qualification, it is required to pass the following appearance test and bend test.

- a) **Appearance test** Test pieces shall be deemed to have passed the appearance test when all of them are free from significant defects in their appearance.
- b) **Bend test** Test pieces shall be deemed to have passed the bend test when all of them are free from fracture on the surface of the pressure weld when bent up to the angle specified in 9.2.3.

Errata for JIS (English edition) are printed in *Standardization and Quality Control*, published monthly by the Japanese Standards Association, and also provided to subscribers of JIS (English edition) in *Monthly Information*.

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