

JIS

JAPANESE INDUSTRIAL STANDARD

**Method of Welding Procedure
Qualification Test for
Stainless-Clad Steel**

JIS Z 3043—1990

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In the event of any doubt arising,
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Method of Welding Procedure Qualification
Test for Stainless - Clad Steel

Z 3043-1990

1. Scope

This Japanese Industrial Standard specifies the testing methods for preliminarily qualifying whether or not the welding procedure used is proper in the butt welding of stainless-clad steels specified in JIS G 3601 (excluding overlay clad steels; hereinafter referred to as the "clad steels").

Remark: The unit and numerical values shown in { } in this Standard are based on the International System of Units (SI) and are appended for informative reference.

Further, those parts in this Standard showing the conventional unit and numerical values followed by the SI unit and numerical values based thereon shown in { } shall be replaced with the unit and numerical values shown in { } or with the unit and numerical values specified in Annex on and after January 1, 1991.

2. Definition

The definitions of the main terms used in this Standard shall be as specified in JIS Z 3001 and JIS G 0601.

3. Qualification Items for Welding Procedure

3.1 Objects of Qualification Items by Kind of Clad Steels

3.1.1 Clad Steel Class 1 The object of welding procedure qualification items shall be the combination of base metal and cladding metal.

3.1.2 Clad Steel Class 2 The object of welding procedure qualification items shall be either of the following (1) or (2).

- (1) Combination of base metal and cladding metal.
- (2) Base metal only. However, the object of welding procedure qualification items for the cladding metal side shall be decided by agreement between the parties concerned.

3.2 Classification of Qualification Items The qualification test shall be performed for each different combination of those divisions specified in the respective items of 3.3 to 3.14.

3.3 Classification of Welding Processes The classification of welding processes shall be as shown in Table 1. Where two or more welding processes are used in combination in a welding procedure for base metal and cladding metal, that combination shall be taken as one division.

Applicable Standards: See pages 33 to 35.

Table 1. Classification of Welding Processes

Classification of welding process	Kind		Remark
A	Shielded metal arc welding		Manual
U	Submerged arc welding		Manual
T	TIG welding		Manual, semiauto- matic, automatic
M	MIG welding		Semiautomatic, automatic
C	MAG welding (including CO ₂ gas arc welding)		Semiautomatic, automatic
S	Other weldings	Strip electrode welding, self-shielded arc welding, gas welding, electroslag welding, electrogas arc welding, plasma arc welding, electron beam welding, etc.	Classification shall be made into division for each kind of welding process.

3.4 Classification of Base Metals and Cladding Metals The classification of base metals and cladding metals shall be made based on the P-number in Table 2, and for other metals than in Table 2, classification shall be made by the combination of the kinds of base metal and cladding metal and their composition.

Further, the respective divisions of base metal and cladding metal shall be combined and each combination shall be taken as one division.

3.5 Classification of Welding Materials

3.5.1 Classification of Covered Electrodes The classification of covered electrodes shall be made as in Table 3, and for others, the kind of electrode and its composition shall be combined to make one division.

Further, the combination of respective electrodes for base metal and cladding metal shall be taken as one division.

3.5.2 Classification of Welding Wires and Covered Electrodes The classification of gas shielded arc welding wires and covered electrodes shall be as shown in Table 4, and the classification of submerged arc welding wires shall be as shown in Table 5. For other than in Tables 4 and 5, classification shall be made according to the combination of the kinds of welding wire and covered electrode and the composition.

Further, the combination of the welding wire and covered electrode for welding the base metal and those for welding cladding metal shall be taken as one division.

3.5.3 Classification of Strip Electrode Welding Materials The classification of strip electrode welding materials shall be as shown in Table 6. For others than in Table 6, classification shall be made according to the combination of the kind of such electrode and the composition.

Table 2. Classification of Base Metals and Cladding Metals
(Applicable up to December 31, 1990)

Classification of base metal		Kind	Material symbol (examples)			Shape
P-number	Gr-number		Alloy composition	Class symbol	JIS number	
1	1	Among carbon steels, those with minimum tensile strengths of less than 49 kgf/mm ² {480 N/mm ² } specified in JIS.	C series	SS 41 SM 41 A	JIS G 3101 JIS G 3106	Steel plate
			C-Si series	SB 42, SB 46	JIS G 3103	
			C-Mn-Si series	SM 41 B, SM 41 C SPV 24 SGV 42, SGV 46 SLA 24 A, SLA 24 B, SLA 33 A, SLA 33 B	JIS G 3106 JIS G 3115 JIS G 3118 JIS G 3126	
			C-Mn-Si-Cu -Cr-(Ni) series	SMA 41 AW, SMA 41 BW, SMA 41 CW, SMA 41 AP, SMA 41 BP, SMA 41 CP	JIS G 3114	
			C-Si series	SF 40 A, SF 45 A SFVC 1	JIS G 3201 JIS G 3202	
			C-Mn-Si series	SFL 1	JIS G 3205	Forged steel

Table 2. (Continued)

Classification of base metal		Kind	Material symbol (examples)			Shape
P-number	Gr-number		Alloy composition	Class symbol	JIS number	
1	2	Among carbon steels, those with minimum tensile strengths of 49 kgf/mm ² {480 N/mm ² } or over to and excl. 56 kgf/mm ² {550 N/mm ² } specified in JIS.	C-Mn-Si series	SB 49 SM 50 A, SM 50 B, SM 50 C, SM 53 B, SM 53 C, SM 50 YA, SM 50 YB SPV 32, SPV 36 SGV 49 SLA 37	JIS G 3103 JIS G 3106 JIS G 3115 JIS G 3118 JIS G 3126	Steel plate
			C-Mn-Si-Cu -Cr-(Ni) series	SMA 50 AW, SMA 50 BW, SMA 50 CW, SMA 50 AP, SMA 50 BP, SMA 50 CP	JIS G 3114	
			C-Si series	SF 50 A SFVC 2 A, SFVC 2 B	JIS G 3201 JIS G 3202	
1	3	Among carbon steels, those with minimum tensile strengths of 56 kgf/mm ² {550 N/mm ² } or over specified in JIS.	C-Mn-Si series	SFL 2	JIS G 3205	Forged steel
			C-Mn-Si series	SM 58 SPV 46, SPV 50	JIS G 3106 JIS G 3115	
3	1	Heat-resistant low alloy steels	C-1/2 Mo series	SB 46 M	JIS G 3103	Steel plate
			1/2 Cr-1/2 Mo series	SCMV 1 1	JIS G 4109	

Table 2. (Continued)

Classification of base metal		Kind	Material symbol (examples)			Shape
P-number	Gr-number		Alloy composition	Class symbol	JIS number	
3	2	Among heat-resistant low alloy steels, those with minimum tensile strengths of 49 kgf/mm ² {480 N/mm ² } or over to and excl. 56 kgf/mm ² {550 N/mm ² } specified in JIS.	C-1/2 Mo series	SB 49 M	JIS G 3103	Steel plate
			Mn-1/2 Mo series	SBV 1 A	JIS G 3119	
			Mn-Si-Cu-Mo series	SEV 25, 30	JIS G 3124	
			1/2 Cr-1/2 Mo series	SCMV 1 2	JIS G 4109	
			C-1/2 Mo series	SFVA F 1	JIS G 3203	Forged steel
3	3	Among heat-resistant low alloy steels, those with minimum tensile strengths of 56 kgf/mm ² {550 N/mm ² } or over specified in JIS.	3/4 Cr-1/2 Mo series	SFVA F 2	JIS G 3203	
			Mn-1/2 Mo series	SBV 1 B SQV 1 A, SQV 1 B	JIS G 3119 JIS G 3120	Steel plate
			Mn-1/2 Mo-1/2 Ni series	SBV 2 SQV 2 A, SQV 2 B	JIS G 3119 JIS G 3120	
			Mn-1/2 Mo-3/4 Ni series	SBV 3 SQV 3 A, SQV 3 B	JIS G 3119 JIS G 3120	
			Mn-Si-Cu-Mo series	SEV 35	JIS G 3124	

Table 2. (Continued)

Classification of base metal		Kind	Material symbol (examples)			Shape
P-number	Gr-number		Alloy composition	Class symbol	JIS number	
3	3	Among heat-resistant low alloy steels, those with minimum tensile strengths of 56 kgf/mm ² {550 N/mm ² } or over specified in JIS.	3/4 Ni-1/2 Mo -1/4 Cr-V series	SFVQ 1 A, SFVQ 1 B	JIS G 3204	Forged steel
			3/4 Ni-1/2 Mo -1/3 Cr-V series	SFVQ 2 A	JIS G 3204	
			1/2 Ni-1/4 Cr -0.6 Mo series	SFVQ 2 B	JIS G 3204	
			3·1/2 Ni-1·3/4 Cr-1/2 Mo series	SFVQ 3	JIS G 3204	
			1 Cr-1/2 Mo series	SCMV 2 1 to 2	JIS G 4109	
4	1	Heat-resistant low alloy steels	1·1/4 Cr-1/2 Mo series	SCMV 3 1 to 2	JIS G 4109	Steel plate
			1 Cr-1/2 Mo series	SFVA F 12	JIS G 3203	
			1·1/4 Cr-1/2 Mo series	SFVA F 11 A, SFVA F 11 B	JIS G 3203	

Table 2. (Continued)

Classification of base metal		Kind	Material symbol (examples)			Shape
P-number	Gr-number		Alloy composition	Class symbol	JIS number	
5	1	Heat-resistant low alloy steels	2-1/4 Cr-1 Mo series	SCMV 4 1 to 2	JIS G 4109	Steel plate
			3 Cr-1 Mo series	SCMV 5 1 to 2	JIS G 4109	
			2-1/4 Cr-1 Mo series	SFVA F 22 A, SFVA F 22 B	JIS G 3203	Forged steel
			3 Cr-1 Mo series	SFVA F 21 A, SFVA F 21 B	JIS G 3203	
5	2	Heat-resistant low alloy steels	5 Cr-1 Mo series	SCMV 6 1 to 2	JIS G 4109	Steel plate
			5 Cr-1 Mo series	SFVA F 5 A, SFVA F 5 B, SFVA F 5 C, SFVA F 5 D	JIS G 3203	Forged steel
			9 Cr-1 Mo series	SFVA F 9	JIS G 3203	
7	-	Ferrite series stainless steel	SUS 410 S SUS 405, SUS 410 L, SUS 429, SUS 430, SUS 430 LX, SUS 434, SUS 436 L, SUS 444, SUS 447 J1, SUS XM 27	JIS G 4304 JIS G 4305	Steel plate	
			SUS 201, SUS 202, SUS 301, SUS 301 J1, SUS 302, SUS 302 B, SUS 304, SUS 304 L, SUS 304 N1, SUS 304 N2, SUS 304 LN, SUS 305, SUS 309 S, SUS 310 S, SUS 316, SUS 316 L, SUS 316 J1L, SUS 317, SUS 317 L, SUS 317 J1, SUS 321, SUS 347, SUS XM 15 J1, SUS 329 J1, SUS 329 J2L	JIS G 4304 JIS G 4305		
8	1	Austenite series stainless steel				

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Table 2. (Continued)

Classification of base metal		Kind	Material symbol (examples)			Shape
P-number	Gr-number		Alloy composition	Class symbol	JIS number	
8	2	Austenite- ferrite series stainless steel	SUS 329 J1 SUS 329 J2L		JIS G 4304 JIS G 4305	Steel plate

Table 3. Classification of Covered Electrodes
(Applicable up to December 31, 1990)

Classification of covered electrode	Kind	Symbol of welding material (examples)	
		Class symbol	JIS number
F-1-(1)	Covered electrodes used for mild steel and steels of 50 kgf/mm ² {490 N/mm ² } grade, excluding low-hydrogen series.	D 4301, D 4303, D 4311, D 4313, D 4324, D 4327 D 5001, D 5003	JIS Z 3211 JIS Z 3212
F-1-(2)	Covered electrodes used for mild steel and steels of 50 kgf/mm ² {490 N/mm ² } grade, of low-hydrogen series.	D 4316, D 4326 D 5016, D 5026, D 5316, D 5326	JIS Z 3211 JIS Z 3212
F-1-(3)	Covered electrodes used for low temperature service steels, the nickel content of deposited metal being less than 2 %.	DL 5016-3XY, DL 5016-4XY, DL 5016-6XY, DL 5016-10XY, DL 5026-3XY, DL 5026-4XY, DL 5026-6XY	JIS Z 3241
F-2	Covered electrodes used for steels of 60 kgf/mm ² {590 N/mm ² } grade, of low-hydrogen series.	D 5816, D 5826, D 6216, D 6226	JIS Z 3212
F-3	Covered electrodes used mainly for P-3 steel, basic alloy composition of deposited metal being of the same degree as P-3 steel.	DT 1216	JIS Z 3223
F-4	Covered electrodes used mainly for P-4 steel, basic alloy composition of deposited metal being of the same degree as P-4 steel.	DT 2313, DT 2315, DT 2316, DT 2318	JIS Z 3223
F-5	Covered electrodes used mainly for P-5 steel, basic alloy composition of deposited metal being of the same degree as P-5 steel.	DT 2413, DT 2415, DT 2416, DT 2418, DT 2516	JIS Z 3223

Table 3. (Continued)

Classification of covered electrode	Kind	Symbol of welding material (examples)	
		Class symbol	JIS number
F-6	Covered electrodes used for stainless steel, producing martensite series deposited metal.	D 410	JIS Z 3221
F-7	Covered electrodes used for stainless steel, producing ferrite series deposited metal.	D 410 Nb, D 430, D 430 Nb	JIS Z 3221
F-8-(1)	Covered electrodes used for stainless steel, producing austenite series deposited metal.	D 308, D 308 L, D 309, D 309 L, D 309 Mo, D 309 MoL, D 317, D 317 L, D 16-8-2, D 347, D 347 L, D 316, D 316L, D 316J1L, D 310, D 310 Mo	JIS Z 3221
F-8-(2)	Covered electrodes used for stainless steel, producing austenite-ferrite series deposited metal.	D 329 J1	JIS Z 3221

Remark: The letters "XY" in the symbols of welding materials are specified in JIS Z 3241, of which X indicates the use or nonuse of post-weld heat treatment (A, P or AP) and Y indicates the chemical composition of deposited metal (0, 1, 2, 3, 4).