

INTERNATIONAL STANDARD

ISO
9606-1

First edition
1994-08-15

AMENDMENT 1
1998-08-01

Approval testing of welders — Fusion welding —

Part 1: Steels

AMENDMENT 1

Qualification des soudeurs — Soudage par fusion —

Partie 1: Aciers

AMENDEMENT 1



Reference number
ISO 9606-1:1994/Amd.1:1998(E)

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Amendment 1 to International Standard ISO 9606-1:1994 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, sub-committee SC 11, *Approval requirements for welding and allied processes personnel*.

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Printed in Switzerland

Approval testing of welders — Fusion welding —

Part 1:

Steels

AMENDMENT 1

1 Scope

Delete the 5th paragraph and replace it by the following.

The welding processes referred to in this part of ISO 9606 include those fusion welding processes which are designated as manual or partly mechanized welding. This International Standard does not cover fully mechanized and automatic welding processes (see 5.2).

Delete the 7th paragraph and replace it by the following.

The certificate of approval testing is issued under the sole responsibility of the examiner or examining body.

2 Normative references

Add the following reference.

ISO 9017:—¹⁾, *Destructive tests on welds in metallic materials — Fracture test*.

3 Definitions

Delete 3.1.

3.1.1 manual welder

To be numbered 3.1 and amend title to "welder".

3.1.2 welding operator

To be numbered 3.2.

¹⁾ To be published.

3.2 examiner or test body

To be numbered 3.3.

Amend title to "examiner or examining body"

Delete definition and replace by the following.

A person or organization who verifies compliance with the applicable standard. The examiner/examining body shall be acceptable to any contracting party.

3.3 welding procedure specification (WPS)

To be numbered 3.4.

3.4 range of approval

To be numbered 3.5.

3.5 test piece

To be numbered 3.6.

3.6 test specimen

To be numbered 3.7.

3.7 test

To be numbered 3.8.

4.4 Miscellaneous

Delete line 2 "gb welding with gas backing".

5.2 Welding processes

Delete "12 submerged arc welding" and replace it by the following:

121 submerged arc welding with wire electrode;

Add the following:

137 flux-cored wire metal-arc welding with inert gas shield.

5.4.2.1 Group W 01

Delete the second sentence and replace it by the following.

This group also includes fine-grained structural steel with a yield strength, $R_{eH} \leq 360 \text{ N/mm}^2$.

5.4.2.3 Group W 03

Delete 5.4.2.3 and replace by the following.

Fine-grained structural steels normalized, quenched and tempered as well as thermomechanically treated steels with a yield strength, $R_{eH} > 360 \text{ N/mm}^2$ as well as similarly weldable nickel steels, with a nickel content of 2 % to 5 %.

5.5 Filler metal, shielding gas and flux

Amend the title to "Consumables".

6.2 Welding process

Delete items a) and b) and replace them by the following.

- a) successful completion of an approval test simulating the multi-process joint, i.e. the root run welded by TIG (141) without backing, subsequent runs or layers welded by metal-arc welding with covered electrode (111) within the limits of the range of approval for each welding process;
- b) successful completion of separate relevant approval tests, one for TIG (141) without backing for the root run and a separate test for the fill by metal-arc welding with covered electrode (111) with backing or welded from both sides with or without gouging.

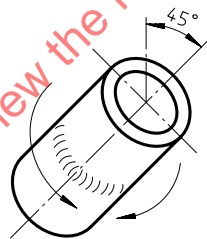
6.3 Joint types

Delete item b) and replace it by the following.

- b) approval for butt welds in plates in all relevant positions covers butt welds on pipes having an outside diameter greater than or equal to 500 mm, except item c) also applies;

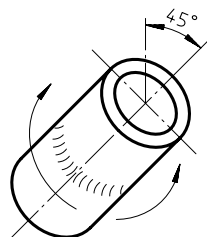
Figure 2

In a), add the following drawing.

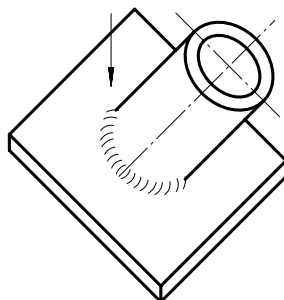


J-L045 Pipe: fixed
Axis: inclined
Weld: vertical downwards

Change the drawing for H-L045 in accordance with J-L045:



In b), add the following drawing.



PA Pipe: rotating
 Axis: inclined
 Weld: flat

6.6 Shielding gas and flux

Amend the title to "Consumables"

Delete the second sentence.

Table 7

Add two rows and two columns indicated below.

Table 7 — Range of approval according to welding position

Welding position of approval test piece				Range of approval																							
				Plates										Pipes													
														Butt welds					Fillet welds					Butt welds			
				Pipe-axis and angle																							
				Rota- ting	Fixed			Rota- ting	1)	Fixed																	
					0°		90°			45°			0°											90°			
				PA	PC	PG	PF	PE	PA	PB	PG	PF	PD	PA	PG	PF	PC	H-L045	J-L045	PA	PB	PG	PF	PD ²⁾			
Plates	Butt welds			PA	*	—	—	—	—	x	x	—	—	—	x	—	—	—	—	—	—	x	x	—	—	—	
				PC	x	*	—	—	—	x	x	—	—	—	x	—	—	x	—	—	—	—	x	x	—	—	—
				PG	—	—	*	—	—	—	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
				PF	x	—	—	*	—	x	x	—	x	—	x	—	—	—	—	—	—	—	x	x	—	x	—
				PE	x	x	—	x	*	x	x	—	x	x	x	—	—	—	—	—	—	—	x	x	—	x	x
	Fillet welds			PA	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	x	—	—	—	—	
				PB	—	—	—	—	—	x	*	—	—	—	—	—	—	—	—	—	—	—	x	x	—	—	—
				PG	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
				PF	—	—	—	—	—	x	x	—	*	—	—	—	—	—	—	—	—	—	x	x	—	—	—
				PD	—	—	—	—	—	x	x	—	x	*	—	—	—	—	—	—	—	—	x	x	—	—	x
Pipes	Butt welds Pipe-axis and angle	Rotating	0°	PA	x	—	—	—	—	x	x	—	—	—	*	—	—	—	—	—	—	x	x	—	—	—	
				PG	—	—	x	—	—	—	x	—	—	—	—	*	—	—	—	—	—	—	—	x	—	—	
				PF	x	—	—	x	x	x	x	—	x	x	x	—	*	—	—	—	—	—	x	x	—	x	x
		Fixed	90°	PC	x	x	—	—	x	x	—	—	—	x	—	—	*	—	—	—	—	x	x	—	—	—	
				H-L045	x	x	—	x	x	x	x	—	x	x	x	—	x	x	*	—	—	x	x	—	x	x	
				J-L045	—	—	x	—	—	—	x	—	—	—	—	x	—	—	—	—	—	*	—	—	x	—	—
	Fillet welds Pipe-axis and angle	Rotating	0°	PA	—	—	—	—	—	x	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	
				1)	PB	—	—	—	—	—	x	x	—	—	—	—	—	—	—	—	—	—	x	*	—	—	—
		Fixed	0°	PG	—	—	—	—	—	—	x	—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	
				PF	—	—	—	—	—	x	x	—	x	x	—	—	—	—	—	—	—	—	x	x	—	*	x

Key

* indicates the welding position for which the welder is approved in the approval test

x indicates those welding positions for which the welder is also approved

— indicates those welding positions for which the welder is not approved

1) PB for pipes may be welded in two versions

a) pipe: rotating, axis: horizontal, weld: vertical

b) pipe: fixed, axis: vertical, weld: horizontal vertical

2) This is an approved position and is covered by the other related tests.

Key

- * indicates the welding position for which the welder is approved in the approval test
 x indicates those welding positions for which the welder is also approved
 — indicates those welding positions for which the welder is not approved

1) PB for pipes may be welded in two versions

- a) pipe: rotating, axis: horizontal, weld: vertical
 b) pipe: fixed, axis: vertical, weld: horizontal vertical

2) This is an approved position and is covered by the other related tests.

7.1 Supervision

Delete the first sentence and replace it by the following.

The welding and testing of test pieces shall be witnessed by an examiner or examining body.

7.3 Welding conditions

Replace "WPS" by "WPS or pWPS" in the first and second sentence and in items k) and l).

Delete items e) and g) and reletter items f) and h) to n) accordingly.

7.4 Test methods

Delete the first paragraph and replace it by the following.

Each completed weld shall be examined visually in the as-welded condition. When required (see table 8), visual examination can be supplemented by magnetic particle, penetrant (see ISO 3452) or other test methods, and macro tests on butt welds.

Table 8

Delete table 8 and replace by the following:

Table 8 — Test methods

Test method	Butt weld plate	Butt weld pipe	Fillet weld
Visual	*	*	*
Radiography	*1) 2)	*1) 2)	—
Bend	*3)	*3)	—
Fracture	*1)	*1)	*4) 5)
Macro (without polishing)	—	—	*5)
Magnetic particle/penetrant	—	—	—
Key * indicates that the test method is mandatory. — indicates that the test method is not mandatory.			
1) Radiography or fracture test shall be used, but not both. 2) The radiographic test may be replaced by an ultrasonic test for thickness greater than or equal to 8 mm on ferritic steels only. 3) When radiography is used, then bend tests are mandatory for the processes 131, 135 and 311. 4) The fracture test should be supported by magnetic particle/penetrant testing when required by the examiner or examining body. 5) The fracture test may be replaced by a macro examination of at least four sections, one of which will be taken from the stop/start location.			

7.5.2 Butt weld in plate

Delete 7.5.2 and replace it by the following.

When radiography is used, the inspection length [see figure 7a)] of the weld in the test pieces shall be radiographed in the as-welded condition in accordance with ISO 1106-1 or ISO 1106-2 using class B technique.

When fracture testing according to ISO 9017 is used, the full test piece inspection length shall be tested. To do this, the test piece shall be cut into several test specimens [see figure 7a)]. The length of any fracture test specimen shall be approximately 50 mm. If necessary, the excess weld metal of the test specimen may be removed and additionally the weld edges may be notched to a depth of approximately 5 mm to facilitate fracture in the weld metal [see figure 7b)]. In the case of single-sided welding (ss) without backing (nb), half of the inspection length shall be tested against the face side and the other half against the root side [see figures 7c) and 7d)].

When transverse bend testing is used, two root bend test specimens and two face bend test specimens shall be tested in accordance with ISO 5173. The diameter of the former or the inner roller shall be $4t$ and the bending angle at least 120° unless the low ductility of the parent metal or filler metal imposes other limitations.

During testing, the test specimens shall not reveal any one single flaw greater than 3 mm in any direction. Failures appearing at the corners of a test specimen during testing shall be ignored in the evaluation.

For plate thicknesses greater than or equal to 12 mm, the transverse bend tests may be substituted by four side bend tests.

7.5.3 Fillet weld on plate

Delete 7.5.3 and replace it by the following.

For fracture tests according to ISO 9017, the test piece may be cut, if necessary, into several test specimens [see figure 8a)]. Each test specimen shall be positioned for breaking as shown in figure 8b), and examined after fracture.

When macro examination is used, four test specimens shall be taken, equally spaced in the inspection length.

7.5.4 Butt weld in pipe

Delete 7.5.4 and replace it by the following.

When radiography is used, the inspection length of the weld in the test piece shall be radiographed in the as-welded condition in accordance with ISO 1106-3 using class B technique, except where double wall technique is necessary.

When fracture testing according to ISO 9017 is used, the full test piece inspection length shall be tested and for this the test piece shall be cut into at least four test specimens [see figure 9a)].

A minimum weld length of 150 mm is required for testing of pipes. If the circumference is less than 150 mm, additional weld test pieces, but a maximum of three test pieces, will be required.

The inspection length of any test specimen shall be approximately 40 mm. If necessary, the excess weld metal of the test specimen may be removed and additionally the weld edges may be notched to a depth of approximately 5 mm to facilitate fracture in the weld metal [see figure 9b)]. In the case of single-side welding (ss) without backing (nb), half of the inspection length [see figure 9a)] shall be tested against the face side and the other half against the root side [see figures 9c) and 9d)].

When transverse bend testing is used, two root bend test specimens and two face bend test specimens shall be tested in accordance with ISO 5173. The diameter of the former or the inner roller, shall be $4t$ and the bending angle at least 120° unless the low ductility of the parent metal or filler metal imposes other limitations.

For the sectioning of test pieces welded in position PF, PG, H-L045 and J-L045 [see figures 2 and 9a)], test specimens shall be taken from different welding positions.