INTERNATIONAL STANDARD

ISO 9692-1

Second edition
2013-09-01

Welding and allied processes — Types of joint preparation —

Part 1: Manual metal arc welding, gas-shielded metal arc welding, gas welding, TIG welding and beam welding of steels

Soudage et techniques connexes — Types de préparation de joints —

Partie 1: Soudage manuel à l'arc avec électrode enrobée, soudage à l'arc avec électrode fusible sous protection gazeuse, soudage aux gaz, soudage TIG et soudage par faisceau des aciers

Reference number
ISO 9692-1:2013(E)

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Published in Switzerland

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 44, *Welding and allied processes*, Subcommittee SC 7, *Representation and terms*.

This second edition of ISO 9692-1 cancels and replaces ISO 9692-1:2003, which has been technically revised.

ISO 9692 consists of the following parts, under the general title *Welding and allied processes — Types of joint preparation*:

— *Part 1: Manual metal arc welding, gas-shielded metal arc welding, gas welding, TIG welding, and beam welding of steels*

— *Part 2: Submerged arc welding of steels*

— *Part 3: Metal inert gas welding and tungsten inert gas welding of aluminium and its alloys*

— *Part 4: Clad steels*

Introduction

This part of ISO 9692 defines the parameters characterizing the joint preparation and the collection of frequently recurring values and shapes.

The specifications given in this part of ISO 9692 have been compiled on the basis of experience and contain dimensions for types of joint preparation that are generally found to lead to suitable welding conditions. However, the extended field of application makes it necessary to give a range of dimensions. The dimension ranges specified represent design limits and are not tolerances for manufacturing purposes. Manufacturing limits depend, for instance, on welding process, parent metal, welding position, and quality level. Because of the common character of this part of ISO 9692, the examples given cannot be regarded as the only solution for the selection of a joint type.

Specific fields of application and manufacturing requirements (e.g. pipeline construction) may be covered by selected ranges specified in other standards adapted from this basic part of ISO 9692.

Requests for official interpretations of any aspect of this part of ISO 9692 should be directed to the Secretariat of ISO/TC 44/SC 7 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

Welding and allied processes — Types of joint preparation —

Part 1: Manual metal arc welding, gas-shielded metal arc welding, gas welding, TIG welding and beam welding of steels

1 Scope

This part of ISO 9692 specifies types of joint preparation for manual metal arc welding, gas-shielded metal arc welding, gas welding, TIG welding, and beam welding of steel (see Clauses 3 and 4).

It applies to joint preparation for full penetration butt welds and for fillet welds. For partial penetration butt welds, types of joint preparation and dimensions differing from those specified in this part of ISO 9692 may be stipulated.

The root gaps referred to in this part of ISO 9692 are those gaps presented after tack welding, if used.

Consideration is given to altering the joint preparation details (where appropriate) to facilitate temporary backing, "one-sided welding," etc.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6947, *Welding and allied processes — Welding positions*

3 Materials

Joint preparations recommended in this part of ISO 9692 are suitable for all kinds of steel.

4 Welding processes

Joint preparations recommended in this part of ISO 9692 are suitable for welding carried out in accordance with the following processes as specified in Tables 1 to 4 (combinations of different processes are possible):

a) (3) gas welding; oxyfuel gas welding;

b) (111) manual metal arc welding (metal arc welding with covered electrode); shielded metal arc welding;

c) (13) gas-shielded metal arc welding; gas metal arc welding includes:

   — (131) MIG welding with solid wire electrode; gas metal arc welding using inert gas and solid wire electrode;

   — (132) MIG welding with flux cored electrode; flux cored arc welding;

   — (133) MIG welding with metal cored electrode; gas metal arc welding using inert gas and metal cored wire;

- (135) MAG welding with solid wire electrode; gas metal arc welding using active gas and solid wire electrode;
- (136) MAG welding with flux cored electrode; gas metal arc welding using active gas and flux cored electrode;
- (138) MAG welding with metal cored electrode; gas metal arc welding using active gas and metal cored electrode;

d) (141) TIG welding with solid filler material (wire/rod); gas tungsten arc welding using inert gas and solid filler material (wire/rod);

e) (5) beam welding:

- (51) electron beam welding;
- (512) electron beam welding in atmosphere;
- (52) laser welding; laser beam welding.

NOTE The numbers in parentheses refer to the reference number of the welding process specified in ISO 4063.[2]

5 Finish

The longitudinal edges of the root face should be de-burred and may be chamfered (up to 2 mm).

6 Type of joint preparation

The recommended types of joint preparation and dimensions are specified in Tables 1 to 4.

Table 1 — Joint preparations for butt welds, welded from one side

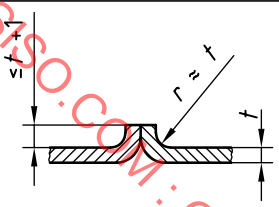
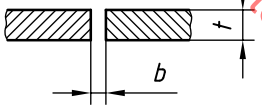
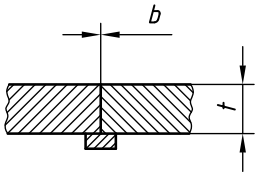
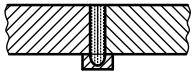
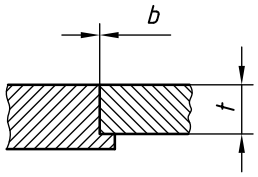
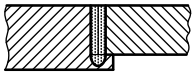
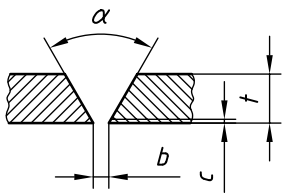
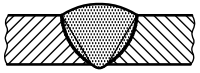
Ref. No.	Material thickness t mm	Type of preparation	Symbol (in accordance with ISO 2553[1])	Cross-section	Dimensions				Recommended welding process (reference No. in accordance with ISO 4063[2])	Weld illustration	Remarks
					Angle[a] α, β	Gap[b] b mm	Thickness of root face c mm	Depth of preparation h mm			
1.1	⩽2	Raised edges			—	—	—	—	3 111 141 512		Usually without filler metal
1.2.1	⩽4	Square preparation			—	~t	—	—	3 111 141		—
1.2.2	3 < t ⩽ 8					6 ⩽ b ⩽ 8			13		Where applicable with backing strip
	⩽15					~t			141[c]		
						⩽1[d]			52		
						0					
1.2.3	⩽100	Square preparation with backing			—	—	—	—	51		—
1.2.4		Square preparation with centering lip									
1.3	3 < t ⩽ 10	Single-V preparation			40° ⩽ α ⩽ 60°	⩽4	⩽2	—	3 111 13 141		Where applicable with backing strip
	8 < t ⩽ 12				6° ⩽ α ⩽ 8°	—			52[d]		

Table 1 *(continued)*

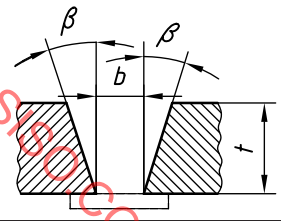
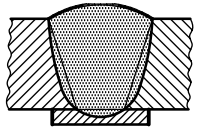
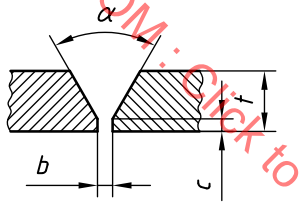
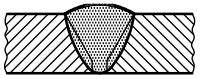
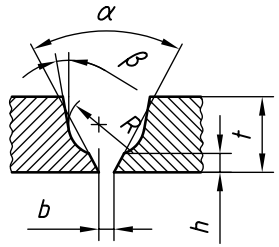
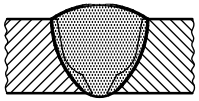
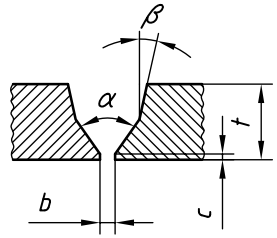
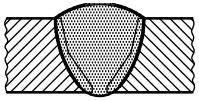
Ref. No.	Material thickness t mm	Type of preparation	Symbol (in accordance with ISO 2553[1])	Cross-section	Dimensions				Recommended welding process (reference No. in accordance with ISO 4063[2])	Weld illustration	Remarks
					Angle[a] α, β	Gap[b] b mm	Thickness of root face c mm	Depth of preparation h mm			
1.4	>16	Steep-flanked single-V preparation			$5° \leqslant \beta \leqslant 20°$	$5 \leqslant b \leqslant 15$	—	—	111 13		With backing strip
1.5	$5 \leqslant t \leqslant 40$	Single-V preparation with broad root face			$\alpha \approx 60°$	$1 \leqslant b \leqslant 4$	$2 \leqslant c \leqslant 4$	—	111 13 141		—
1.6	>12	Single-U preparation with V root	e		$60° \leqslant \alpha \leqslant 90°$ $8° \leqslant \beta \leqslant 12°$	$1 \leqslant b \leqslant 3$	—	~4	111 13 141		$6 \leqslant R \leqslant 9$
1.7	>12	Single-V preparation with V root	e		$60° \leqslant \alpha \leqslant 90°$ $10° \leqslant \beta \leqslant 15°$	$2 \leqslant b \leqslant 4$	≤ 2	—	111 13 141		—

Table 1 *(continued)*

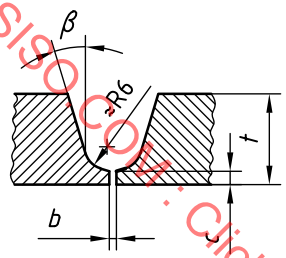
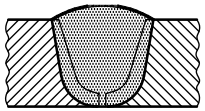
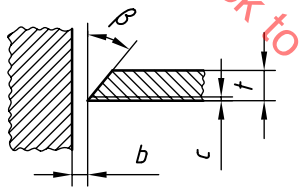
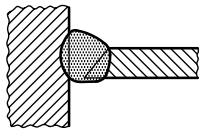
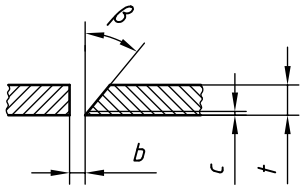
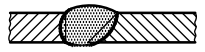
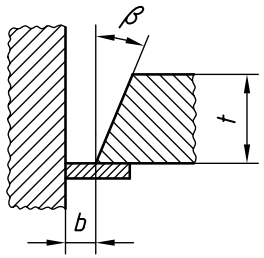
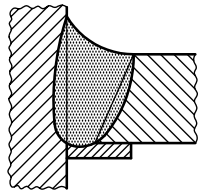
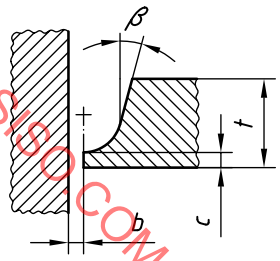
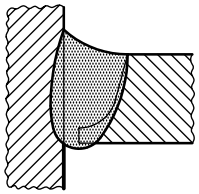
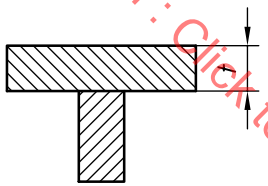
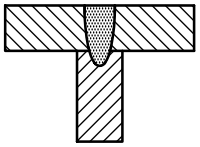
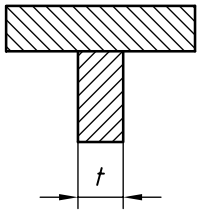
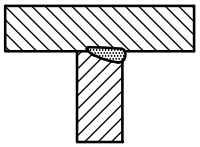
Ref. No.	Material thickness t mm	Type of preparation	Symbol (in accordance with ISO 2553[1])	Cross-section	Dimensions				Recommended welding process (reference No. in accordance with ISO 4063[2])	Weld illustration	Remarks
					Angle[a] α, β	Gap[b] b mm	Thickness of root face c mm	Depth of preparation h mm			
1.8	>12	Single-U preparation			$8° \leqslant \beta \leqslant 12°$	$\leqslant 4$	$\leqslant 3$	—	111 13 141		—
1.9.1	$3 < t \leqslant 10$	Single-bevel preparation			$35° \leqslant \beta \leqslant 60°$	$2 \leqslant b \leqslant 4$	$1 \leqslant c \leqslant 2$	—	111 13 141		—
1.9.2											
1.10	>16	Steep-flanked single-bevel preparation			$15° \leqslant \beta \leqslant 60°$	$6 \leqslant b \leqslant 12$ ~12	—	—	111 13 141		With backing strip

Table 1 *(continued)*

Ref. No.	Material thickness t mm	Type of preparation	Symbol (in accordance with ISO 2553[1])	Cross-section	Dimensions				Recommended welding process (reference No. in accordance with ISO 4063[2])	Weld illustration	Remarks
					Angle[a] α, β	Gap[b] b mm	Thickness of root face c mm	Depth of preparation h mm			
1.11	>16	Single-J preparation			$10° \leqslant \beta \leqslant 20°$	$2 \leqslant b \leqslant 4$	$1 \leqslant c \leqslant 2$	—	111 13 141		—
1.12	⩽15 ⩽100	Square preparation	—[e]		—	—	—	—	52 51		—
1.13	⩽15 ⩽100	Square preparation	—[e]		—	—	—	—	52 51		—

a Angles are also larger and/or asymmetric for welding in position PC according to ISO 6947 (horizontal position).

b Dimensions given apply to the tacked condition.

c The indication of the welding process does not mean that it is applicable for the whole range of workpiece thicknesses.

d With filler metal.

e Symbol and number not yet standardized in ISO 2553:1992.[1]

Table 2 — Joint preparations for butt welds, welded from both sides

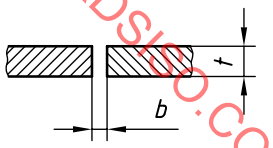
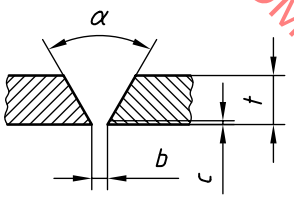
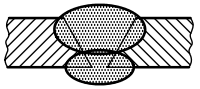
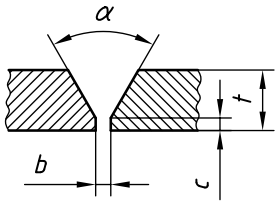
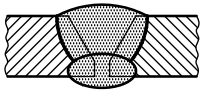
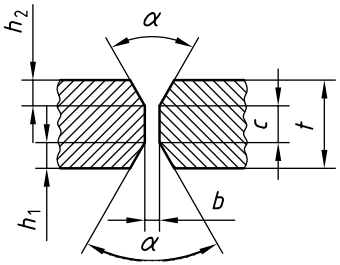
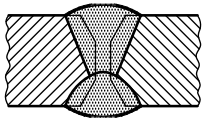
Ref. No	Material thickness t mm	Type of preparation	Symbol (in accordance with ISO 2553[1])	Cross-section	Dimensions: Angle[a] α, β	Dimensions: Gap[b] b mm	Dimensions: Thickness of root face c mm	Dimensions: Depth of preparation h mm	Recommended welding process (reference No. in accordance with ISO 4063[2])	Weld illustration	Remarks
2.1	⩽8	Square preparation			—	≈$t/2$	—	—	111 141		—
						⩽ $(t/2)$			13		
	⩽15					0			52		
2.2	$3 \leqslant t \leqslant 40$	Single-V preparation			$\alpha \approx 60°$ $40° \leqslant \alpha \leqslant 60°$	⩽3	⩽2	—	111 141 13		Back run is indicated.
2.3	>10	Single-V preparation with broad root face			$\alpha \approx 60°$ $40° \leqslant \alpha \leqslant 60°$	$1 \leqslant b \leqslant 3$	$2 \leqslant c \leqslant 4$	—	111 141 13		In special cases, also possible for smaller work piece thicknesses and welding process 3. Back run is indicated.
2.4	>10	Double-V preparation with broad root face			$\alpha \approx 60°$ $40° \leqslant \alpha \leqslant 60°$	$1 \leqslant b \leqslant 4$	$2 \leqslant c \leqslant 6$	$h_1 = h_2 = \frac{t-c}{2}$	111 141 13		—

Table 2 *(continued)*

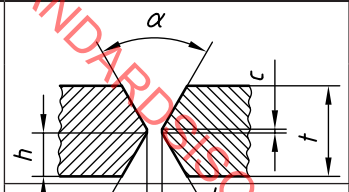
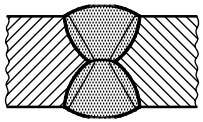
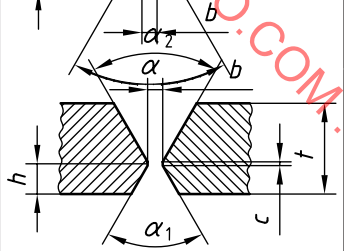
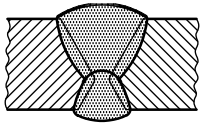
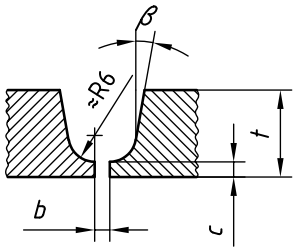
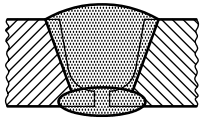
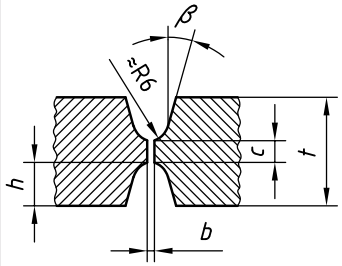
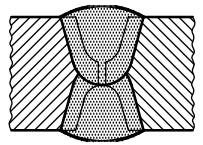
Ref. No	Material thickness t mm	Type of preparation	Symbol (in accordance with ISO 2553[1])	Cross-section	Dimensions				Recommended welding process (reference No. in accordance with ISO 4063[2])	Weld illustration	Remarks
					Angle[a] α, β	Gap[b] b mm	Thickness of root face c mm	Depth of preparation h mm			
2.5.1	>10	Double-V preparation			$\alpha \approx 60°$	$1 \leqslant b \leqslant 3$	$\leqslant 2$	$\approx t/2$	111 141		—
					$40° \leqslant \alpha \leqslant 60°$				13		
2.5.2		Asymmetrical double-V preparation			$\alpha_1 \approx 60°$ $\alpha_2 \approx 60°$			$\approx t/3$	111 141		—
					$40° \leqslant \alpha_1 \leqslant 60°$ $40° \leqslant \alpha_2 \leqslant 60°$				13		
2.6	>12	Single-U preparation			$8° \leqslant \beta \leqslant 12°$	$1 \leqslant b \leqslant 3$	~5	—	111 13		Back run is indicated.
						$\leqslant 3$			141[c]		
2.7	⩾30	Double-U preparation			$8° \leqslant \beta \leqslant 12°$	$\leqslant 3$	~3	$\approx \frac{t-c}{2}$	111 13 141[c]		This type of joint preparation can also be produced asymmetrically in a similar manner to the asymmetrical double-V preparation.

Table 2 *(continued)*

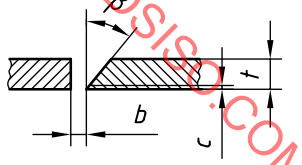
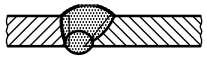
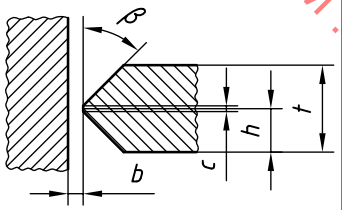
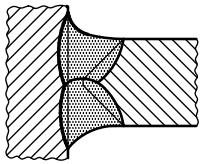
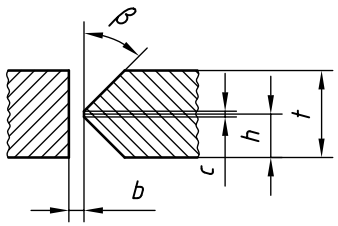
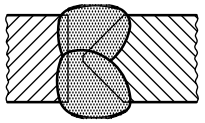
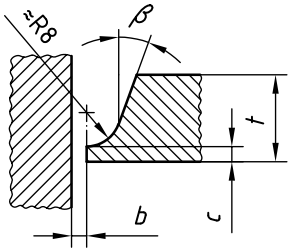
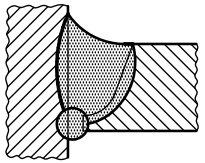
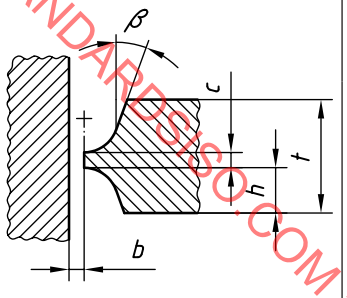
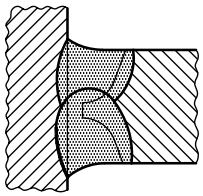
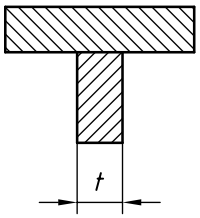
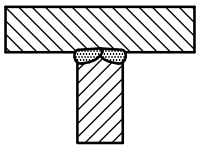
Ref. No	Material thickness t mm	Type of preparation	Symbol (in accordance with ISO 2553[1])	Cross-section	Dimensions				Recommended welding process (reference No. in accordance with ISO 4063[2])	Weld illustration	Remarks
					Angle[a] α, β	Gap[b] b mm	Thickness of root face c mm	Depth of preparation h mm			
2.8	$3 \leqslant t \leqslant 30$	Single-bevel preparation			$35° \leqslant \beta \leqslant 60°$	$1 \leqslant b \leqslant 4$	$\leqslant 2$	—	111 13 141[c]		Back run is indicated.
2.9.1	>10	Double-bevel preparation			$35° \leqslant \beta \leqslant 60°$	$1 \leqslant b \leqslant 4$	$\leqslant 2$	$= \frac{t}{2}$ or $= \frac{t}{3}$	111 13 141		This type of joint preparation can also be produced asymmetrically in a similar manner to the asymmetrical double-V preparation.
2.9.2											
2.10	>16	Single-J preparation			$10° \leqslant \beta \leqslant 20°$	$1 \leqslant b \leqslant 3$	$\geqslant 2$	—	111 13 141[c]		Back run is indicated.

Table 2 *(continued)*

Ref. No	Material thickness t mm	Type of preparation	Symbol (in accordance with ISO 2553[1])	Cross-section	Dimensions				Recommended welding process (reference No. in accordance with ISO 4063[2])	Weld illustration	Remarks
					Angle[a] α, β	Gap[b] b mm	Thickness of root face c mm	Depth of preparation h mm			
2.11	>30	Double-J preparation			$10° \leqslant \beta \leqslant 20°$	⩽3	⩾2	$=\frac{t-c}{2}$	111 13 141[c]		This type of joint preparation can also be produced asymmetrically in a similar manner to the asymmetrical double-V preparation.
							<2	≈t/2			
2.12	⩽25 ⩽170	Square preparation	—[d]		—	—	—	—	52 51		—

a Angles are also larger and/or asymmetric for welding in position PC according to ISO 6947 (horizontal position).

b Dimensions given apply to the tacked condition.

c The indication of the welding process does not mean that it is applicable for the whole range of workpiece thicknesses.

d Symbol and number not standardized in ISO 2553:1992.[1]