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Welding and allied processes — Recommendations for joint preparation —

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

Soudage et techniques connexes — Recommandations pour la préparation de joints —

Partie 3: Soudage MIG et TIG de l'aluminium et de ses alliages

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this part of ISO 9692 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 9692-3 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 7, *Representation and terms*.

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

— *Part 1: Manual metal-arc welding, gas-shielded metal-arc welding and gas 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 assembly of the most often encountered dimensions and shapes.

The recommendations 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 provide 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, quality level, etc. Due to 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 may be covered by selected ranges of dimensions specified in the relevant application standard.

Welding and allied processes — Recommendations for joint preparation —

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

1 Scope

This part of ISO 9692 specifies types of joint preparation for metal inert gas welding, MIG, (131) and tungsten inert gas welding, TIG, (141) on aluminium and its alloys.

It applies to fully penetrated welds.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 9692. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 9692 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2553:1992, *Welded, brazed and soldered joints — Symbolic representation on drawings.*

ISO 4063:1998, *Welding and allied processes — Nomenclature of processes and reference numbers*.

3 Materials

Joint preparations recommended in this part of ISO 9692 are suitable for all types of aluminium and its weldable alloys.

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 3. Combinations of different processes are possible:

— metal inert gas welding (MIG) (131)

— tungsten inert gas welding (TIG) (141)

NOTE The numbers in parantheses refer to the reference number of the welding process specified in ISO 4063.

5 Finish

Edges should be prepared by mechanical means (e.g. shearing, sawing or milling). No cleaning fluids based on mineral oil shall be used. If plasma cutting is used, consideration shall be given to the quality of cut surfaces (e.g. cracks).

The longitudinal edges of the root face should be de-burred and chamfered, especially for single sided butt welds without backing.

6 Type of joint preparation

The recommended types of joint preparation and dimensions are specified in Tables 1 to 3.

The choice of joint details (angle, gap, thickness of root face) depends on the joint thickness, the position and the welding process. The use of larger gaps ($\geqslant$ 1,5 mm) permits smaller angles.

If gaps are $\geqslant$ 1,5 mm, backing is preferably used.

For single sided welding, backing bars should be grooved.

NOTE The reference numbers have been determined in accordance with the following scheme:

The first digit corresponds with the number of the table (e.g. digit 1 for Table 1 with joint preparation for butt welds, welded from one side), the second digit or numerical group corresponds with the number in ISO 2553 (e.g. digit 2 for square butt weld as given in Table 1 of ISO 2553:1992), the third indication, expressed by a letter, covers the variants of joint preparations.

EXAMPLE Joint preparation for a butt weld, welded from one side (1), finished for single-V butt weld (3) gets the number: 1.3

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

(Dimensions in millimetres)

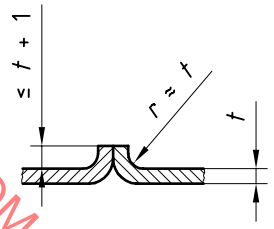
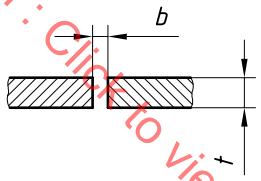
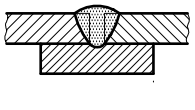
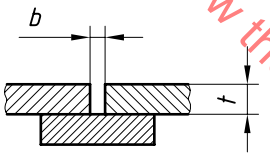
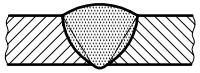
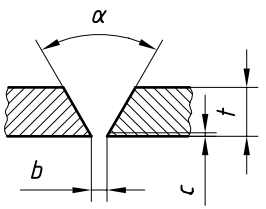
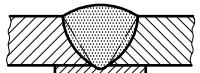
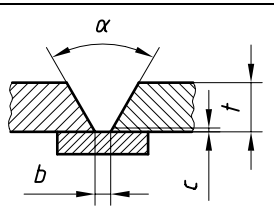
Weld					Joint preparation					Recommended welding process [c]	Remarks
Ref. No.[a]	Workpiece thickness t	Designation	Symbol [b]	Illustration	Cross section	Angle α, β	Gap b	Thickness of root face c	Other dimensions		
1.1	$t \leqslant 2$	Butt weld between plates with raised edges				—	—	—	—	141	
1.2	$t \leqslant 4$	Square butt weld				—	$b \leqslant 2$	—	—	141	Chamfering on the root side is recommended
	$2 \leqslant t \leqslant 4$	Square butt weld with backing				—	$b \leqslant 1{,}5$	—	—	131	
1.3	$3 \leqslant t \leqslant 5$	Single-V butt weld				$\alpha \geqslant 50°$	$b \leqslant 3$	$c \leqslant 2$	—	141	
						$60° \leqslant \alpha \leqslant 90°$	$b \leqslant 2$			131	
		Single-V butt weld with temporary backing				$60° \leqslant \alpha \leqslant 90°$	$b \leqslant 4$	$c \leqslant 2$	—	131	

Table 1 (*continued*)

(Dimensions in millimetres)

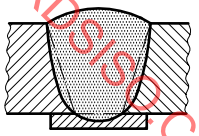
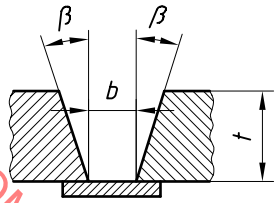
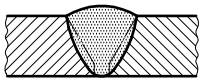
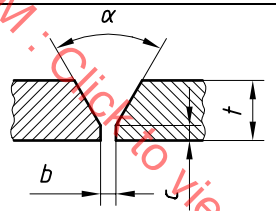
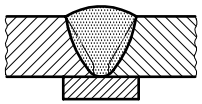
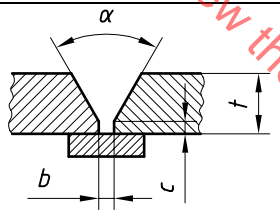
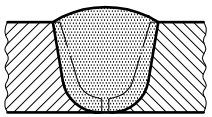
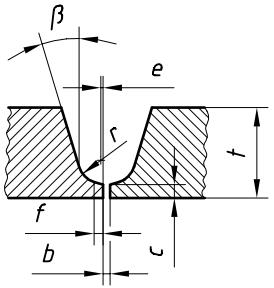
Weld					Joint preparation					Recommended welding process [c]	Remarks
Ref. No.[a]	Workpiece thickness t	Designation	Symbol [b]	Illustration	Cross section	Angle α, β	Gap b	Thickness of root face c	Other dimensions		
1.14	$8 \leqslant t \leqslant 20$	Steep-flanked single-V butt weld with backing				$15° \leqslant \beta \leqslant 20°$	$3 \leqslant b \leqslant 10$	—	—	131	
1.5	$3 \leqslant t \leqslant 15$	Single-V butt weld with broad root face				$\alpha \geqslant 50°$	$b \leqslant 2$	$c \leqslant 2$	—	131 141	
	$6 \leqslant t \leqslant 25$	Single-V butt weld with broad root face with backing				$\alpha \geqslant 50°$	$4 \leqslant b \leqslant 10$	$c = 3$	—	131	
1.7	plate $t \geqslant 12$ t pipe $t \geqslant 5$	Single-U butt weld (sloping sides)				$15° \leqslant \beta \leqslant 20°$	$b \leqslant 2$	$2 \leqslant c \leqslant 4$	$4 \leqslant r \leqslant 6$ $3 \leqslant f \leqslant 4$ $0 \leqslant e \leqslant 4$	141	
	$15 \leqslant t \leqslant 30$					$15° \leqslant \beta \leqslant 20°$	$1 \leqslant b \leqslant 3$	$2 \leqslant c \leqslant 4$	$4 \leqslant r \leqslant 6$ $3 \leqslant f \leqslant 4$ $0 \leqslant e \leqslant 4$	131	Preferable root run: 141.

Table 1 (*continued*)

(Dimensions in millimetres)

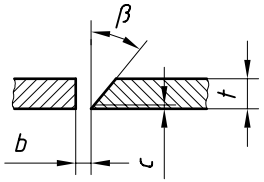
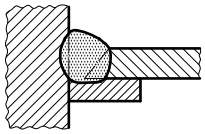
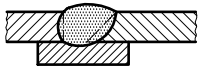
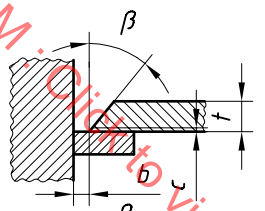
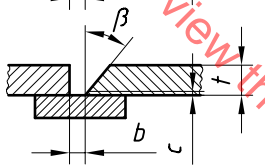
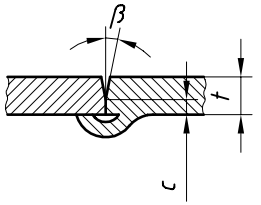
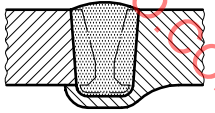
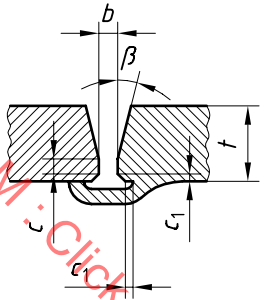
Weld					Joint preparation					Recommended welding process [c]	Remarks
Ref. No.[a]	Workpiece thickness t	Designation	Symbol [b]	Illustration	Cross section	Angle α, β	Gap b	Thickness of root face c	Other dimensions		
1.4	$4 \leqslant t \leqslant 10$	Single-bevel butt weld				$\beta \geqslant 50°$	$b \leqslant 3$	$c \leqslant 2$	—	131 141	
	$3 \leqslant t \leqslant 20$	Single-bevel butt weld with backing	 	 	 	$50° \leqslant \beta \leqslant 70°$	$b \leqslant 6$	$c \leqslant 2$	—	131 141	
1.3 A	$2 \leqslant t \leqslant 20$	Single-V butt weld on extruded profile				$20° \leqslant \beta \leqslant 40°$	$b \leqslant 3$	$1 \leqslant c \leqslant 3$	—	131 141	

Table 1 (*continued*)

(Dimensions in millimetres)

Weld					Joint preparation							
Ref. No.[a]	Workpiece thickness t	Designation	Symbol[b]	Illustration	Cross section	Angle α, β	Gap b	Thickness of root face c	Other dimensions	Recommended welding process[c]	Remarks
1.3 B	$6 \leqslant t \leqslant 40$	Single-V butt weld on extruded profile				$10° \leqslant \beta \leqslant 20°$	$0 \leqslant b \leqslant 3$	$2 \leqslant c \leqslant 3$	$c_1 \geqslant 1$	131 141	

a As explainded in the note of clause 6.
b In accordance with ISO 2553.
c Reference number in accordance with ISO 4063

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

(Dimensions in millimetres)

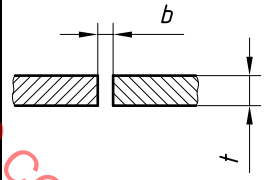
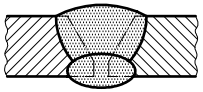
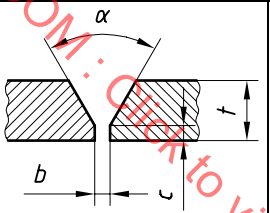
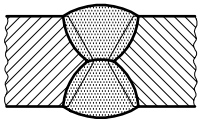
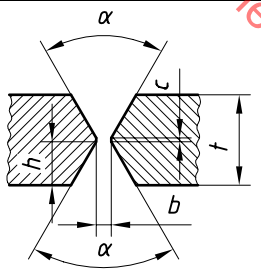
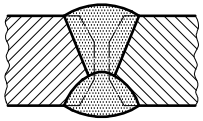
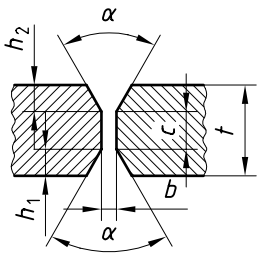
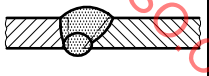
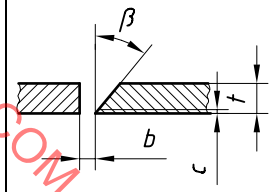
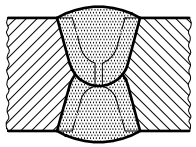
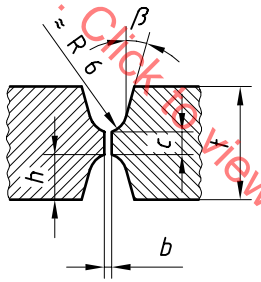
Weld					Joint preparation					Recommended welding process [c]	Remarks
Ref. No.[a]	Workpiece thickness t	Designation	Symbol [b]	Illustration	Cross section	Angle α, β	Gap b	Thickness of root face c	Other dimensions		
2.2	$6 \leqslant t \leqslant 20$	Square butt weld				—	$b \leqslant 6$	—	—	131 141	Simultaneous welding both sides vertical.
2.5.9	$6 \leqslant t \leqslant 15$	Single-V butt weld with broad root face and backing run				$\alpha \geqslant 50°$	$b \leqslant 3$	$2 \leqslant c \leqslant 4$	—	141 131	
2.3.3	$6 \leqslant t \leqslant 15$	Double-V butt weld				$\alpha \geqslant 60°$	$b \leqslant 3$	$c \leqslant 2$	—	141	
	$t > 15$					$\alpha \geqslant 70°$		$c \leqslant 2$		131	
2.5.5	$6 \leqslant t \leqslant 15$	Double-V butt weld with broad root face				$\alpha \geqslant 50°$	$b \leqslant 3$	$2 \leqslant c \leqslant 4$	$h_1 \approx h_2$	141	
	$t > 15$					$60° \leqslant \alpha \leqslant 70°$		$2 \leqslant c \leqslant 6$		131	

Table 2 (*continued*)

(Dimensions in millimetres)

Weld					Joint preparation					Recommended welding process [c]	Remarks
Ref. No.[a]	Workpiece thickness t	Designation	Symbol [b]	Illustration	Cross section	Angle α, β	Gap b	Thickness of root face c	Other dimensions		
2.4.9	$3 \leqslant t \leqslant 15$	Single-bevel butt weld with backing run				$\beta \geqslant 50°$	$b \leqslant 3$	$c \leqslant 2$	—	141 131	
2.7.7	$t \geqslant 15$	Double-U butt weld				$15° \leqslant \beta \leqslant 20°$	$b \leqslant 3$	$2 \leqslant c \leqslant 4$	$h \approx 0{,}5(t - c)$	131	

a As explainded in the note of clause 6.
b In accordance with ISO 2553.
c Reference number in accordance with ISO 4063.