



**SLOVENSKI STANDARD**  
**oSIST prEN ISO 17660-1:2017**  
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**Varjenje - Varjenje betonskega jekla - 1. del: Obremenjeni zvarni spoji (ISO/DIS 17660-1:2017)**

Welding - Welding of reinforcing steel - Part 1: Load-bearing welded joints (ISO/DIS 17660-1:2017)

Schweißen - Schweißen von Betonstahl - Teil 1: Tragende Schweißverbindungen (ISO/DIS 17660-1:2017)

Soudage - Soudage des aciers pour armature - Partie 1: Assemblages transmettant les efforts (ISO/DIS 17660-1:2017)

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**Ta slovenski standard je istoveten z: prEN ISO 17660-1**

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**ICS:**

25.160.10      Varilni postopki in varjenje      Welding processes

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# DRAFT INTERNATIONAL STANDARD

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## Welding — Welding of reinforcing steel —

### Part 1: Load-bearing welded joints

*Soudage — Soudage des aciers d'armatures —**Partie 1: Assemblages transmettant des efforts*

ICS: 25.160.10

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**ISO/DIS 17660-1:2017(E)****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 (see [www.iso.org/directives](http://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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

The committee responsible for this document is ISO/44/SC 10 "Quality management in the field of welding".

This second edition cancels and replaces the first edition (ISO 17660-1:2006), clause 6.2, clause 6.4, annex A, annex B and annex C of which have been technically revised.

ISO 17660 consists of the following parts, under the general title *Welding — Welding of reinforcing steel*:

- *Part 1: Load-bearing welded joints*
- *Part 2: Non load-bearing welded joints*

Requests for official interpretations of any aspect of this part of ISO 17660 should be directed to the Secretariat of ISO/TC 44/SC 10 via your national standards body. A complete listing of these bodies can be found at [www.iso.org](http://www.iso.org).



## Introduction

Reinforcing steel bars are produced by a number of process routes and usually have a ribbed profile. Taking these issues into account, it is apparent that both the welder and the welding coordinator require a specific level of skill and job knowledge and that special procedures for quality assurance need to be adopted.

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# Welding — Welding of reinforcing steel — Part 1: Load-bearing welded joints

## 1 Scope

This part of ISO 17660 is applicable to the welding of weldable reinforcing steel and stainless reinforcing steel of load-bearing joints, in workshops or on site. It specifies requirements for materials, design and execution of welded joints, welding personnel, quality requirements, examination and testing.

This part of ISO 17660 also covers welded joints between reinforcing steel bars and other steel components, such as connection devices and insertion anchors, including prefabricated assemblies. Non load-bearing joints are covered by ISO 17660-2.

This part of ISO 17660 is not applicable to factory production of welding fabric and lattice girders using multiple spot welding machines or multiple projection welding machines.

The requirements of this part of ISO 17660 are only applicable to static loaded structures.

NOTE For fatigue-loaded structures, depending on type of joint and welding process, it is recommended that an appropriate reduction be taken into account on the fatigue strength of the reinforcing steel.

## 2 Normative references

[oSIST prEN ISO 17660-1:2017](https://www.iso.org/obp/ui/#iso:code:31000:17660-1:2017)

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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 3834-3 *Quality requirements for fusion welding of metallic materials — Part 3: Standard quality requirements*

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

ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections*

ISO 9606-1, *Qualification testing of welders — Fusion welding — Part 1: Steels*

ISO 14731, *Welding coordination — Tasks and responsibilities*

ISO 14732, *Welding personnel — Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials*

ISO 15609-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 1: Arc welding*

ISO 15609-2, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 2: Gas welding*

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ISO 15609-5, *Specification and qualification of welding procedures for metallic materials — Welding procedure specification — Part 5: Resistance welding*

ISO 15614-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys*

ISO 15614-12, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 12: Spot, seam and projection welding*

ISO 15614-13, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 13: Upset (resistance butt) and flash welding*

ISO 15620, *Welding — Friction welding of metallic materials*

ISO 15630-1, *Steel for the reinforcement and prestressing of concrete — Test methods — Part 1: Reinforcing bars, wire rod and wire*

ISO 15630-2, *Steel for the reinforcement and prestressing of concrete — Test methods — Part 2: Welded fabric*

ISO 16020, *Steel for the reinforcement and prestressing of concrete — Vocabulary*

EN 10079, *Definition of steel products*

EN 10080, *Steel for the reinforcement of concrete — Weldable reinforcing steel — General*

EN 10164, *Steel products with improved deformation properties perpendicular to the surface of the product — Technical delivery conditions*

**3 Terms and definitions**

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For the purposes of this document, the terms and definitions given in EN 10079, EN 10080 and ISO 16020 and the following apply:

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

**3.1 load-bearing welded joint**  
welded joint used for transmission of specified loads between reinforcing steel bars or between reinforcing steel bars and other steel products

**3.2 non load-bearing welded joint**  
welded joint whose strength is not taken into account in the design of the reinforced concrete structure

NOTE The purpose of a non load-bearing welded joint is usually only to keep the reinforcing components in their correct places during fabrication, transport and concreting. The weld is often called tack weld.

**3.3 shear factor**  
 $S_f$   
relation between the shear force of a cross joint and the nominal yield strength  $R_e$ , multiplied by the nominal cross section area  $A_s$  of the loaded bar

**3.4****manufacturer**

enterprise carrying out the welding works within workshops or on site

**4 Symbols and abbreviated terms**

$a$	throat thickness
$A_{gt}$	percentage total elongation at maximum force
$A_n$	nominal cross-sectional area of the bar
$A_s$	nominal cross-sectional area of the bar to be anchored
$b$	excess of the bar
$d$	nominal diameter of the welded bar
$d_{max}$	maximum nominal diameter of the welded bar
$d_{min}$	minimum nominal diameter of the welded bar
$e$	distance between the bars
$F$	force to be anchored by transverse bar
$F_{max}$	maximum tensile force
$F_s$	shear force
$l$	length of the weld (cross joint)
$l_o$	overall lap length
$L_{min}$	minimum length of the test specimen
$r$	radius of bent reinforcing steel bar
$R_e$	specified characteristic yield strength of the reinforcing steel
$R_m$	nominal tensile strength of the reinforcing steel
$S_f$	shear factor
$t$	thickness of the web of a section or of a plate to be welded
$t_{min}$	minimum thickness of the web of a section or of a plate to be welded
$w$	weld width
$x$	root gap
$y$	depth of root face
$\alpha$	included angle
BW	butt weld
CEV	carbon equivalent value

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FW fillet weld

SF shear factor class

WPQR welding procedure qualification record

WPS welding procedure specification

**5 Welding processes**

The following welding processes in accordance with ISO 4063 may be used (see Table 1):

**Table 1 — List of welding processes and reference numbers in accordance with ISO 4063**

Welding process	English term	American term
111	manual metal arc welding (metal arc welding with covered electrode)	shielded metal arc welding
114	self-shielded tubular cored arc welding	
135	MAG welding with solid wire electrode	gas metal arc welding using active gas with 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
21	resistance spot welding	spot welding
23	projection welding	
24	flash welding	
25	resistance butt welding	upset welding
42	friction welding	
47	oxy-fuel gas pressure welding	pressure gas welding

The principles of this part of ISO 17660 may be applied to other welding processes.

**6 Load-bearing welded joints****6.1 General**

A summary of common ranges of bar diameters for welded joints, depending on the welding process, is given in Table 2.

Table 2 — Common ranges of bar diameters for welded joints

Welding process	Type of welded joint	Range of bar diameters for load-bearing welded joint mm
21 23	cross joint <sup>a</sup>	4 to 20
24 25	butt joint	5 to 50 5 to 25
42	butt joint joint to other steel component	6 to 50 6 to 50
47	butt joint	6 to 50
111 114 135 136 138	butt joint without backing	≥ 16
	butt joint with permanent backing	≥ 12
	lap joint	6 to 32
	strap joint	6 to 50
	cross joint <sup>a</sup>	6 to 50
	joint to other steel components	6 to 50

<sup>a</sup>  $d_{\min}/d_{\max}$  should be ≥ 0,4.

The joints specified in 6.2, 6.3, 6.4 and 6.6 are designed to give full load-bearing capacity of the bar. Exceptions are possible for butt welds and joints between reinforcing steel bars and other steel components, and shall be specified. For cross joints the shear strength shall be specified in the design (see also Annex G).

The welded joint shall meet the strength and ductility requirements of the specific reinforcing steel, unless such requirements are deemed to be irrelevant for the functions of the welded product.

The joints specified below are examples of good practice. Other joint configurations may be used if they can be shown to meet the requirements of Clause 11.

## 6.2 Butt joints

### 6.2.1 Butt joints welded by welding processes 111, 114, 135, 136 and 138

Examples of butt joint preparation for load-bearing welded joints are given in Figures 1a) to 1d). Other joint preparations or types of permanent backing may also be used.

The prepared joint shall be bevelled. The joint preparation should be carried out by grinding or flame cutting.