
**Welding consumables — Rods, wires
and deposits for tungsten inert gas
welding of non-alloy and fine-grain
steels — Classification**

*Produits consommables pour le soudage — Baguettes et fils pour
dépôts par soudage TIG des aciers non alliés et des aciers à grains fins
— Classification*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 636:2015](https://standards.iteh.ai/catalog/standards/sist/1684907c-0b78-46f2-9fe2-519eabe12f0e/iso-636-2015)

<https://standards.iteh.ai/catalog/standards/sist/1684907c-0b78-46f2-9fe2-519eabe12f0e/iso-636-2015>



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 636:2015

<https://standards.iteh.ai/catalog/standards/sist/1684907c-0b78-46f2-9fe2-519eabe12f0e/iso-636-2015>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

	Page
Foreword.....	iv
Introduction.....	v
1 Scope.....	1
2 Normative references.....	1
3 Classification.....	1
4 Symbols and requirements.....	2
4.1 Symbol for the product/process.....	2
4.2 Symbol for strength and elongation of all-weld metal.....	3
4.3 Symbol for impact properties of all-weld metal.....	4
4.4 Symbol for the chemical composition of rods or wires.....	4
5 Mechanical tests.....	9
5.1 Preheating and interpass temperatures.....	9
5.2 Welding conditions and pass sequence.....	10
5.3 PWHT condition.....	10
6 Chemical analysis.....	10
7 Rounding procedure.....	11
8 Retests.....	11
9 Technical delivery conditions.....	11
10 Designation.....	11

<https://standards.iteh.ai/catalog/standards/sist/1684907c-0b78-46f2-9fe2-519eabe12f0e/iso-636-2015>
 (standards.iteh.ai)

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.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 3, *Welding consumables*.

This fourth edition cancels and replaces the third edition (ISO 636:2004), which has been technically revised.

Requests for official interpretations of any aspect of this International Standard should be directed to the Secretariat of ISO/TC 44/SC 3, through your national standards body, a complete listing of which can be found at www.iso.org.

Introduction

This International Standard provides a classification for the designation of rods and wires in terms of their chemical composition and, where required, in terms of the yield strength, tensile strength, and elongation of the all-weld metal. The ratio of yield to tensile strength of weld metal is generally higher than that of parent metal. Matching weld metal yield strength to parent metal yield strength will not necessarily ensure that the weld metal tensile strength matches that of the parent material. Where the application requires matching tensile strengths, selection of consumables is made by reference to column 3 of [Table 1A](#) or [Table 1B](#).

Of note is that the mechanical properties of all-weld metal test specimens used to classify the rods and wires vary from those obtained in production joints because of differences in welding procedure such as diameter, width of weave, welding position, and material composition.

The classification according to system A is mainly based on EN 1668:1997. The classification according to system B is mainly based upon standards used around the Pacific Rim.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO 636:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/1684907c-0b78-46f2-9fe2-519eabe12f0e/iso-636-2015>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 636:2015

<https://standards.iteh.ai/catalog/standards/sist/1684907c-0b78-46f2-9fe2-519eabe12f0e/iso-636-2015>

Welding consumables — Rods, wires and deposits for tungsten inert gas welding of non-alloy and fine-grain steels — Classification

1 Scope

This International Standard specifies requirements for classification of rods and wires in the as-welded condition and in the post-weld heat-treated condition for tungsten inert gas welding of non-alloy and fine-grain steels with a minimum yield strength of up to 500 MPa or a minimum tensile strength of up to 570 MPa.

This International Standard is a combined specification providing classification utilizing a system based upon the yield strength and the average impact energy of 47 J of all-weld metal or utilizing a system based upon the tensile strength and the average impact energy of 27 J of all-weld metal.

- a) Paragraphs and tables which carry the suffix letter “A” are applicable only to rods and wires classified to the system based upon the yield strength and the average impact energy of 47 J of all-weld metal in accordance with this International Standard.
- b) Paragraphs and tables which carry the suffix letter “B” are applicable only to rods and wires classified to the system based upon the tensile strength and the average impact energy of 27 J of all-weld metal in accordance with this International Standard.
- c) Paragraphs and tables which have neither the suffix letter “A” nor the suffix letter “B” are applicable to all rods and wires classified in accordance with this International Standard.

<https://standards.iteh.ai/catalog/standards/sist/1684907c-0b78-46f2-9fe2-519eabe12f0e/iso-636-2015>

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 544, *Welding consumables — Technical delivery conditions for filler materials and fluxes — Type of product, dimensions, tolerances and markings*

ISO 13916, *Welding — Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature*

ISO 14175, *Welding consumables — Gases and gas mixtures for fusion welding and allied processes*

ISO 14344, *Welding consumables — Procurement of filler materials and fluxes*

ISO 15792-1:2000, *Welding consumables — Test methods — Part 1: Test methods for all-weld metal test specimens in steel, nickel and nickel alloys*. Amended by ISO 15792-1:2000/Amd 1:2011

ISO 80000-1:2009, *Quantities and units — Part 1: General*. Corrected by ISO 80000-1:2009/Cor 1:2011

3 Classification

Classification designations are based upon two approaches to indicate the tensile properties and the impact properties of the all-weld metal obtained with rods or wires. The two designation approaches include additional designators for some other classification requirements, but not all as will be clear from the following sections. In most cases, a given commercial product can be classified to the

classification requirements in both systems. Then, either or both classification designations can be used for the product.

Rods or wires shall be classified according to their chemical composition in accordance with [Table 3A](#) or [Table 3B](#).

3A Classification by yield strength and 47 J impact energy

The classification is divided into four parts.

- 1) The first part gives a symbol indicating the product/process to be identified.
- 2) The second part gives a symbol indicating the strength and elongation of the all-weld metal (see [Table 1A](#)).
- 3) The third part gives a symbol indicating the impact properties of all-weld metal (see [Table 2](#)).
- 4) The fourth part gives a symbol indicating the chemical composition of the rods or wires used (see [Table 3A](#)).

3B Classification according to alloy type

The classification is divided into four parts.

- 1) The first part gives a symbol indicating the product/process to be identified.
- 2) The second part gives a symbol indicating the strength and elongation of the all-weld metal in either the as-welded or post-weld heat-treated condition (see [Table 1B](#)).
- 3) The third part gives a symbol indicating the impact properties of all-weld metal in the same condition as specified for the tensile strength (see [Table 2](#)). The letter “U” after this designator indicates that the deposit meets an average optional requirement of 47 J at the designated Charpy test temperature.
- 4) The fourth part gives a symbol indicating the chemical composition of the rods or wires used (see [Table 3B](#)).

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 636:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/1684907c-0b78-46f2-9fe2-519eabe12f0e/iso-636-2015>

4 Symbols and requirements

4.1 Symbol for the product/process

The symbol of weld deposit by the tungsten inert gas welding process shall be the letter “W” placed at the beginning of the designation.

The symbol of rods or wires for the tungsten inert gas welding shall be the letter “W” placed at the beginning of the rod or wire designation.

4.2 Symbol for strength and elongation of all-weld metal

4.2A Classification by yield strength and 47 J impact energy

The symbol in [Table 1A](#) indicates yield strength, tensile strength, and elongation of the all-weld metal in the as-welded condition determined in accordance with [Clause 5](#).

4.2B Classification by tensile strength and 27 J impact energy

The symbol in [Table 1B](#) indicates yield strength, tensile strength, and elongation of the all-weld metal in the as-welded condition or in the post-weld heat-treated condition determined in accordance with [Clause 5](#).

Table 1A — Symbol for strength and elongation of all-weld metal

Symbol	Minimum yield strength ^a	Tensile strength	Minimum elongation ^b
	MPa	MPa	%
35	355	440 to 570	22
38	380	470 to 600	20
42	420	500 to 640	20
46	460	530 to 680	20
50	500	560 to 720	18

Table 1B — Symbol for strength and elongation of all-weld metal

Symbol ^a	Minimum yield strength ^b	Tensile strength	Minimum elongation ^c
	MPa	MPa	%
43X	330	430 to 600	20
49X	390	490 to 670	18
55X	460	550 to 740	17
57X	490	570 to 770	17

^a For yield strength, the lower yield (R_{eL}) is used when yielding occurs. Otherwise, the 0,2 % proof strength ($R_{p0,2}$) is used.

^b Gauge length is equal to five times the test specimen diameter.

^a X is "A" or "P". Where "A" indicates testing in the as-welded condition and "P" indicates testing in the post weld heat-treated condition.

^b For yield strength, the lower yield (R_{eL}) is used when yielding occurs. Otherwise, the 0,2 % proof strength ($R_{p0,2}$) is used.

^c Gauge length is equal to five times the test specimen diameter.

4.3 Symbol for impact properties of all-weld metal

4.3A Classification by yield strength and 47 J impact energy

The symbols in [Table 2](#) indicate the temperature at which impact energy of 47 J is achieved under the conditions given in [Clause 5](#).

Three test specimens shall be tested. Only one individual value can be lower than 47 J, but not lower than 32 J. The average of the three values shall be at least 47 J.

4.3B Classification by tensile strength and 27 J impact energy

The symbol in [Table 2](#) indicates the temperature at which impact energy of 27 J is achieved in the as-welded condition or in the post-weld heat-treated condition under the conditions given in [Clause 5](#).

Five test specimens shall be tested. The lowest and highest values obtained shall be disregarded. Two of the three remaining values shall be equal or greater than the specified 27 J level. One of the three can be lower, but shall not be less than 20 J. The average of the three remaining values shall be at least 27 J.

The addition of the optional symbol U immediately after the symbol for condition of heat treatment indicates that the supplemental requirement of 47 J impact energy at the normal 27 J impact test temperature has also been satisfied. For the 47 J impact requirement, the number of specimens tested and values obtained shall meet the requirement of [4.3A](#).

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Table 2 — Symbol for impact properties of all-weld metal

Symbol	Temperature for minimum average impact energy of 47 J ^a or 27 J ^b °C
Z	No requirements
A ^a or Y ^b	+20
0	0
2	-20
3	-30
4	-40
5	-50
6	-60
7	-70
8	-80
9	-90
10	-100
^a	Classification by yield strength and 47 J impact energy.
^b	Classification by tensile strength and 27 J impact energy.

4.4 Symbol for the chemical composition of rods or wires

The symbol in [Table 3A](#) or [Table 3B](#) indicates the chemical composition of the rods or wires and includes an indication of characteristic alloying elements.

Table 3A — Symbol for chemical composition (classification by yield strength and 47 J impact energy)

Symbol	Chemical composition (percentage mass fraction) ^a										
	C	Si	Mn	P	S	Ni	Cr	Mo	V	Al	Ti + Zr
2Si	0,06 to 0,14	0,50 to 0,80	0,90 to 1,30	0,025	0,025	0,15	0,15	0,15	0,03	0,02	0,15
3Si1	0,06 to 0,14	0,70 to 1,00	1,30 to 1,60	0,025	0,025	0,15	0,15	0,15	0,03	0,02	0,15
4Si1	0,06 to 0,14	0,80 to 1,20	1,60 to 1,90	0,025	0,025	0,15	0,15	0,15	0,03	0,02	0,15
2Ti	0,04 to 0,14	0,40 to 0,80	0,90 to 1,40	0,025	0,025	0,15	0,15	0,15	0,03	0,05 to 0,20	0,05 to 0,25
3Ni1	0,06 to 0,14	0,50 to 0,90	1,00 to 1,60	0,020	0,020	0,80 to 1,50	0,15	0,15	0,03	0,02	0,15
2Ni2	0,06 to 0,14	0,40 to 0,80	0,80 to 1,40	0,020	0,020	2,10 to 2,70	0,15	0,15	0,03	0,02	0,15
2Mo	0,08 to 0,12	0,30 to 0,70	0,90 to 1,30	0,020	0,020	0,15	0,15	0,40 to 0,60	0,03	0,02	0,15
Zb	Any other agreed composition										

^a Single values shown in the table are maximum values.

^b Consumables for which the chemical composition is not listed in this table shall be symbolized similarly and prefixed by the letter Z. The chemical composition ranges are not specified and therefore it is possible that two electrodes with the same Z classification are not interchangeable.