INTERNATIONAL STANDARD

ISO 9017

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Destructive tests on welds in metallic materials — Fracture test

Essais destructifs des soudures sur matériaux métalliques — Essai de texture

Reference number
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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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 9017 was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 5, *Testing and inspection of welds*.

Annex A of this International Standard is for information only.

Destructive tests on welds in metallic materials — Fracture test

1 Scope

This International standard specifies the sizes of test specimen and the procedures for carrying out fracture tests in order to obtain information about types, sizes and distribution of internal imperfections such as porosities, cracks, lack of fusion, lack of penetration and solid inclusions on the fracture surface.

This International Standard applies to metallic materials in all forms of product with joints made by any fusion welding process with a thickness greater or equal to 2 mm.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard 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 5817:—[1], *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections.*

ISO 10042, *Arc-welded joints in aluminium and its weldable alloys — Guidance on quality levels for imperfections.*

EN 970, *Non-destructive examination of fusion welds — Visual examination.*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
examination length
L_f
length of the test specimen measured along the weld axis between any side notches

See Figure 6.

3.2
total examination length
ΣL_f
sum of the lengths of all the test specimens comprising the test piece, measured along the weld axis, of the fracture faces between the side notches of the test specimens

See Figure 6.

1) To be published. (Revision of ISO 5817:1992)

3.3
examination thickness
a_f
thickness of the fracture area for each test specimen

See Figures 7and 8.

3.4
examination area
A_f
product of the examination length and the examination thickness for each test specimen

3.5
total examination area
ΣA_f
sum of all examination areas

4 Principle

Fracture the joint through the weld metal in order to examine the fracture surface. The fracture can be induced by bending or tension, static or dynamic loading. Furthermore, notch dimensions and temperature can be varied to induce the fracture.

Unless otherwise specified, the test shall be carried out at ambient temperature (23 ± 5) °C.

5 Symbols and abbreviated terms

The symbols and abbreviated terms to be used for fracture tests are specified in Table 1 and represented in Figures 5 to 8.

Normally, it is sufficient to give the basic denomination, but for special applications, additional denominations about the notching and test method can be requested.

EXAMPLE 1 Test specimen taken from a fillet weld with an examination length of 40 mm and examination thickness of 10 mm.

Without any requirement about notching and test method:

Basic denomination: FW/($L_f a_f$)

i.e. for this example:

FW/(40 × 10)

With additional requirement (square face notching and test method):

Comprehensive denomination: FW/($L_f a_f$)/Fq — See Figure 8

i.e. for this example:

FW/(40 × 10)/Fq — See Figure 8

EXAMPLE 2 Test specimen taken from a butt weld with an examination length of 40 mm and examination thickness of 10 mm.

Without any requirement about notching and test method:

Basic denomination: BW/($L_f a_f$)

i.e. for this example:

BW/(40 × 10)

With additional requirement (round side notching and test method):

Comprehensive denomination: BW/($L_f a_f$)/Sr See Figure 6

i.e. for this example:

BW/(40 × 10)/Sr See Figure 6

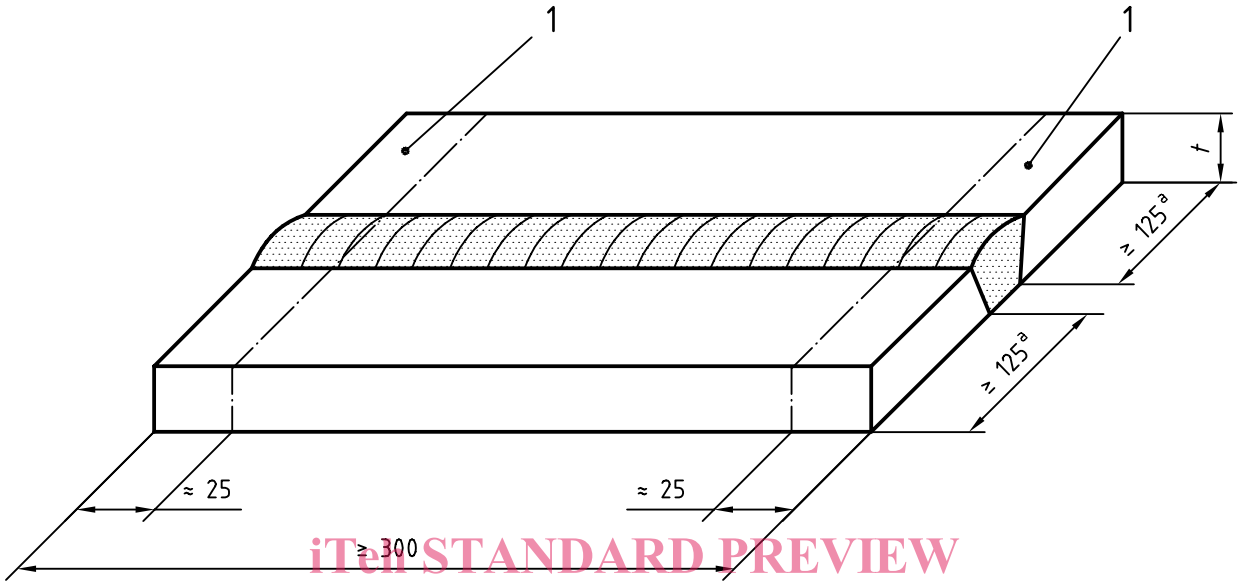
Table 1 — Symbols and abbreviated terms

Denomination	Symbol or abbreviated term	Unit
Butt weld	BW	–
Fillet weld	FW	–
Thickness of test piece	t, t_1, t_2	mm
Length of test piece	l_1, l_2	mm
Outside diameter of tube	D	mm
Test specimen and test piece		
examination length	L_f	mm
examination thickness	a_f	mm
examination area	A_f	mm^2
area of imperfections	A_i	mm^2
Side notch	S	
square (q)	Sq	–
round (r)	Sr	–
sharp (s)	Ss	–
Longitudinal notch		
Face notch	F	–
square (q)	Fq	–
round (r)	Fr	–
sharp (s)	Fs	–
Root notch	R	–
square (q)	Rq	–
round (r)	Rr	–
sharp (s)	Rs	–

6 Dimensions of test pieces

Unless otherwise specified by the application standard or by agreement between the contracting parties, test piece dimensions shall be in accordance with Figures 1 to 4. The test piece shall provide sufficient test specimens for the required total examination length (ΣL_f) and area (ΣA_f).

Dimensions in millimetres



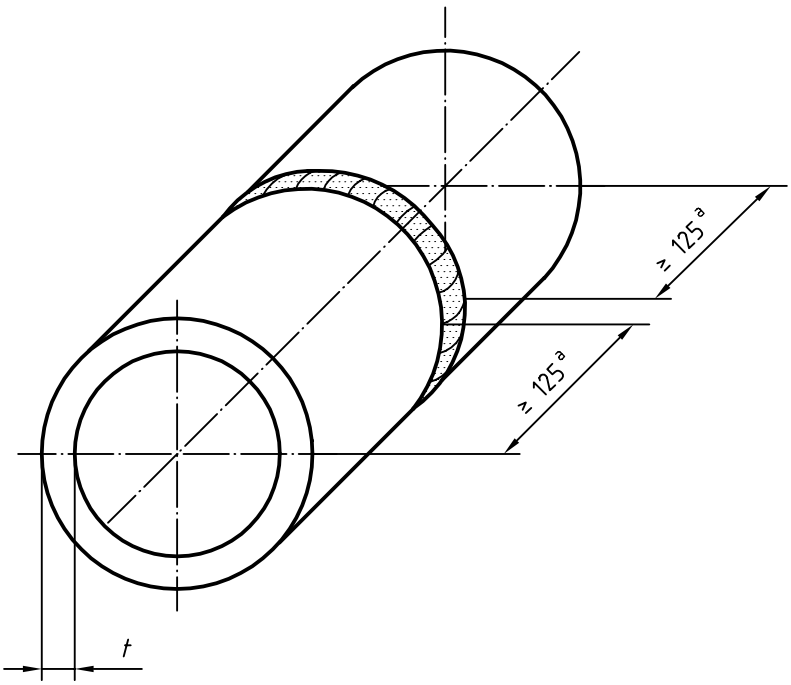
Key

1 Discard

a ⩾ 150 mm for materials of high thermal conductivity (e.g. aluminium and copper)

Figure 1 — Test piece for butt welds in plate

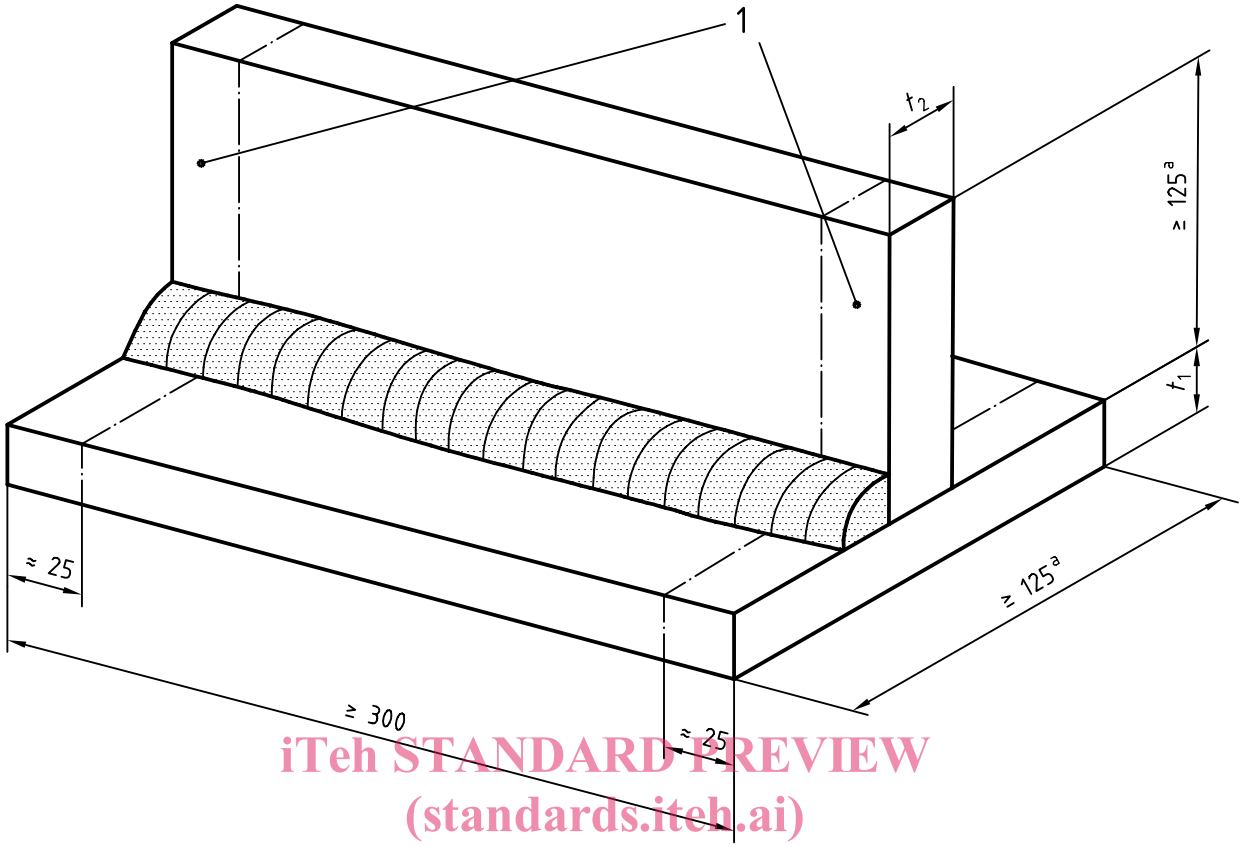
Dimensions in millimetres



a ⩾ 150 mm for materials of high thermal conductivity (e.g. aluminium and copper)

Figure 2 — Test piece for butt welds in pipe

Dimensions in millimetres



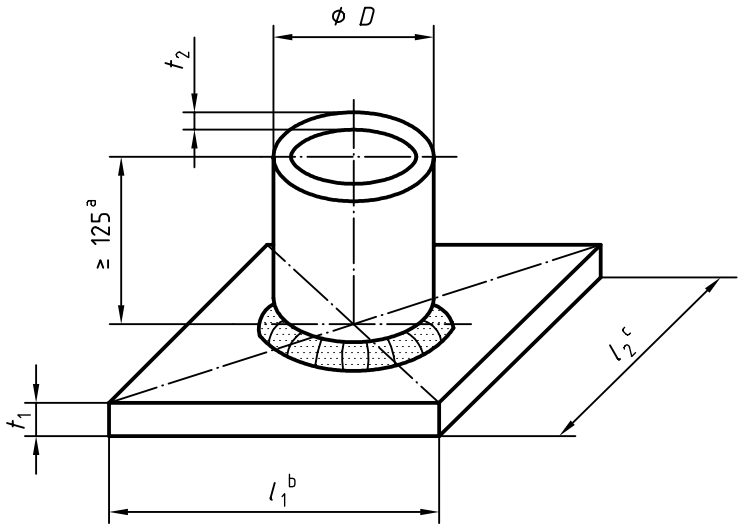
Key

1 Discard

a ⩾ 150 mm for materials of high thermal conductivity (e.g. aluminium and copper)

Figure 3 — Test piece for fillet welds on plate

Dimensions in millimetres



a ⩾ 150 mm for materials of high thermal conductivity (e.g. aluminium and copper)

b $l_1 \approx l_2$; $l_1 \geqslant (D + 100)$

c $l_2 \geqslant (D + 100)$

Figure 4 — Test piece for fillet welds on pipe