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Motståndssvetsning – Punktsvetsning av aluminium och aluminiumlegeringar – Svetsbarhet, svetsning och provning (ISO 18595:2007)

Resistance welding – Spot welding of aluminium and aluminium alloys – Weldability, welding and testing (ISO 18595:2007)

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The European Standard EN ISO 18595:2007 has the status of a Swedish Standard. This document contains the official English version of EN ISO 18595:2007.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 18595

September 2007

ICS 25.160.10

English Version

Resistance welding - Spot welding of aluminium and aluminium alloys - Weldability, welding and testing (ISO 18595:2007)

Soudage par résistance - Soudage par points de l'aluminium et des alliages d'aluminium - Soudabilité, soudage et essais (ISO 18595:2007)

Widerstandsschweißen - Punktschweißen von Aluminium und Aluminiumlegierungen - Schweißeignung, Schweißen und Prüfungen (ISO 18595:2007)

This European Standard was approved by CEN on 8 August 2007.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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Foreword

This document (EN ISO 18595:2007) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2008, and conflicting national standards shall be withdrawn at the latest by March 2008.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 18595:2007 has been approved by CEN as a EN ISO 18595:2007 without any modification.

Resistance welding — Spot welding of aluminium and aluminium alloys — Weldability, welding and testing

1 Scope

This International Standard specifies requirements for resistance spot welding in the fabrication of assemblies of aluminium sheet, extrusions (both work- and age-hardening alloys) and/or cast material comprising two or three thicknesses of metal, where the maximum single (sheet) thickness of components to be welded is within the range 0,6 mm to 6 mm.

This International Standard is applicable to the welding of sheets or plates of dissimilar thickness where the thickness ratio is less than or equal to 3:1. It applies to the welding of three thicknesses where the total thickness is less than or equal to 9 mm.

Welding with the following types of machines is within the scope of this International Standard:

— pedestal welding machines;

— gun welders;

— automatic welding equipment where the components are fed by robots or automatic feeding equipment;

— multi-welders;

— robotic welders.

Information on appropriate welding equipment is given in Annex A and on spot welding conditions in Annex B. The latter are for guidance only and may require modification depending on service conditions of the fabrication, type of welding equipment, characteristics of the secondary circuit, electrode material and geometry.

The welding of coated material, e.g. zinc-coated or anodised material, is not within the scope of this International Standard.

2 Normative references

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

ISO 669:2000, *Resistance welding — Resistance welding equipment — Mechanical and electrical requirements*

ISO 5182, *Welding — Materials for resistance welding electrodes and ancillary equipment*

ISO 5184, *Straight resistance spot welding electrodes*

ISO 5821, *Resistance spot welding electrode caps*

ISO 5830, *Resistance spot welding — Male electrode caps*

ISO 10447, *Resistance welding — Peel and chisel testing of resistance spot and projection welds*

ISO 14329:2003, *Resistance welding — Destructive tests of welds — Failure types and geometric measurements for resistance spot, seam, and projection welds*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 669:2000 and ISO 14329:2003 and the following apply.

3.1
corona bond zone
zone outside the weld nugget in which solid phase bonding has occurred

NOTE 1 See Figure 1.

NOTE 2 This zone can contribute towards the strength of the joints but may not be considered for design purposes.

3.2
corona bond diameter
d_c
outer diameter of the corona bond zone

NOTE See Figure 1.

3.3
cross-tension test
test to determine the load-carrying behaviour of a spot-welded joint subjected to cross-tension loading

3.4
interface failure
fracture through the weld nugget between the sheets in the plane of the interface

NOTE See Figure 1.

3.5
nugget diameter
d_n
mean of the maximum and minimum diameters of the fused nugget in the plane of the interface between the pieces joined, measured on a metallographic section taken transversely through the centre of the nugget

NOTE See Figure 1. The nugget diameter is the parameter on which the mechanical behaviour of a structure is based. Other parameters such as the plug or weld diameter can be influenced by the type of destructive test.

3.6
plug failure
slug/button failure
fracture in the base metal, the heat-affected zone, or the nugget leaving attached metal pulled through thickness from the opposing sheet

NOTE See Figure 2.

3.7
partial plug failure
fracture partly in the base material or the heat-affected zone and partly in the nugget leaving attached metal pulled through thickness from the opposing sheet

NOTE See Figure 2.

3.8
shear test
tensile shear test
test to determine the load-carrying behaviour of a spot-welded joint subjected to shear tension loading

3.9
weld diameter
d
⟨in an interface failure⟩ mean diameter of the fused zone measured at the interface omitting the corona bond

3.10
weld diameter
d
⟨in a plug failure⟩ mean diameter of the plug

NOTE See Figure 2 a) and b).

3.11
weld diameter
d
⟨in a partial plug failure⟩ mean diameter of the fused zone measured at the interface, omitting the corona bond area and the maximum diameter of the plug component of the failure

NOTE 1 See Figure 2 c).

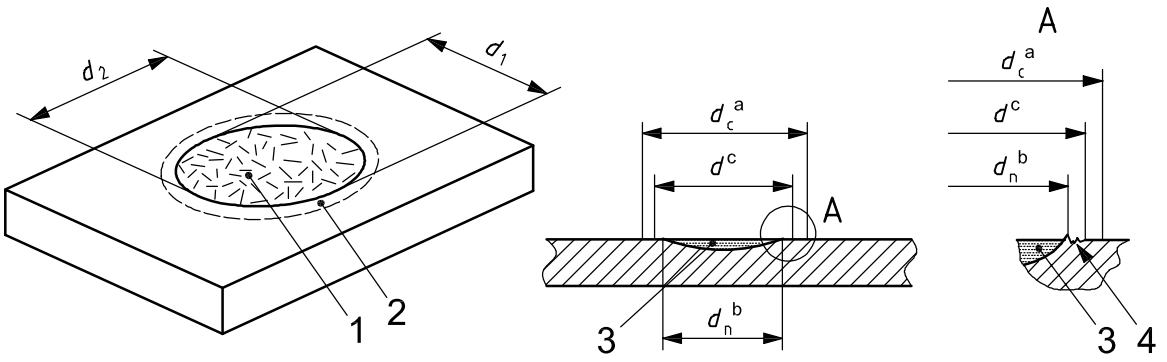
NOTE 2 The minimum diameter of the plug component of the fracture is reported separately (see Figures 1 and 2).

NOTE 3 The plug diameter in aluminium spot welds is generally less than or equal to the diameter of the (weld) nugget.

3.12
weld nugget
lenticular zone in a resistance weld where metal from both (all) sheets has melted and resolidified

3.13
plug diameter
d_p
mean diameter of the plug in both plug and partial plug failure modes

NOTE See Figure 2.

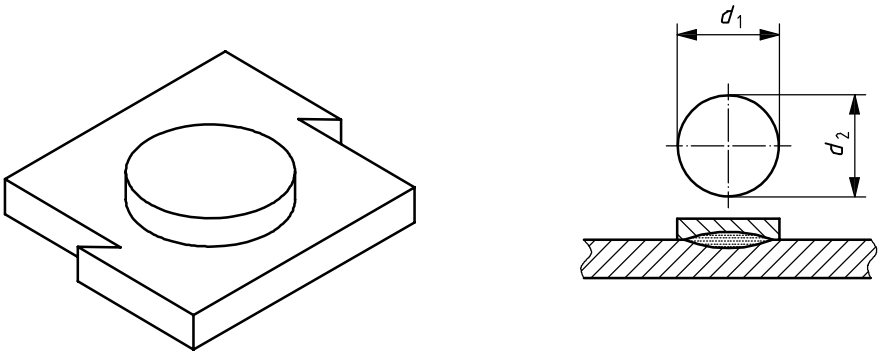


Key

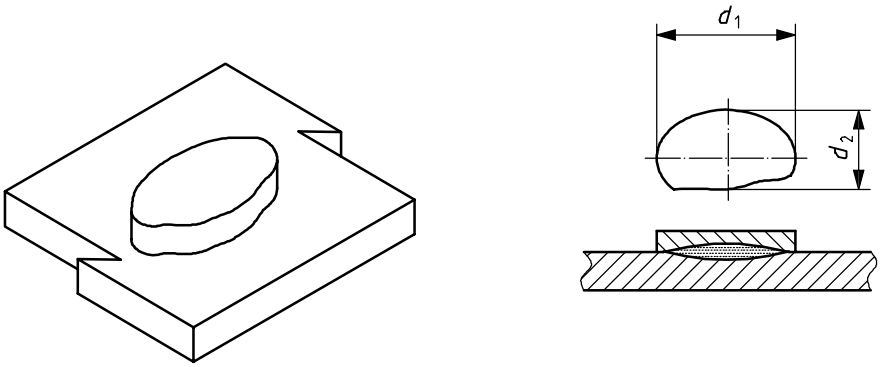
1 weld with interfacial fracture ($d \approx d_n$)
2 corona bond zone
3 molten material of the nugget
4 rough fracture zone

a Corona bond diameter.
b Nugget diameter.
c Weld diameter (d_1 or d_2).

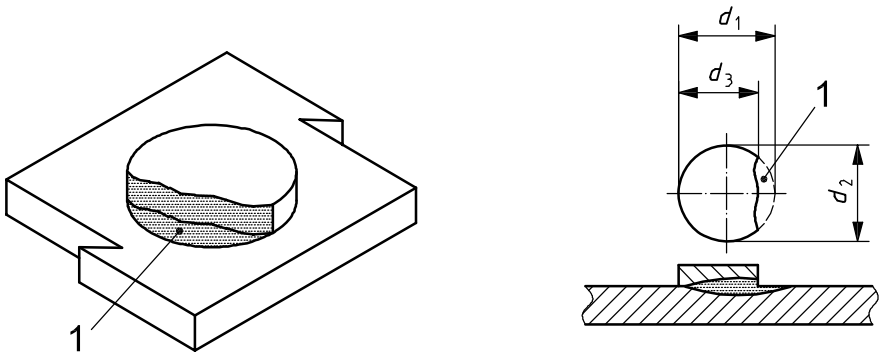
Figure 1 — Measurement of weld size — Weld with interface failure



a) Symmetrical plug failure[a]



b) Asymmetrical plug failure[a]



c) Partial plug failure[b]

a $d = d_p = (d_1 + d_2)/2$

b $d = (d_1 + d_2)/2$ and $d_p = (d_2 + d_3)/2$

Figure 2 — Measurement of weld size — Weld with plug (slug) failure

4 Symbols

Symbol	Term	Unit
d	weld diameter	mm
d_c	corona bond diameter	mm
d_i	initial or set-up weld diameter	mm
d_n	nugget diameter	mm
d_p	plug diameter	mm
d_t	initial electrode tip diameter	mm
t	sheet thickness	mm
P_s	shear strength of weld	kN
R_m	ultimate strength of aluminium being welded	MPa