SLOVENSKI STANDARD
SIST EN 16296:2014

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Nepravilnosti v zvarjenih spojih plastomerov - Stopnje kakovosti

Imperfections in thermoplastics welded joints - Quality levels

Unregelmäßigkeiten an Schweißverbindungen von thermoplastischen Kunststoffen - Qualitätsstufen

Défauts dans les assemblages soudés en thermoplastiques - Niveaux de qualité

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25.160.40	Varjeni spoji in vari	Welded joints
83.080.20	Plastomeri	Thermoplastic materials

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English Version

Imperfections in thermoplastics welded joints - Quality levels

Défauts dans les assemblages soudés en thermoplastiques - Niveaux de qualité

Unregelmäßigkeiten an Schweißverbindungen von thermoplastischen Kunststoffen - Qualitätsstufen

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 16296:2012) has been prepared by Technical Committee CEN/TC 249 “Plastics”, the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by April 2013, and conflicting national standards shall be withdrawn at the latest by April 2013.

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Introduction

This European Standard should be used as a reference in drafting of application codes and/or other application standards. It contains a simplified selection of imperfections based on the designations given in EN 14728, *Imperfections in thermoplastic welds — Classification*.

Some imperfections according to EN 14728 have been used directly and some have been grouped together. The basic numerical referencing system from EN 14728 has been used.

The purpose of this standard is to define quality levels based on typical imperfections, which might occur in normal fabrication. It may be used within a quality system for the production of factory welded joints. It provides three sets of dimensional values from which a selection can be made for a particular application. The quality level necessary in each case should be defined by the application standard or the fabricator in conjunction with the user and/or other parties concerned. The level should be prescribed before the start of production, preferably at the enquiry or order stage.

The quality levels given in this standard are intended to provide basic reference data and are not specifically related to any particular application. They refer to the types of welded joints in a fabrication and not to the complete product or component itself. It is possible, therefore, that different quality levels are applied to individual welded joints in the same product or component.

The choice of quality level for any application should take account of design considerations, subsequent processing, mode of stressing (e.g. static, dynamic), service conditions (e.g. pressure, temperature, environment) and consequences of failure. Economic factors are also important and should include not only the cost of welding but also of inspection, test and repair.

Although this European Standard includes types of imperfections relevant to the processes given in Clause 1, only those which are applicable to the process and application in question need to be considered.

Imperfections are quoted in terms of their actual dimensions. However their detection and evaluation may require the use of one or more methods of non-destructive testing. It should be noted that the detection and sizing of imperfections is dependent on the inspection methods and the extent of testing specified in the application standard or contract.

The need for detection is not the subject of this standard.

This European Standard is directly applicable to visual examination of welds or test specimens. It does not include details of recommended methods of detection and sizing. The indication provided by non-destructive testing should not be used directly for the evaluation of quality levels. Therefore, it needs to be supplemented by requirements for examinations, inspection and testing.

1 Scope

This European Standard provides quality levels for imperfections in thermoplastics welded joints. It applies to material thickness above 2,0 mm.

Three quality levels are given in order to permit application for a wide range of welded fabrication. They are designated by symbols B, C and D, where B is the most stringent. The quality levels refer to production quality and not to the fitness-for-purpose (see 3.2) of the manufactured product.

This European Standard applies to the following thermoplastic materials:

Table 1

Abbreviation	Material description
ABS	Acrylonitrile-butadiene-styrene plastic
ECTFE	Ethylene-chlorotrifluoroethylene copolymer
FEP	Fluorinated ethylene propylene
PB	Polybutylene
PE	Polyethylene
PFA	Perfluoroalkoxy
PP-B	Polypropylene block copolymer
PP-H	Polypropylene homopolymer
PP-R	Polypropylene random copolymer
PVC-C	Chlorinated polyvinyl chloride
PVC-U	Unplasticised polyvinyl chloride (rigid PVC)
PVDF	Polyvinylidene fluoride

and to the following welding processes:

— Heated tool welding;

— Electrofusion welding;

— Hot gas welding using filler rod only;

— Extrusion welding;

— Solvent welding of pipes.

2 Normative reference

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.

EN 14728, *Imperfections in thermoplastic welds — Classification*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply

3.1
quality level
description of the qualities of a weld on the basis of type and size of selected imperfections

3.2
fitness-for-purpose
ability of a product, process or service to serve a defined purpose under specific conditions

4 Quality levels

4.1 Classification

Three quality levels are defined as B, C and D in order to permit application for a wide range of welded fabrications (see Table 2).

Table 2 — Quality levels for weld imperfections

Symbol	Requirement
B	Stringent
C	Intermediate
D	Moderate

The purpose of this standard is to define quality levels based on typical imperfections, which might occur in normal fabrications and are classified in EN 14728. It may be used within a quality system for the production of factory welded joints. It provides three sets of dimensional values from which a selection can be made for a particular application. The quality level necessary in each case should be defined by the application standard or the fabricator in conjunction with the user and/or other parties concerned. The level should be prescribed before the start of production, preferably at the enquiry or order stage.

For specific applications, additional requirements not covered by this standard may need to be prescribed. These additional requirements shall be defined as quality level A.

4.2 Choice of quality level

For the choice of the quality level, the following factors, among others, shall be taken into account:

— mechanical loading (static, dynamic);

— environment (media, temperature);

— material properties (ductile, brittle);

— manufacturing conditions (workshop, construction site, welding in constrained condition);

— operating conditions;

— potential danger in the event of failure.

5 Requirements for welded joints

The requirements for the above mentioned quality levels (B, C and D) are listed as follows:

— Heated tool butt welds: Table 3;

— Heated tool socket welds: Table 4;

— Electrofusion welds: Table 5;

— Hot gas welds: Table 6;

— Extrusion welds: Table 7;

— Solvent welds in pipes: Table 8.

Different types of imperfection occurring simultaneously at any cross-section of the joint may need special consideration and advice should be sought from the product manufacturer.

Any two adjacent imperfections separated by a distance smaller than the major dimension of the smaller imperfection shall be considered as a single imperfection.

In certain circumstances, it is necessary to machine the completed weld. In this case, the weld shall be examined both before and after machining.

Table 3 — Definition of quality levels for heated tool butt welds

Number	Designations	Level B	Level C	Level D
1AAAA	Cracks	Not permissible	Not permissible	Not permissible
2BAAA	Gas cavity	Isolated cavities permissible if diameter ≤ 5 % of wall thickness	Permissible if diameter of largest cavity ≤ 10 % of wall thickness	Permissible if diameter of largest cavity ≤ 15 % of wall thickness
2CAAA	Shrinkage cavity	Isolated cavities permissible if diameter ≤ 5 % of wall thickness	Permissible if diameter of largest cavity ≤ 10 % of wall thickness	Permissible if diameter of largest cavity ≤ 15 % of wall thickness
2DAAA	Craze	Not permissible	Not permissible	Not permissible
3AAAA	Inclusion	Isolated inclusion permissible if maximum dimension ≤ 5 % of wall thickness	Isolated and rows of inclusions permissible if maximum dimension ≤ 10 % of wall thickness	Isolated and rows of inclusions permissible if maximum dimension ≤ 15 % of wall thickness
3KAAA	Degraded polymer	Not permissible	Not permissible	Not permissible
4BAAA	Lack of fusion	Not permissible	Not permissible	Not permissible
5AAAA	Imperfect shape	Mechanical testing of sample welds is recommended	Mechanical testing of sample welds is recommended	Mechanical testing of sample welds is recommended
5EJAA	Linear misalignment	Permissible if misalignment is not greater than 10 % of the wall thickness	Permissible if misalignment is not greater than 15 % of the wall thickness	Permissible if misalignment is not greater than 20 % of the wall thickness
5EKAA	Angular misalignment	Permissible if misalignment is not greater than 0,2°	Permissible if misalignment is not greater than 0,4°	Permissible if misalignment is not greater than 0,8°
5HAAA	Irregular surface	Not permissible	Not permissible	Not permissible
6EAAA	Excessive upset	Not permissible	Not permissible	Not permissible
6HAAA 6HAAC	Excessive asymmetry of welds	Permissible if smaller half of weld bead is not less than 70 % of	Permissible if smaller half of weld bead is not less than 60 % of	Permissible if smaller half of weld bead is not less than 50 % of

Number	Designations	Level B	Level C	Level D
		larger half of weld bead around the whole circumference	larger half of weld bead around the whole circumference	larger half of weld bead around the whole circumference
7BAAA	Thermal damage	Not permissible	Not permissible	Not permissible
9CAAA	Tool mark	Locally permissible if bottom of notch is not acute and the notch depth is less than 10 % of the wall thickness and not greater than 0,5 mm	Locally permissible if bottom of notch is not acute and the notch depth is less than 10 % of the wall thickness and not greater than 1,0 mm	Locally permissible if bottom of notch is not acute and the notch depth is less than 15 % of the wall thickness and not greater than 2,0 mm
NOTE The data in this table can also be found in DVS 2202-1 [1].				