SLOVENSKI STANDARD
SIST EN 9132:2017

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Nadomešča:
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Aeronavtika - Sistem vodenja kakovosti - Zahteve za kakovost črtne kode Data Matrix za označevanje delov

Aerospace series - Quality management systems - Data Matrix Quality Requirements for Parts Marking

Luft- und Raumfahrt - Qualitätsmanagementsysteme - Data Matrix Qualitätsanforderungen für Teilemarkierung

Série aérospatiale - Systèmes de management de la qualité - Exigences qualité du marquage des pièces en code-barres Data Matrix

Ta slovenski standard je istoveten z: **EN 9132:2017**

ICS:

03.100.70	Sistemi vodenja	Management systems
03.120.10	Vodenje in zagotavljanje kakovosti	Quality management and quality assurance
49.020	Letala in vesoljska vozila na splošno	Aircraft and space vehicles in general

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ICS 03.100.70; 03.120.10; 49.020

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English Version

Aerospace series - Quality management systems - Data Matrix Quality Requirements for Parts Marking

Série aérospatiale - Systèmes de management de la qualité - Exigences qualité du marquage des pièces en code-barres Data Matrix

Luft- und Raumfahrt - Qualitätsmanagementsysteme - Data Matrix Qualitätsanforderungen für Teilemarkierung

This European Standard was approved by CEN on 4 December 2016.

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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-CENELEC Management Centre has the same status as the official versions.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN 9132:2017) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

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 August 2017, and conflicting national standards shall be withdrawn at the latest by August 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 9132:2006.

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Rationale

This standard has been revised to clean up the general text/content and to reformat the document to the latest format/style guide. This standard was created to provide for uniform quality and technical requirements relative to metallic parts marking performed within the aviation, space, and defence industry. This standard can be invoked as a stand-alone requirement or used in conjunction with EN 9100-series standards (i. e., EN 9100, EN 9110, EN 9120).

Foreword

To assure customer satisfaction, the aviation, space, and defence industry organizations must produce and continually improve safe, reliable products that meet or exceed customer and regulatory authority requirements. The globalization of the industry, and the resulting diversity of regional/national requirements and expectations, has complicated this objective. End-product organizations face the challenge of assuring the quality of, and integrating, product purchased from suppliers throughout the world and at all levels within the supply chain. Furthermore, suppliers and processors, within the industry, face the challenge of delivering product to multiple customers having varying quality expectations and requirements.

The aviation, space, and defence industry established the International Aerospace Quality Group (IAQG) for the purpose of achieving significant improvements in quality and safety, and reductions in cost, throughout the value stream. This organization includes representation from companies in the Americas, Asia/Pacific, and Europe. This document standardizes data matrix quality requirements for parts marking for the industry. The establishment of common requirements, for use at all levels of the supply-chain by organizations, should result in improved quality and safety, and decreased costs, due to the elimination or reduction of organization-unique requirements and the resultant variation inherent in these multiple expectations.

1 Scope

This standard defines uniform quality and technical requirements relative to metallic parts marking performed using “data matrix symbology” within the aviation, space, and defence industry. ISO/IEC 16022 specifies general requirements (e. g., data character encodation, error correction rules, decoding algorithm). In addition to ISO/IEC 16022 specification, part identification with such symbology is subject to the requirements in this standard to ensure electronic reading of the symbol.

The marking processes covered by this standard are as follows:

- Dot Peening;
- Laser;
- Electro-Chemical Etching.

Further marking processes will be included, if required.

Unless specified otherwise in the contractual business relationship, the company responsible for the design of the part shall determine the location of the data matrix marking. Symbol position should allow optimum illumination from all sides for readability.

This standard does not specify information to be encoded.

1.1 Convention

The following conventions are used in this standard:

- The word “shall” indicates mandatory requirements;
- The word “should” indicates requirements with some flexibility allowed in compliance methodology. Producers choosing other approaches to satisfy a “should” shall be able to show that their approach meets the intent of the standard’s requirement;
- The words “typical”, “example”, “for reference” or “e. g.” indicate suggestions given for guidance only;
- Appendices to this document are for information only and are provided for use as guidelines;
- Dimensions used in this document are as follows. Metric millimetre (mm) sizes followed by inches (in) in parentheses, unless otherwise stated.

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.

EN 9102, *Quality Systems — First article inspection requirement*

ISO/IEC 16022, *Information technology — Automatic identification and data capture techniques — Data Matrix bar code symbology specification*

3 Marking requirements

3.1 General requirements

a) Rows and columns:

Rows and columns connected with data matrix symbology shall conform to Error Checking and Correcting (ECC) 200 (see ISO/IEC 16022).

b) Square versus rectangle:

Matrix may be square or rectangular within ECC 200 requirements (see ISO/IEC 16022). Square is preferred for easier reading.

c) Quiet zone:

The quiet zone (margin) around the matrix shall be equal to or greater than one module size.

d) Round surface:

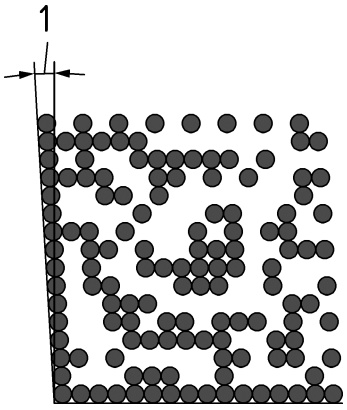
If the marking is made on a round/curved surface, the symbol coverage shall be equal to or less than 16 % of the diameter or 5 % of circumference.

e) Symbol size:

To facilitate electronic reading of the symbol, the overall symbol size should be less than 25,4 mm (1 000 inch), outside dimension, longest side. Irrespective of matrix size used, the requirements included in this standard shall be applied.

f) Angular distortion of the symbol:

Angular deviation of 90-degree axes between row and column shall not exceed ±7 degrees (see Figure 1).



Key

1 Angle of Distortion

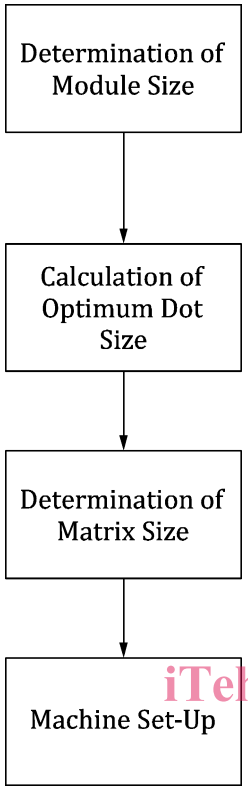
Figure 1 — Angle of distortion

3.2 Dot peening

3.2.1 Description of process

a) Dot-peen marking technology typically produces round indentations on a part's surface with a pneumatically or electromechanically driven pin, otherwise known as a stylus. Critical to the readability of dot-peen marked symbols are the indented dot's shape, size, and spacing. The dot size and appearance are determined mostly by the stylus cone angle, marking force, and material hardness. The

indented dot created should be suitable to trap or reflect light and large enough to be distinguishable from the parts surface roughness. It should also have spacing wide enough to accommodate varying module sizes, placement, and illumination (see Figure 2).



Determine minimum module size according to the surface texture. See Table 1, Figure 3 (inch), or Figure 4 (mm).

Calculate dot size with regard to the above minimum module size in choosing stylus angle (i. e., 60°, 90°, or 120°) depending on maximum depth allowed by engineering design requirements (see Table 2 for the optimum dot size).

Determine matrix size depending on the information coded in the matrix (reference tables presented in Appendix A for minimum matrix size based on available marking area)

Set up machine (e. g., height, air pressure, force) for desired dot geometry)

Figure 2 — Instructions for determination of marking parameters

b) The issues involved in marking and reading dot-peen-marked symbols on metals are different than symbols printed on paper. The first fundamental difference is that the contrast between dark and light fields is created by artificial illumination of the symbol. Therefore, the module's shape, size, spacing, and part surface finish can all affect symbol readability.

c) The key to a successful dot-peen marking and reading project is to control the variables affecting the consistency of the process. Symbol reading verification systems can provide feedback of the process parameters to some extent. Marking system operating and maintenance procedures shall be established to help ensure consistent symbol quality. Regular maintenance schedules should be established to check for issues such as stylus wear.

d) Additional processes, like machining dedicated surfaces, may be necessary to improve the symbol readability. Cleaning the part surfaces, prior to marking, with an abrasive pad to remove coatings, rust, and discolouration, or using an air knife to blow away excess machining fluids, debris, or oil can increase the symbol readability.

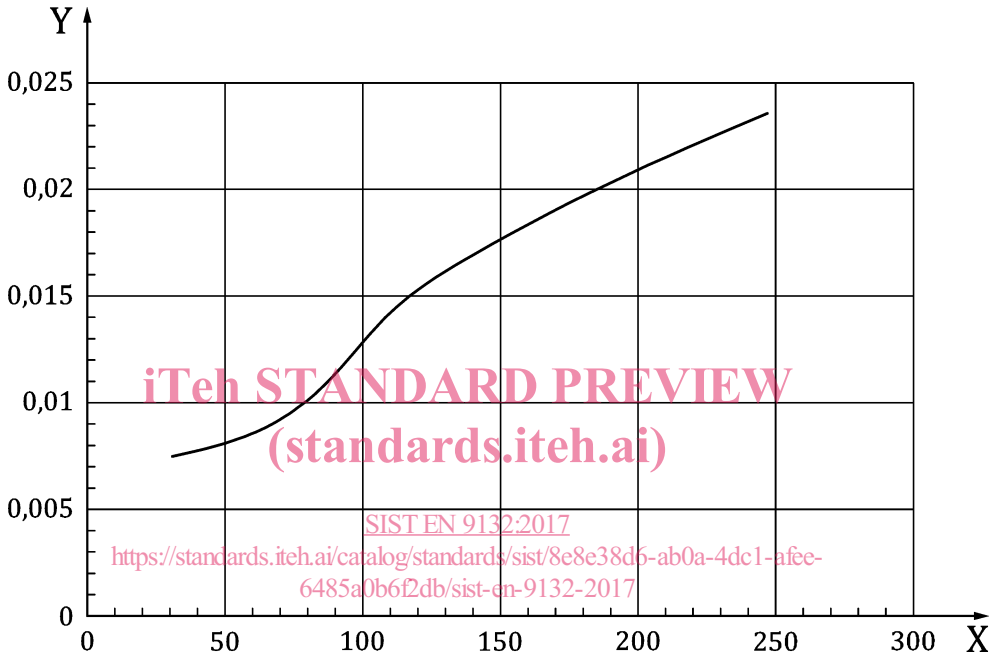
3.2.2 Requirements

a) Data matrix symbol nominal module size:

The surface texture of the part affects the quality of a data matrix symbol produced by dot peening. Table 1 and Figure 3 and Figure 4 show the minimum readable module size requirements for the surface texture of the part. The engineering design authority shall approve changes to the minimum module size.

Table 1 — Minimum readable module size by surface texture (Ra)

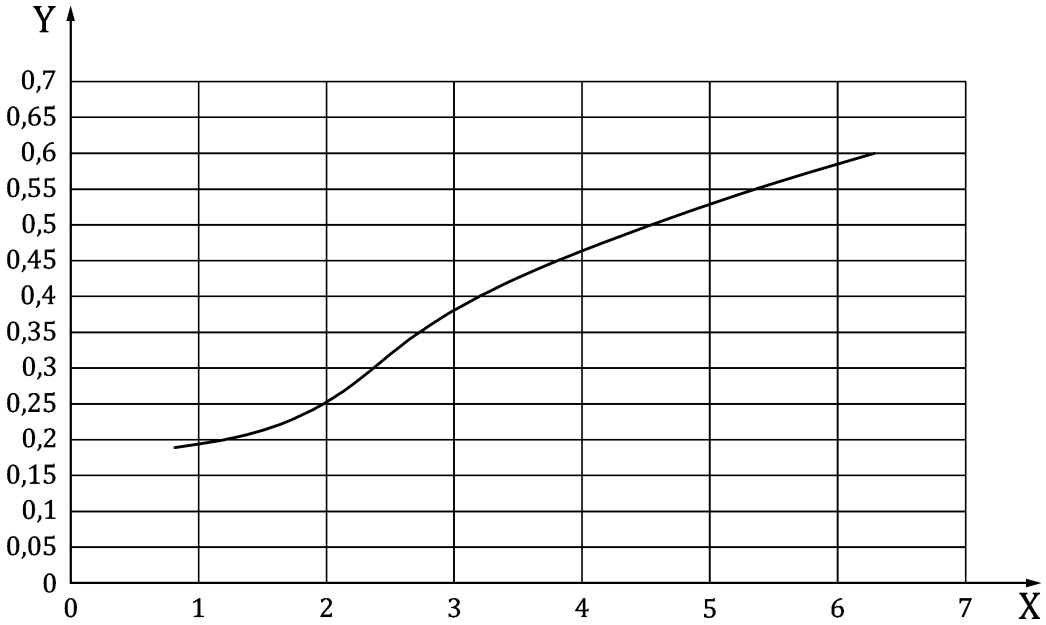
Surface Texture (Ra)		**Minimum Module Size**	
Microinches	Micrometres	Inches	Millimetres
32	0.8	0.0075	0,19
63	1.6	0.0087	0,22
95	2.4	0.0122	0,31
125	3.2	0.0161	0,41
250	6.3	0.0236	0,60



Key

Y Minimum call size [inch]
X Surface texture Ra (µ inch)

Figure 3 — Minimum module size (inch) by surface texture (µinch)



Key

Y Minimum call size [inch]
X Surface texture Ra (µ inch)

Figure 4 — Minimum module size (mm) by surface texture (µm)

b) Data capacity:

Tables in Appendix A for dot peening show the symbol size and the data capacity compared to the nominal module size and the number of rows and columns relative to surface texture. These tables are based on practical testing.

c) Data matrix symbol quality requirements:

Below are the symbol quality requirements of the data matrix and marking equipment, but these may vary according to the design requirements and responsibility:

- Dot depth is subject to engineering design requirements. The dot depth is based upon the requirements for process, environment survivability, and other material considerations;
- Stylus radius is an engineering design requirement. The maximum tolerance shall not exceed 10 % of the stylus radius;
- Surface colour and colour consistency may be specified as an engineering design requirement. In order to maximize readability, variation in surface colour should be minimized;
- Stylus cone angle (reference α in Appendix B) is an engineering design requirement. The cone angles permitted are 60, 90 and 120 degrees. The tolerance on the cone angle shall be ±2 degrees. For general quality of mark and stylus life, stylus cone angle of 120 degrees is preferred;
- Stylus point finish shall be polished. Surface texture shall not exceed 32 µin or 0.8 µm. Guidance instructions for grinding are provided in Appendix B;
- Stylus point concentricity should be 0,04 mm (0.0016 inch) total indicator reading or 0,02 mm (0.0008 inch) radial point displacement. Point concentricity is referenced to stylus centreline. Hand held grinding of stylus points is not permitted;
- Dot size shall not exceed 105 % of the nominal module size and not be less than 60 % of the nominal module size. The ovality (see Figure 5) of the dot shall not exceed 20 % of the module size.