BRITISH STANDARD

BS EN
4300:2008

Aerospace series — Identification marking of engine items — Design standard

ICS 49.050

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 4300:2008.

The UK participation in its preparation was entrusted to Technical Committee ACE/12, Aerospace fasteners and fastening systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Aerospace series - Identification marking of engine items - Design standard

Série aérospatiale - Marquage pour articles moteurs - Normes de conception

Luft- und Raumfahrt - Kennzeichnung von Triebwerkbauteilen - Konstruktionsnorm

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 4300:2008) 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of an identical text or by endorsement, at the latest by October 2008, and conflicting national standards shall be withdrawn at the latest by October 2008.

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1 Scope

This standard:

— describes the location and the layout of the marks of the item;

— describes the marking processes to be used according to the environment and the function of the items;

— determines the selection conditions of the marks;

— determines the compatibility conditions of the marking processes with the constitution, the production and the use of the items.

This document applies to aerospace engine items and shall be used in conjunction with EN 4301.

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.

EN 4301, *Aerospace series — Identification marking methods for engine items.*

AS 478J, *Identification Marking Methods*. [1)]

3 Abbreviation

O.C.R. Optical Character Recognition

4 Presentation

4.1 Definition

4.1.1 Identity mark

An identity is represented by a mark affixed by means of a marking process.

An identity mark allows for example:

— the identity of an item and its design origin;

— the initial compliance of the item with its definition to be proved;

— the data relating to the various stages of the item's life in production and in use to be traced (traceability);

— the conditions of use to be specified;

— etc.

4.1.2 Description of an identity mark

An identity mark is information (coded identity or not), consisting of characters presented in a clear and orderly manner. A mark is characterised by a composition and a size and is applied directly to the item or to a separate support.

1) Published by: Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001 USA.

4.2 Marking

Marking is the action of affixing the marks on a medium (item, label, etc.). Marking is defined by a process (or several alternative processes) at a location identical for all the units of the same item.

The marking process is selected according to:

— its ability not to affect the material, the geometry or the characteristics of the item;

— its ease of implementation;

— its cost;

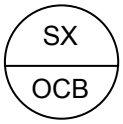
— its long-term resistance.

Selection shall be thorough. An ill-suited process or sign size may damage an item during the last phases of manufacturing.

4.3 Relationship between identifier and mark

The following examples in Table 1 illustrate the relationship between identifier and mark.

Table 1

Identity requirement	Mark to be applied
To identify item's definition.	F0320 37356-12-6
To indicate the conditions of use.	VENT BEFORE OPENING
To state the compliance of an item with its definition.	 (inspection punch)
To provide for traceability of the item.	12345678 (serial number)
To specify a functional aspect of the item.	 (flow direction of a fluid)
To specify the condition of the item.	REP R2738 (item having been subjected to repair)
To specify a grade of material.	● Colour dot on an elastomer seal

5 Application of use

5.1 General

Minimum identification shall be provided to clearly identify the part and be compatible with the item and its environment.

5.2 Selection of the marks (see Table 3)

5.2.1 General

Selection and layout of the marks shall not be detrimental to the function of the item.

Avoid repeating existing marks.

All the characters of all the identity marks shall be readable by a single means, whether automated or not. In the case of automated reading of codified identity marks, character readable identification should also be provided if possible.

It is necessary to measure the size of the medium to be marked since the height chosen for the characters is **to be as great as possible** with respect to the space available.

5.2.2 Reduced markings for small items

For small-size items and those difficult to mark, the number of marks placed on the actual item can be reduced. However when reduced marking is used, a tag or the packaging should bear all the information required by the definition.

For non-serialised items, replace code 3 (serial number) with code 9 (manufacturing date). In some cases, only the production source's company monogram, code 6, is acceptable.

The order of preference for using reduced marking is given below:

EXAMPLES

	Identification marks		**Code** (see EN 4301, Table 1)
Preference 1	• Designer's company code	:	2
	• Item identification number	:	1
	• Production source's company code	:	10
	• Serial number (or manufacturing date)	:	3 (or 9)
Preference 2	• Item identification number	:	1
	• Production source's company code	:	10
	• Serial number (or manufacturing date)	:	3 (or 9)
Preference 3	• Production source's company monogram	:	6
	• Serial number (or manufacturing date)	:	3 (or 9)
Preference 4	• Production source's company monogram	:	6

5.3 Selection of the marking locations

5.3.1 General

The surface selected for marking shall be such as to be accessible and compatible to the marking process, and adequate to contain all the marks.

For replaceable elements, the location shall be selected such that, where possible, the marks remain visible after assembly.

5.3.2 Prohibited areas

The application of marks is prohibited in the following areas:

— proximity to fillet radius, chamfers and component edges or angled surface's because of the risk of stress cracking;

— flow areas, because of the risk of flow disturbance;

— assembly areas e.g. welding, clamping, bonding because of the risks of bearing surface defect, alignment defect, loss of clamping loads, contamination, etc.;

— friction or sliding areas because of the risk of seizing, stiff points, etc.;

— stressed areas, because of the cracks, fatigue, life cycle reduction, etc.

The surface hardened (case hardening) hence embrittled areas shall be avoided, because of the risk of fatigue failure.

5.3.3 Restricted marking area

If a designer specifies a specific controlled area to contain the marking (see 6.3.2), he shall first contact manufacturing, to ensure all relevant information can be fitted into that area.

5.3.4 For the pipe assemblies, tubing and electrical wiring

A minimum of one mark shall be provided at or near one of the connection points.

Where more than one mark is used on a tube run for ease of reading, inversion of every second group of marks is acceptable.

5.4 Selection of the marking processes

5.4.1 General

Whatever the environment of the component the marking process chosen must ensure a permanent marking is achieved:

— select the processes which can be applied to an item according to the selection of Table 3, i.e.:

  — geometry,

  — material,

  — environment,

  — function.

  Refer to 5.3 for the marking selection criteria and to Table 2 for the design criteria as given above, according to the marking process chosen;

— ensure that the process:
  — presents no danger to the item: risk of distortion, corrosion, embrittlement, etc.,
  — is compatible with the item's utilisation environment: temperature, fluids, etc.,
  — is compatible with the geometry of the location: accessibility, surface condition, etc.,
  — produces legible marks: contrast with the background, impastation, etc.;
— examine the possibilities of later rework or additions: upgrading of the item to a new definition, application of repair, etc.;
— if automatic identification and/or recording of the marks is required, refer to EN 4301; compatible O.C.R. marking processes are given in Table "Marking method codes, class letter and depth" of EN 4301.

5.4.2 Permanent marking process

Permanent markings ensure identification during the normal service life of the item.

Permanent markings are permitted on finished items only when specified by the engineering drawing from which the item is manufactured.

Permanent markings shall not affect the function or serviceability of the item.

Permanent marking is not recommended on contacting surfaces, nor on surfaces which are in motion with respect to the mating surface during operation of the items. However, when permanent markings must be placed on such surfaces, all raised metal and burrs shall be removed in accordance with the requirements given on the engineering drawing of the item.

Permanent markings shall not be applied on surfaces which have been chemically processed, painted, or plated unless the marking will be legible and the minimum requirements of the surface treatment process is maintained or restored.

See EN 4301.

5.4.3 Temporary marking process

Temporary markings ensure identification during ordinary handling and storage of items prior to assembly and use. Under certain service conditions these markings may exhibit the characteristics of permanent markings.

Temporary markings shall not adversely affect the function or serviceability of the item. On items subject to intense heat, any temporary marking method which leaves heavy carbon deposit or sufficient detrimental residue such as cadmium, copper, zinc, lead, etc., should be avoided or, when used, shall be removed before subjection to intense heat.

See EN 4301.

6 Information to be entered on the drawing

6.1 General

The identification marking methods are described in EN 4301.

6.2 Definition of the item

The drawing calls out:

— the identification marking codes in accordance with EN 4301, see Figure 1 (*);
— standard combinations of identification marks in accordance with EN 4301, see Figure 2 (**);

— EN 4301 for marking method (***);

— the process(es) code(s) in accordance with EN 4301, see Figure 2 (***) [2];

— any additional descriptors.

6.3 Location of indication marks

6.3.1 For unrestricted marking on a component surface

The callout line shall show the surface that is to be marked refer to examples in Figures 1 and 2.

See EN 4301 "Indication on drawings".

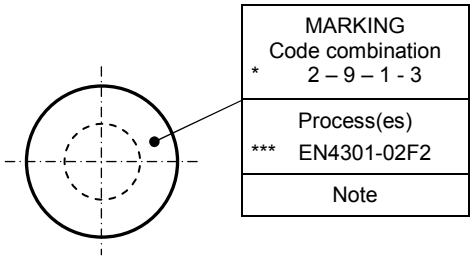


Figure 1

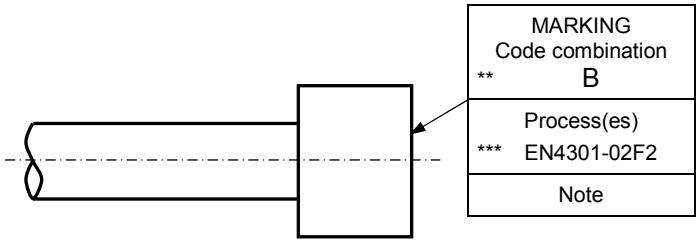


Figure 2

6.3.2 For restricted marking on a component surface

The callout line shall indicate the area the marking is to be positioned delineated by a fine dot and dash line, refer to example in Figure 3.

The marking area shall be dimensioned and indicated by a fine dotted and dashed line refer to 5.3.3.

See EN 4301 "Indication on drawings".

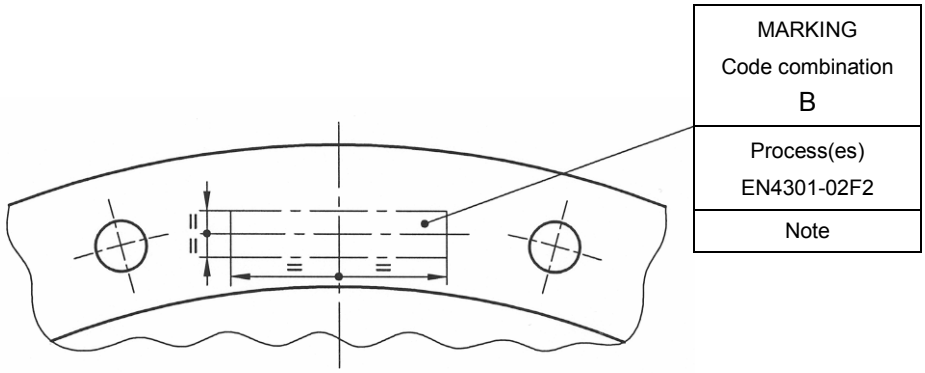


Figure 3

NOTE Designer shall not in choosing a position on the component surface to place the marking area, he shall provide minimum clearance for the margin requirements as given in EN 4301.

2) If automatic reading and / or recording is required, refer to 6.4 for additional identification codes.

6.4 Automatic identification methods

6.4.1 O.C.R. requirements (Optical Character Recognition)

If automatic identification and/or recording of the O.C.R. marks is required, the drawing shall carry:

— an arrow and the wording **"Writing direction"** shall be in the vicinity of the area to be marked (see Figure 4);

— the O.C.R. compatible marking process followed by the O.C.R. process code (DM1 to DM6) related to character height, refer to EN 4301, Table "Marking method codes, class letter and depth" and Annex "Character shapes and optical character recognition requirements (O.C.R.) for 5×7 dot matrix method".

EXAMPLE

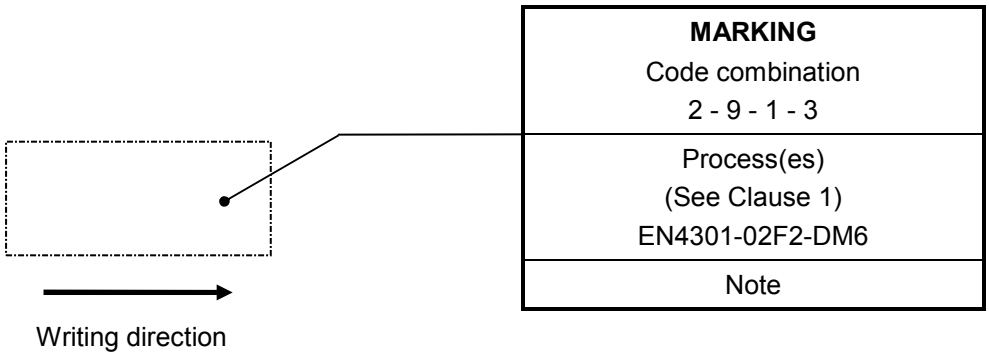
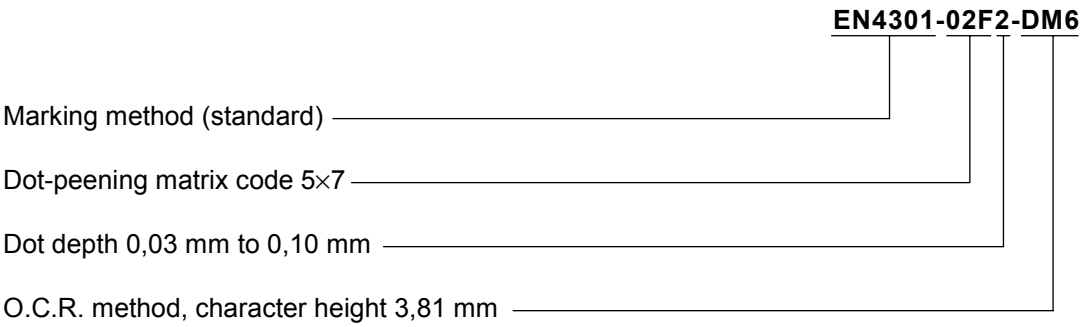


Figure 4



6.4.2 Other methods of electronic identification

Other methods of electronic identification, e.g. bar coding may also be used.

Table 2

Identification code			Process	Geometry	Material	Environment		Function
						Thermal	chemical	
01			**Integral**	Applicable on moulded, cold formed or forged items	All mouldable forgeable or cold formable materials	No recessed marking on thin walls subjected to low temperatures (– 20 °C)	Risk of retention of corrosive agents	Except in the following areas: – flow – assembly – friction – sliding – envelope – interface for raised mark
	01A		Light					
		01A1	– raised					
		01A2	– depressed					
	01B		Intermediate					
		01B1	– raised					
		01B2	– depressed					
	01C		Heavy (raised only)	Thickness > 5 mm				
02			**Metal stamp**	Suitable for solid metal parts. Prohibited on thin or ductile walls. Replace by pressure whenever possible.	Suitable for ductile materials with a resistance < 1 450 MPa. Prohibited on: – magnesium and alloys – titanium and alloys – composite structures – single-crystal materials – aluminium alloys R > 450 MPa			Except in the following areas: – flow – assembly – sliding – friction – stressed (dent effect)
	02A		Hammer					
		02A1	– shallow					
		02A2	– deep					
	02B		Press	Suitable for flat surfaces. Prohibited on walls < 2 mm if R > 1 450 MPa.				
		02B1	– shallow					
		02B2	– deep					
	02C		Roll					
		02C1	– shallow					
		02C2	– deep					
	02D		Vibro peen, manual	Prohibited on radius < 2,5 mm.				
		02D1	– shallow					
		02D2	– deep					

continued

Table 2 *(continued)*

Identification code			Process	Geometry	Material	Environment		Function
						Thermal	chemical	
02	02E		**Metal stamp** Vibro peen, control	Prohibited on radius < 2,5 mm.	Usable on composite structures and single-crystal materials with laboratory agreement	No recessed marking on thin walls subjected to low temperature (– 20 °C)	Risk of retention of corrosive agents	Except in the following areas: – flow – assembly – sliding – friction – stressed (dent effect)
		02E1	– shallow					
		02E2	– deep					
	02F		Dot-peening matrix mode (5×7):	Easy access Clear area Flat surface or large curvature radius On curved areas, preferred orientation/ generator	Material which can be distorted plastically			Except in the following areas: – flow – assembly – friction – sliding
		02F1	– shallow					
		02F2	– intermediate					
		02F3	– deep					
03	03A		**Engrave** Manual	Suitable for flat or cylindrical surface with diameter > 10 mm. Prohibited on diameter < 5 mm.	Usable on composite structures and single-crystal materials with laboratory agreement			Except in the following areas: – flow – assembly – friction – sliding – high stress in particular cyclical
	03B		Controlled					
		03B1	– shallow					
		03B2	– deep					
07	07A		**Electrochemical process:** Etch	Except hardly accessible areas	Metallic only. Prohibited on magnesium alloys. Use on titanium, alloys and powder metallurgy materials subjected to laboratory agreement. Risk of 20 % to 60 % reduction in fatigue.	Except hot areas > 500 °C	Except areas protect or subjected to oil projection Neutralisation and corrosion inhibition indispensable	Except in the following areas: – flow – sliding – friction Except rotating or stressed items, or items subjected to vibrations.
		07A1	– shallow					
		07A2	– intermediate					
		07A3	– deep					
	07B		Deposit	No previous experience				

continued

Table 2 *(continued)*

Identification code			Process	Geometry	Material	Environment		Function
						Thermal	chemical	
07			**Electrochemical process**:	Except hardly accessible areas	Metallic only. Prohibited on magnesium alloys. Use on titanium, alloys and powder metallurgy materials subjected to laboratory agreement. Risk of 20 % to 60 % reduction in fatigue.	Except hot areas > 500 °C	Except areas protect or subjected to oil projection Neutralisation and corrosion inhibition indispensable	Except in the following areas: – flow – sliding – friction Except rotating or stressed items, or items subjected to vibrations
	07C		AC etch					
		07C1	– shallow					
		07C2	– intermediate					
		07C3	– deep					
	07D		AC etch – DC deposit					
08			**Blast**	On fully cleared surface only Surface condition $R_a \leq 6{,}3$	Except magnesium alloys. Recommended on transparent materials. Pressure and granulometry are specified.		Except protected areas	
	08A		shallow					
	08B		intermediate					
	08C		deep					
09			**Brand**	No previous experience				
	09A		hot press					
10			**Ceramic**	No previous experience				
11			**Decalcomania**			Except hot or lukewarm areas > 120 °C		Except in the following areas: – assembly – friction – sliding – flow areas
13			**Band**					
14			**Pressure sensitive label**			Except hot or lukewarm areas > 120 °C	Compatibility of the adhesive and the base material	Except in the following areas: – flow – projection – friction – sliding – assembly

continued

Table 2 *(continued)*

Identification code			Process	Geometry	Material	Environment		Function
						Thermal	chemical	
15	15A		**Laser** Dot matrix mode (5×7)	Except masked zone, even partially	20 % to 60 % fatigue reduction on titanium and alloys and sintered items. Except magnesium alloys. Uncoated area. Applicable on certain reinforced plastics after testing. Suitable for hard material, not recommended on hydraulic and pneumatic pipes, risk of cracking.	Except hot areas > 500 °C	Except protected areas, or areas subjected to oil projections	Except in the following areas: – flow – friction – assembly – risk of projection – risk of incipient crack – stressed or fatigued areas
		15A1	– shallow					
		15A2	– intermediate					
		15A3	– deep					
	15B		Engrave mode		For hard materials, dot marking is preferable.			
		15B1	– shallow					
		15B2	– intermediate					
		15B3	– deep					
16			**Plastic laminate** (inserts)		Compatibility of the inserts and base materials			Except in the following areas: – flow – friction – sliding – assembly
29				All marking processes providing non-permanent marks				
30			**Ink**	Easy access Clear area		Except hot areas > 500 °C		Except in the following areas: – flow – friction – sliding – assembly
31			**Dye**	Easy access Clear area	Absorbent material			

continued

Table 2 *(concluded)*

Identification code			Process	Geometry	Material	Environment		Function
						Thermal	chemical	
32			**Paint**	Easy access Clear area	Applicable on composite materials Compatibility: surface to be marked and paint nature	Except hot areas (paint resistant) Compatibility between paint baking and thermal treatment of the base material	Compatibility of the solvents and the base materials Risk of decomposition with certain fluids	Except in the following areas: – flow – friction – sliding – assembly
	32A		silk-screen	Simple shapes	Absorbent materials Little previous experience			
33			**Chalk**	Polished areas may be scored	Sensitivity to corrosion by absorption of the atmospheric elements		Increase sensitivity to corrosion	Marks must be removed from assembly areas
34			**Crayon**		Graphite lead prohibited on titanium and alloys			
35			**Tag**					
	35A		non-metallic tag and string					
	35B		non-metallic tag and wire					
	35C		metallic tag and wire					
	35D		bag item and tag					
36			**Band or tape**					
	36A		non-metallic					
	36B		metallic					
37			**Package**					
50			**Non imposed process**					

Table 3 — Selection criteria

Geometry									Material									Environment: Thermal					Environment: Chemical			Function						Method code			Marking method See EN 4301
Moulded, forged	Thickness < 5 mm	Thin deformable	Poorty accessible surface	Thickness < 2 mm R >1 450 MPa	Radius < 2,5 mm	Surface roughness Ra > 3,2	Surface roughness Ra > 6,3	Polished surface	Aluminium	Titanium	Magnesium	Composite	Metalic > 1 450 MPa	Monocrystaline	All other metalic types	All other non metallic types	Powder metallurgy	Thin wall < -20 °C	Subjected to shocks	Thermal	Zones > 120 °C	Zones > 500 °C	Fluid retention	Proximity of coating	Protected zone	Interface	Stressed zones	Flying product	Fluid splash risk zone	Rotating items	Items ready for assembly	1	2	3	
	■		■																				■									01			Integral
	■		■																				■										01A		Light
	■		■																				■			■								01A1	Raised
	■		■															■					■											01A2	Depressed
	■		■																				■										01B		Intermediate
	■		■																				■			■								01B1	Raised
	■		■															■					■											01B2	Depressed
	■		■																				■										01C		Heavy (raised only)
	■	■	■				■		■	■	■	■		■		■	■	■					■		■		■					02			Metal stamp
	■	■	■				■		■	■	■	■		■		■	■	■					■		■		■						02A		Hammer
	■	■	■				■		■	■	■	■		■		■	■	■					■		■		■							02A1	Shallow
	■	■	■	■			■		■	■	■	■		■		■	■	■					■		■		■							02A2	Deep
	■	■	■	■			■		■	■	■	■		■		■	■	■					■		■		■						02B		Press
	■	■	■	■			■		■	■	■	■		■		■	■	■					■		■		■							02B1	Shallow
	■	■	■	■			■		■	■	■	■		■		■	■	■					■		■		■							02B2	Deep
	■	■	■	■			■		■	■	■	■		■		■	■	■					■		■		■						02C		Roll
	■	■	■	■			■		■	■	■	■		■		■	■	■					■		■		■							02C1	Shallow
	■	■	■	■			■		■	■	■	■		■		■	■	■					■		■		■							02C2	Deep
	■	■	■	■	■		■		■	■	■	■		■		■	■	■			■		■		■		■	■		■			02D		Vibro peen, manual
	■	■	■	■	■		■		■	■	■	■		■		■	■	■			■		■		■		■	■		■				02D1	Shallow
	■	■	■	■	■		■		■	■	■	■		■		■	■	■			■		■		■		■	■		■				02D2	Deep
	■	■	■	■	■		■					■		■		■	■	■					■		■		■						02E		Vibro peen, controlled
	■	■	■	■	■		■					■		■		■	■	■					■		■		■							02E1	Shallow
	■	■	■	■	■		■					■		■		■	■	■					■		■		■							02E2	Deep
	■	■	■	■	■		■					■				■		■							■								02F		Dot-peening matrix mode (5×7)
	■	■	■	■	■		■					■				■		■							■									02F1	Shallow
	■	■	■	■	■		■					■				■		■							■									02F2	Intermediate
	■	■	■	■	■		■					■				■		■							■									02F3	Deep

Legend

■ Prohibited

■ Prior approval required

□ Authorized

Table 3 *(continued)*

Legend

Prohibited

Prior approval required

Authorized

Marking method See EN 4301	Method code 1	2	3	Geometry: Moulded, forged	Thickness < 5 mm	Thin deformable	Poorly accessible surface	Thickness < 2 mm R >1 450 MPa	Radius < 2,5 mm	Surface roughness Ra > 3,2	Surface roughness Ra > 6,3	Polished surface	Material: Aluminium	Titanium	Magnesium	Composite	Metallic > 1 450 MPa	Monocrystaline	All other metalic types	All other non metallic types	Powder metallurgy	Environment: Thermal: Thin wall < -20 °C	Subjected to shocks	Thermal	Zones > 120 °C	Zones > 500 °C	Environment: Chemical: Fluid retention	Proximity of coating	Protected zone	Function: Interface	Stressed zones	Flying product	Fluid splash risk zone	Rotating items	Items ready for assembly
Engrave	03																																		
Manual		03A																																	
Controlled		03B																																	
Shallow			03B1																																
Deep			03B2																																
Electrochemical	07																																		
Etch		07A																																	
Shallow			07A1																																
Intermediate			07A2																																
Deep			07A3																																
Deposit - raised		07B																																	
AC etch		07C																																	
Shallow			07C1																																
Intermediate			07C2																																
Deep			07C3																																
AC etch – DC deposit		07D																																	
Blast	08																																		
Shallow		08A																																	
Intermediate		08B																																	
Deep		08C																																	
Brand	09																																		
Hot press		09A																																	
Ceramic	10																																		
Decalcomania	11																																		
Band	13																																		
Pressure sensitive label	14																																		

Table 3 *(concluded)*

Geometry									Material								Environment: Thermal					Environment: Chemical			Function						Method code			Marking method See EN 4301
Moulded, forged	Thickness < 5 mm	Thin deformable	Poorty accessible surface	Thickness < 2 mm R >1 450 MPa	Radius < 2,5 mm	Surface roughness Ra > 3,2	Surface roughness Ra > 6,3	Polished surface	Aluminium	Titanium	Magnesium	Composite	Metalic > 1 450 MPa	Monocrystaline	All other metalic types	All other non metallic types	Powder metallurgy	Thin wall < -20 °C	Subjected to shocks	Thermal	Zones > 120 °C	Zones > 500 °C	Fluid retention	Proximity of coating	Protected zone	Interface	Stressed zones	Flying product	Fluid splash risk zone	Rotating items	Items ready for assembly	1	2	3	
							■				■					■				■		■			■		■		■			15			Laser
							■				■					■				■		■			■		■		■				15A		Dot matrix code (5×7)
							■				■					■				■		■			■		■		■					15A1	Shallow
							■				■					■				■		■			■		■		■					15A2	Intermediate
							■				■					■				■		■			■		■		■					15A3	Deep
							■				■					■				■		■			■		■		■				15B		Engrave mode
							■				■					■				■		■			■		■		■					15B1	Shallow
							■				■					■				■		■			■		■		■					15B2	Intermediate
							■				■					■				■		■			■		■		■					15B3	Deep
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	16			Plastic laminate (inserts)
																																29			Any tempory method
		■																				■										30			Ink
		■																				■										31			Dye
		■																														32			Paint
		■																															32A		Silk-screen
		■																												■		33			Chalk
		■								■																						34			Crayon
																						■										35			Tag
																																	35A		Non-metallic tag and string
																						■											35B		Non metallic tag and wire
																																	35C		Metallic tag and wire
																																	35D		Bag item and tag
																																36			Band or tape
																						■											36A		Non-metallic
																																	36B		Metallic
																																37			Package
																														■		50			Non imposed process

Legend

■ Prohibited

■ Prior approval required

□ Authorized

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