VS 3268

VOITH STANDARD (VS)

color inside

Component marking for serialization/batching + DMC

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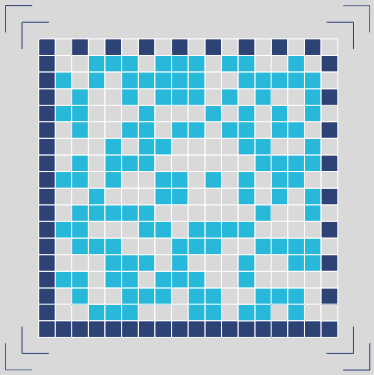

Abstract:
The document describes the minimum requirement for marking single parts ("components") for the purpose of consistent identification. In addition to the general requirements for the content and structure of the identification key, the requirements specifically for the design as a data matrix code are described.

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Revisions

Compared to VS 3268:2022-05, the following changes have been made:

a) Chapter 7 Annex added,
b) Size examples from Table 3 updated and expanded with quiet zone,
c) Chapter 5.7 Drawing specification added.

Earlier editions

Version 3268:2022-05

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1 Scope

This standard applies for the Voith Group and for companies of the Voith Group, unless contractually specified otherwise.

2 Area of Application

The document describes the general requirements for machine-readable single part markings with regard to structure, syntax and content for Voith and its suppliers. The scope of application extends to the marking of single parts and semi-finished products for which machine-readable serialization or batching is required.

In particular, markings in the form of the Data Matrix Code (DMC) are described. All graphic 2D codes or barcodes must be executed as DMC.

The assembly of marked parts must be documented in a database (Section 5.2) and digitally linked in this way. This updates the entries of all components.

3 Purpose

The standard serves to standardize different component markings at Voith. It ensures the traceability of single parts and identification throughout the service life of such parts and the documentation of the history.

4 Terms and abbreviations

Table 1: Terms and abbreviations

DMC	Data Matrix Code
ISO	International Organization for Standardization
IEC	International Electrotechnical Commission
ANSI	American National Standards Institute

5 Contents of component marking

5.1 Structure and syntax

The coded string must be created using ANSI MH-10.8.2-2016 field identifiers according to ISO/IEC 15418.

Traceability results from an identification key via which a component can be clearly identified. In the following, the term "number" is also to include non-numeric identifiers.

Each marking must contain at least the following information (minimum requirement):

- Voith material number (field identifier P)
- Serial number (field identifier S) or batch number (field identifier T)[1]
- Voith supplier ID or Voith Plant ID for in-house production (field identifier V)

The combination is referred to below as the "identification key".

The identification key is freely configurable from ASCII characters 33-126. The Voith material number is formatted without a period as a separator after the third digit. In addition, further information can be placed in the marking, taking into account the MH-10 formatting.

If serialized components can be assigned to specific batches, the batch number must be specified in the database. It is not necessary to additionally code it in the marking.

According to ISO/IEC 15434, the message *string* is to be structured from a "*Message Envelope*" and one or more "*Format Envelopes*". These are strings that specify in a standardized way how the actual content of the message is encoded. The *message envelope* consists of the characters: square parentheses on the left, round parentheses on the right, greater than and the unprintable ASCII character *Record Separator* (Unicode U+001E). The end marks the unprintable ASCII character *End of Transmission* (Unicode U+0004). The *format envelope* would consist of the digits "06" and the unprintable ASCII character *Group Separator* (Unicode U+001D) when using the field identifiers according to ANSI MH-10. The content itself is likewise separated by *Group Separator* characters and terminated by the *Record Separator* character. Contrary to the ISO / IEC 15434 standard, the *format envelope* is to be dropped when marking components. This is done for efficiency reasons for graphical markings. The message must therefore be structured as follows (example in Figure 1):

- Message header: [)>▲ (ASCII *Record Separator*, Unicode U+001E)
- Field identifier P and Voith material number
- ↔ (ASCII *Group Separator*, Unicode U+001D)
- Field identifier S and serial number
- ↔ (ASCII *Group Separator*, Unicode U+001D)
- Field identifier with user data
- … etc.
- Message end: ♦ (ASCII *End of Transmission*, Unicode U+0004)

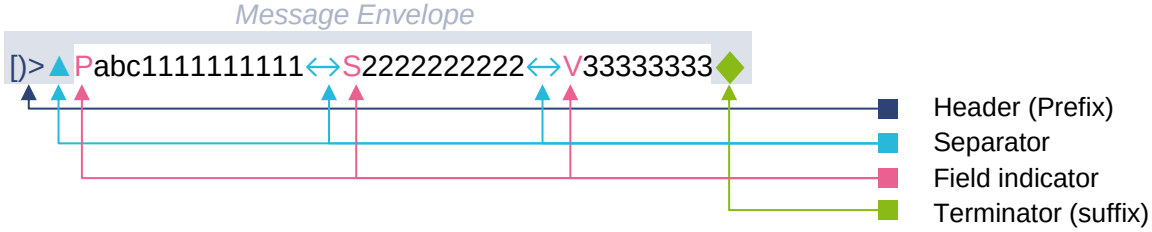

Figure 1 Example string for minimum requirement regarding content

[1]The serial/batch number of the customer (Voith) is identified by S/T. The serial/batch number of a supplier by 1S/1T. Since the serial/batch number of the supplier is normally adopted by Voith, it contains less than 19 digits, this must also be coded as S/T. In the case of in-house production, Voith acts as its own customer and supplier, therefore the field indicators S/T are to be used.

5.2 Database

All data in the marking (Section 5.1) are additionally written as individual fields (i.e. not as ANSI MH-10 strings) to and saved in a central database at Voith for all components. In addition

- date and time of manufacture (if applicable, otherwise the time when the marking was applied) in local time with indication of the UTC offset (formatting YYYYMMDDhhmm[ss][poooo] as 24h time format. optional specifications are indicated by square parentheses)
- Voith SAP order number
- batch number as required

as well as further, individual items of information must be entered into the database. According to ANSI MH-10 standard, this information corresponds to the field identifiers 6V, 23D and T. We recommend that they are not included in the marking for data protection reasons to and protect operational procedures, see Section 5.3. It may be necessary to hold further data in it (e.g. process characteristics, test results, version of the technical drawing, etc.).

The data must be archived according to the warranty period, the minimum period being 15 years. The data must be transferred to Voith's own central database when the goods are received at Voith at the latest. After that, the required archiving period for the supplier is reduced to one year.

The unique database ID is composed of the identification key (see section 5.1) (Primary Key).

5.3 Data Protection and Secrecy

Common markings, such as a *data matrix code* (DMC) or a *radio frequency identification* (RFID) label, are in principle non-encrypted and therefore freely readable. The use of established standards for structuring content, such as the field identifiers used by Voith in accordance with ANSI MH-10, permit an unrestricted exchange of information, within Voith's own production, between Voith and suppliers, but also with third parties. Therefore, care must be taken to ensure data economy when marking. Personal, confidential, or data that allows inference of operating practices must be saved in the secured database insofar as they are relevant during the life of the component.

5.4 Scope of the marking

During the machining of components, the identification key may change from that of the unmachined part to that of the finished part as a result of the manufacturing steps. If the marking is removed during machining, a new marking with updated identification key must be created. In the database, the associated virtual instance of the component must likewise be updated and the identification key history kept.

If the old marking remains, this is to be understood as a database ID and not executed as plain text (section 6.3). No additional information may be coded in the marking besides the minimum requirements specified in section 5.1. Reading out the respective current Voith material number and the associated serial number is then possible only via the database query.

If marked components are assembled or mounted, their marking remains even if the assembly is given a new identification key. The assembly must be documented in the database. When joining individual parts to form a component, the component can again be treated as a single part. The aim is to mark single parts. Joined components are to be marked with the new identification key of the assembled product only if the individual components do not have any markings.

5.5 Incorrect markings

Components with incorrect or non-readable markings are to be treated as rejects. This also applies if the quality requirement for the marking is not met.

5.6 Incorrect database entry

Components without a corresponding database entry (Section 5.2) are treated as components with incorrect markings.

5.7 Drawing specification

The marking is symbolized by a diamond (square rotated by 45°) on the technical drawing. The location is indicated by a reference line (narrow solid line) extending from the diamond. The reference line ends in a point on the surface to which the marking is to be affixed. In the case of an edge or a hole, an arrow is to be provided instead of a point, see Figure 2.

The marking can be positioned anywhere within the area specified by the dot. The area can be delimited by dashed auxiliary lines, which must then be dimensioned. Dimensioning of the dot is not admissible. If a concealed area, such as the rear, is indicated, the reference line must be dashed.

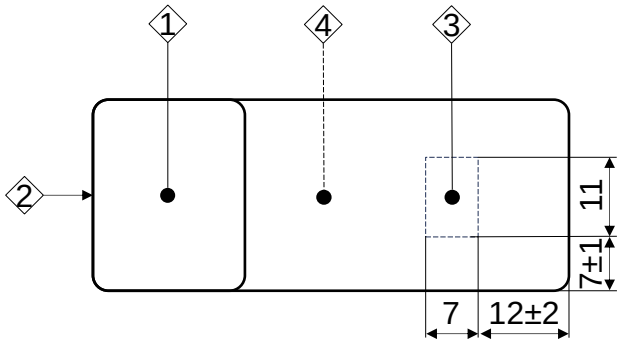

Figure 2: Drawing specification for a marking, dimensioning

The requirements for the marking must be indicated next to the symbol, in the notes section or in the accompanying technical documentation. If there are several markings, the symbols are numbered.

The specification starts with the heading "MARKED IN ACCORDANCE WITH VS 3268" and consists of a second line indicating the type of marking (e.g. "DATA MATRIX" for a DMC), the marking method and the field identifiers that must be contained in the marking. Deviation from the minimum requirements listed in section 5.1 is not admissible. The field identifiers listed here expand the requirement. For the sake of completeness, however, it is recommended that the minimum requirements from section 5.1 are also indicated. The specifications are separated by horizontal lines (dashes). For markings made by RFID transmitters, the method is left blank. Figure 3 shows examples.

◇ MARKED IN ACCORDANCE WITH VS 3268
DATA MATRIX – A1 – P(10) S(6) V(4)

◇ MARKED IN ACCORDANCE WITH VS 3268
DATA MATRIX – B – P S V 16D

Field identifier,
if applicable with indication of the number of characters

Marking type

Marking type

◇ MARKED IN ACCORDANCE WITH VS 3268
DATA MATRIX – A1 – P(10) S(6) V(6) 16D
„P“ Voith-Material number, 10 alpha -num. characters

„S“ Serial number, 6 Digits

„V“ Voith-Suppliers -ID, 6 Digits

„16D“ Production date

◇ MARKED IN ACCORDANCE WITH VS 3268
RFID – – P(10) S(6) V(4)

Figure 3: Drawing specification for a marking, specification

Optionally, the field identifiers can be explicitly explained below. Table 2 shows an overview of the abbreviations for marking methods. The abbreviations consist of a letter and a number. If only one letter is specified, a method can be freely selected from the group. Regardless of the method selected, the requirements regarding the quality and service life of the marking shall apply.

Table 2: Marking methods

Abbreviation	***Method***	***Note***
A	*Adhesive*	
A1	*Label*	
B	*Direct marking*	
B1	*Laser*	
B2	*Needle embossing*	
B3	*Etching (electro-chemical)*	
B4	*Direct printing*	

6 Execution as a data matrix code

A component marking with a graphic code must be executed as a *data matrix code* (DMC).

The component markings to be used must be DMC type ECC 200 according to ISO/IEC 16022.

6.1 Position of the marking

The marking area can be found on the technical drawing. Here you must specify an area in which the marking can be applied. This must be capable of including the minimum size of the marking (see Section 6.2) and, if necessary, the plain text (section 6.3).

6.2 Size of the marking

The required capacity of the DMC depends on its content and is variable in principle, since the components of the identification key do not have a fixed length. In the most favorable combination, a DMC capacity of 22 ASCII characters is sufficient. However, by default 46 ASCII characters, i.e. 24×24 modules for square size or 16×36 modules for rectangular size, should be assumed to meet the nominal requirements (see Section 5.1).

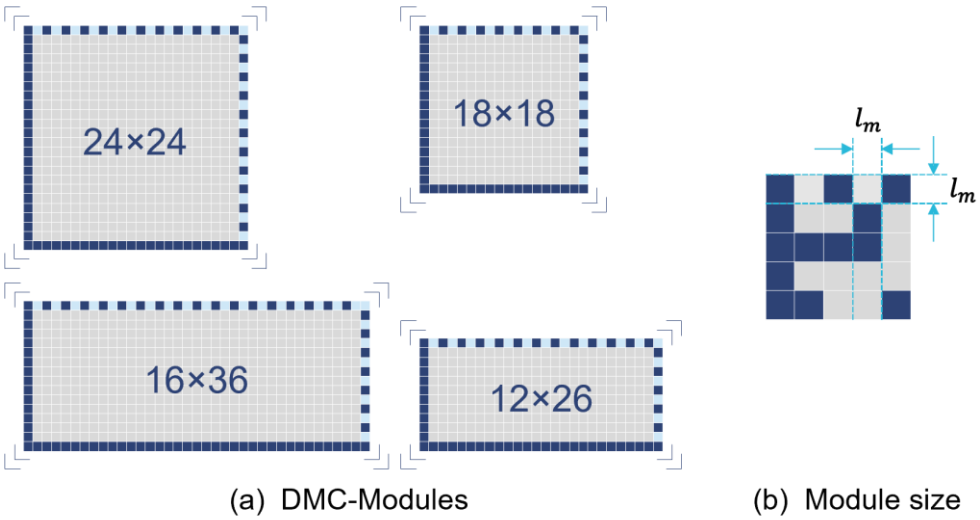

Figure 4 (a) DMC modules and (b) size of the module

The height/width of the modules is a minimum of $l_{m,min} = 0{,}4\ mm$ and must not exceed $l_{m,max} = 2\ mm$, Figure 1. The nominal size is $l_m = 0{,}8\ mm$. The size specifications refer to components that do not exceed a length of 1 m in any dimension. For larger components, a higher module size can be specified by the Design Department. The size must be recorded in the technical documentation.

The quiet zone is a minimum of one and a maximum of twice the module width to each side of the DMC. This results in a minimum physical size of the DMC (including simple quiet zone) of 7.6 × 7.6 mm, Table 3. If possible, a quiet zone of twice the module size should be used.

Table 3: Relative sizes of possible DMC markings (incl. quiet zone)

DMC modules	*Number of ASCII characters*	*Min. size*	*Max. size**
12 × 26	22	*5.6 × 11.2 mm*	*32 × 60 mm*
18 × 18	25	*8 × 8 mm*	*44 × 44 mm*
20 × 20	31	*8.8 × 8.8 mm*	*48 × 48 mm*
12 × 36	31	*5.6 × 15.2 mm*	*32 × 80 mm*
22 × 22	43	*9.6 × 9.6 mm*	*52 × 52 mm*
16 × 36	46	*7.2 × 14.8 mm*	*40 × 80 mm*
24 × 24	52	*10.4 × 10 mm*	*56 × 56 mm*
26 × 26	*64*	*11.2 × 11.2 mm*	*60 × 60 mm*
32 × 32	*91*	*13.6 × 13.6 mm*	*72 × 72 mm*
16 × 48	*98*	*7.3 × 20 mm*	*40 × 104 mm*

** for components smaller than 1 m × 1 m × 1 m*

6.3 Plain text

For each component part marking, a plain text under/next to the DMC is also required. This is to be formatted as a sans-serif font (*Arial* or *Helvetica*). The font size (font height) is six DMC module ($2{,}4 - 12\ mm$, see section 6.2, that corresponds to $10 - 47\ pt$). The length can be estimated with $l = 0{,}74 \cdot Höhe \cdot \#Ziffern$ for orientation.

At least the minimum requirements of the DMC content (cf. Section 5.1) including field identifiers must be specified. All information specified as plain text must be included in the DMC. The Voith material number must be entered without a period as a separator after the third digit, as in the content of the DMC.

If the space is too small, the requirement can be deviated from to the effect that only the marking by means of DMC without plain text is carried out (prioritization). This must be recorded in the technical documentation.

A full stop is used as decimal separator and numbers are not to be grouped. This means that no further separators (e.g. thousands separator) are required.

The plain text is to be applied using the same technology as the DMC. Attention should be paid to qualitative readability. The plain text is part of the lettering. In case of incorrect or missing lettering, proceed as per Section 5.5 or Section 5.6.

6.4 Marking technology

All markings, lettering and labels must be permanent. Under normal use, the DMC must be recognizable and readable over its entire service life. The marking method must therefore be selected individually for each application in consultation with Voith.

6.5 Quality

For readability, a code quality according to ISO/IEC 29158, or according to ISO/IEC 15415 for printed label, of the following quality level must be achieved:

DPM 3.0 / 10-20 / 635-660 / (45CS | D | 90)

The specification is made according to ISO / IEC 29158 with the prefix "DPM" for *direct part marking* followed by the numerical quality grade, the aperture to be used, luminous color or wavelength and the illumination situation. Quality grade B (3.0) according to ISO/IEC 15415 must be achieved for printed labels.

The marking must be protected against damage during transport and storage. When installing the component at Voith, the same quality level (≥ 3.0) must be achieved.

Proof and assurance of quality after application must be ensured. This can be done, for example, using special "barcode verifiers" with suitable lighting. The regular quality check must be documented to one decimal place, e.g. the database (Section 5.2). An automated process with a 100% check is recommended.

6.6 Incorrect DMC markings

Incorrect markings must be made clearly unrecognizable. The plain text is to be struck through and the DMC blacked out (meaning that the blank fields in the DMC template are to be filled in). After consultation with Voith, the incorrect DMC can also be made illegible with two large XX in individual cases.

A replacement marking must be placed in the immediate vicinity. A replacement marking must be the same size as the original marking within the marking area. If no replacement marking is possible, the component must be treated as a defective component.

7 Annex

7.1 Determining the number of ASCII characters in a message

A letter or a special character corresponds to an ASCII character. For numbers, two adjacent digits are combined to form an ASCII character.

Examples:

Text	***# ASCII characters***
12	*1*
9	*1*
3D	*2*
D123	*3*

The message header consists of four ASCII characters, plus separators between the message fields and the final character at the end.

Example:

- *Voith material number: ABC.1234567 => 7 ASCII characters (no dot), field identifier "P" (1 ASCII character)*
- *Serial number: 1234567890 => 5 ASCII characters, field identifier "S" (1 ASCII character)*
- *Supplier ID: 123456 => 3 ASCII characters, field identifier "V" (1 ASCII character)*

Together with the message header, two separators and the final character, the entire message would therefore consist of 25 ASCII characters.

For a DMC, this means that the physical size can be deduced from the capacity, i.e. the number of ASCII characters, only if the exact character length is specified.

***https://dmc-generator-vt.apps.cloud.voith.com** offers a service that can be used to interactively compile and generate a compliant DMC. The number of ASCII characters is also specified so that the required area can be estimated. The service is mirrored on the intranet at the address **http://mucu0202:8502/** and is also available at a different address as an API.*
The web service is an auxiliary tool that implements the standard by way of example; this text document remains binding.

7.2 Examples of DMCs

Description	Field indicator	Content
Voith-Material number	P	ABC123456789D00
Serial number	S	0000001
	V	123456
		27 ASCII-Character

22×22 16×36

Description		Content
Voith-Material number	P	123456789012
Chagenumber	T	12345
Voith-Work -ID	V	1234
Generic date	D	220131
		26 ASCII-Character

22×22 16×36

Description		Content
Voith-Material number	P	123456789012
Chagenumber	T	12345
Voith-Work -ID	V	1234
Production date (DDMMYYYY)	17D	31012023
		28 ASCII-Character

22×22 16×36

Description		Content
Voith-Material number	P	12345678901234
Material number of the Supplier	1P	VOITH123
Serial number	S	1234567890
Voith-Supplier-ID	V	123456
Time of application of the DMC	18D	202301311659
		44 ASCII-Character

26×26 16×48

Description		Content
Voith-Material number	P	12345678901234
Serial number	S	!yTy6$k?4<]ZU:[FQ'.I
Voith-Work -ID	V	1234
		39 ASCII-Character

26×26 16×48

Figure 5: Examples of DMCs

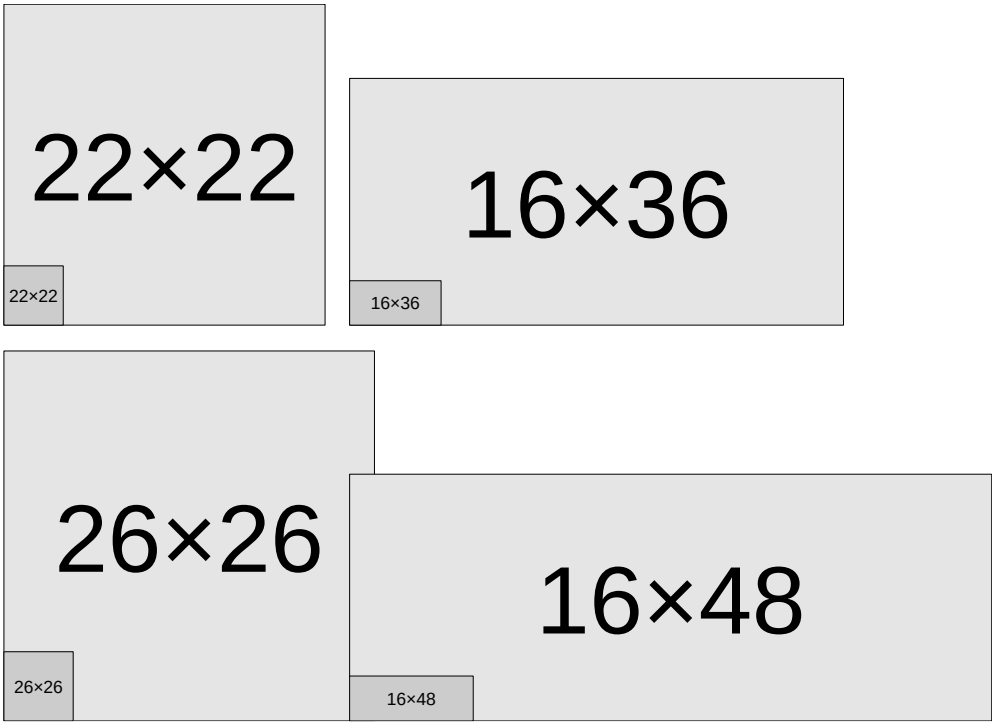

Figure 6: Size comparison – max./min. size DMC 22×22, 16×36, 26×26 and 16×48

8 Normative references

Table 4: Normative references

Document	Title
ANSI MH10.8.2-2016	Data Identifier and Application Identifier Standard
ISO/IEC 15415:2011	Bar code symbol print quality test specification
ISO/IEC 15418:2016	Information technology — Automatic identification and data capture techniques — Syntax for high-capacity ADC media
ISO/IEC 16022:2006	Data Matrix bar code symbology specification
ISO/IEC 29158:2020	Direct Part Mark (DPM) Quality Guideline

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