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# Identification cards — Recording technique —

## Part 1: Embossing

*Cartes d'identification — Technique d'enregistrement —  
Partie 1: Estampage*



Reference number  
ISO/IEC 7811-1:2018(E)

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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by ISO/IEC JTC 1, *Information technology*, SC 17, *Cards and personal identification*.

This fifth edition cancels and replaces the fourth edition (ISO/IEC 7811-1:2014), which has been technically revised.

Major changes from the previous edition are as follows:

- [Annex D](#) has been added to define the minimum spacing from embossing and IC components;
- the title of [Clause 6](#) was changed to avoid confusion. Formerly, the title was “Visually and machine readable characters” which could be interpreted to include characters in the following clause. The reference in [Table 1](#) was also changed.

Notes in this document are only used for giving additional information intended to assist in the understanding or use of the document. They do not contain provisions or requirements to which it is necessary to conform in order to be able to claim compliance to this document.

A list of all the parts in the ISO/IEC 7811 series, can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).



# Identification cards — Recording technique —

## Part 1: Embossing

### 1 Scope

This document is one of a series of International Standards describing the parameters for identification cards as defined in the terms and definitions clause and the use of such cards for international interchange.

This document specifies requirements for embossed characters on identification cards. The embossed characters are intended for transfer of data either by use of imprinters or by visual or machine reading. It takes into consideration both human and machine aspects and states minimum requirements.

It is the purpose of this document to provide criteria to which cards shall perform. No consideration is given within this document to the amount of use, if any, experienced by the card prior to test. Failure to conform to specified criteria is negotiated between the involved parties.

ISO/IEC 10373-1 specifies the test procedures used to check cards against the parameters specified in this document.

NOTE 1 Numeric values in the SI and/or Imperial measurement system in this document may have been rounded off and are consistent with, but not exactly equal to each other. Using either system is correct but intermixing or reconverting values can result in errors. The original design was made using the Imperial measurement system.

NOTE 2 Tactile Identifier Mark (TIM) defined by ISO/IEC 7811-9 can be located in the name and address area of this document. The layout of embossed characters in this area is not intended to interfere with TIM.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1073-1, *Alphanumeric character sets for optical recognition — Part 1: Character set OCR-A — Shapes and dimensions of the printed image*

ISO 1073-2, *Alphanumeric character sets for optical recognition — Part 2: Character set OCR-B — Shapes and dimensions of the printed image*

ISO 1831, *Printing specifications for optical character recognition*

ISO/IEC 7810, *Identification cards — Physical characteristics*

ISO/IEC 7811-9, *Identification cards — Recording technique — Part 9: Tactile identifier mark*

ISO/IEC 7812-1, *Identification cards — Identification of issuers — Part 1: Numbering system*

ISO/IEC 7812-2, *Identification cards — Identification of issuers — Part 2: Application and registration procedures*

ISO/IEC 10373-1, *Identification cards — Test methods — Part 1: General characteristics*



ISO/IEC 14443-1:2018, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 1: Physical characteristics*

ISO/IEC 15693-1, *Identification cards — Contactless integrated circuit cards — Vicinity cards — Part 1: Physical characteristics*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 7810 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

- 3.1**  
**embossing**  
characters raised in relief from the front surface of the card
- 3.2**  
**unused card**  
card which has been embossed with all the characters required for its intended purpose but has not been issued
- 3.3**  
**returned card**  
embossed card after it has been issued to the card holder and returned for the purpose of testing
- 3.4**  
**identification number**  
number that identifies the card holder

### 4 Conformance

A prerequisite for conformance with this document is conformance with ISO/IEC 7810 for the ID-1 size card. An identification card is in conformance with this document if it meets all mandatory requirements specified herein. Default values apply if no others are specified.

### 5 Card characteristics

#### 5.1 General

Special attention shall be paid to the characteristics of the material affecting its suitability for this purpose, particularly in respect to its ability to resist crushing and collapsing of the embossed parts when operating in imprinters.

Cards shall be made of PVC (polyvinyl chloride) and/or PVCA (vinyl chloride/vinyl acetate copolymer) or materials having equal or better performance such as polyesters, polyethylenes and polycarbonates.

**NOTE** Refer to machine manufacturer instructions regarding card construction requirements for achieving embossed character relief heights in compliance with this document. At the time of publication there was no agreed on test method for verifying the suitability of card structures for embossing. See informative [Annex C](#).

5.2 Card warpage

When lying convex side up on a flat rigid surface, the maximum distance from the flat surface to any non-embossed portion of the convex side of an embossed card immediately prior to issue shall not be greater than 2,5 mm (0.10 in) including the card thickness.

NOTE The amount of card warpage depends on the card material and the embossing technique used.

5.3 Surface distortions

No raised area shall exceed 0,51 mm (0.020 in) on the front of the card in the area A as shown in [Figure 1](#).

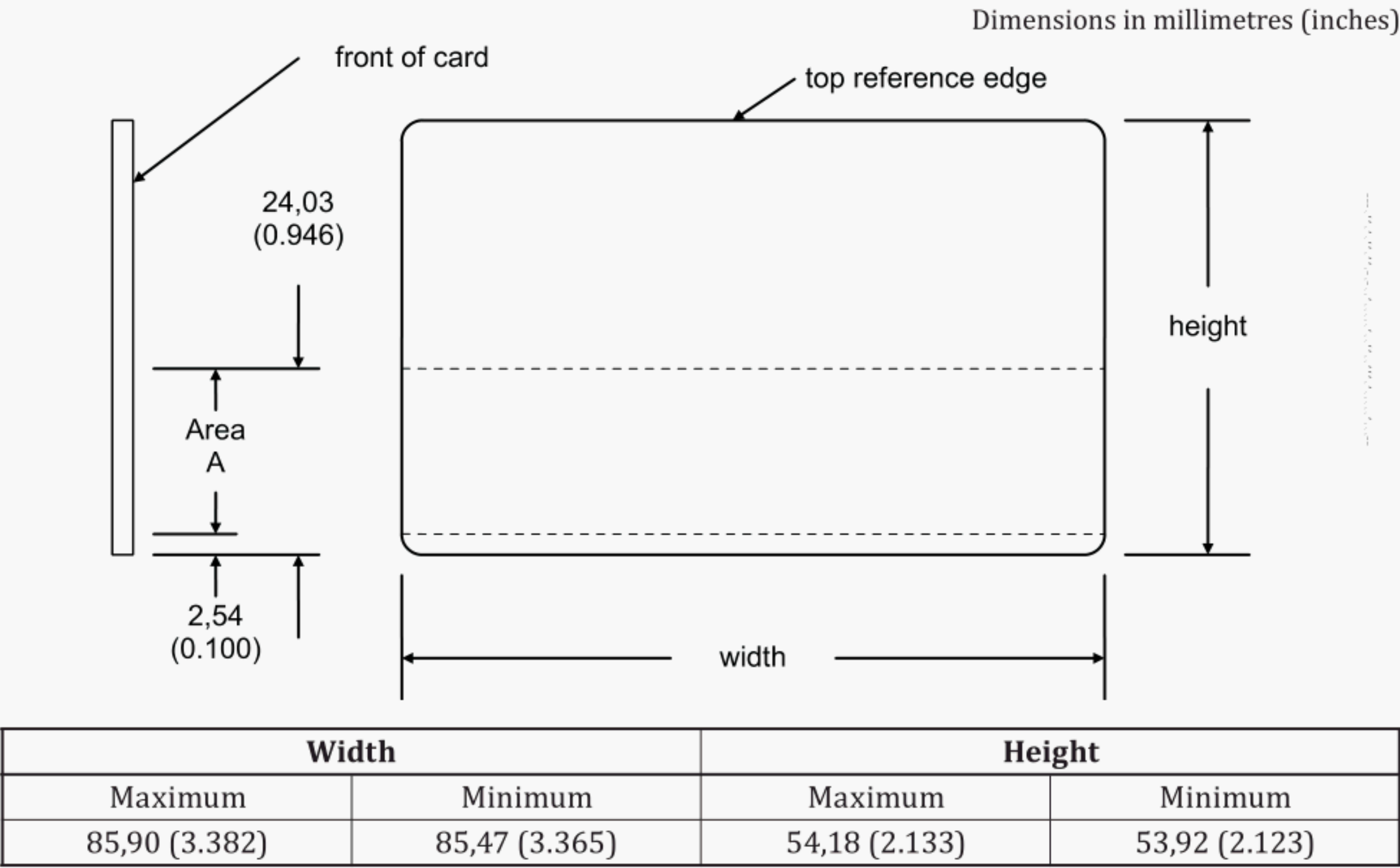


Figure 1 — Embossed card dimensions

5.4 Card width and height

All points on the edges of the embossed card in the finished state, except for the rounded corners, shall fall between two concentric, similarly aligned rectangles as defined in [Figure 1](#) for maximum height and width, and minimum height and width.

NOTE 1 Card width and height tolerances given here are different than those in ISO/IEC 7810 to account for changes in card size due to embossing.

NOTE 2 All identification card standards use the top edge of the card as the reference edge for dimensions, except for this embossing standard which, for historical reasons, uses the bottom edge of the card as the reference.



## 6 Machine readable characters

### 6.1 Character set and type font

The numeric characters of one of the following type fonts shall be used for embossed characters intended for machine reading, either directly from the card or from card imprints (see [Annex A](#)):

- ISO 1073-1, OCR-A, Sizes I and IV;
- ISO 1073-2, OCR-B, Sizes I and IV;
- Type font Farrington 7B as described in [Annex B](#).

NOTE To ensure system compatibility in the choice of font, the attention of intended users is drawn to the necessity of agreement with their potential interchange partners.

Print specifications are given in ISO 1831.

### 6.2 Character spacing

The centreline to centreline character spacing shall be 3,63 mm  $\pm$  0,15 mm (0.143 in  $\pm$  0.006 in).

### 6.3 Character height

Maximum height at the printing surface of the embossed characters, encompassing centreline skew, and character misalignment shall be 4,32 mm (0.170 in).

### 6.4 Relief height of embossed characters

Relief height of imprinting character surfaces above the card surface as measured from the non-embossed surface of the card to the highest point on the embossed character is shown in [Table 1](#) for unused cards and for returned cards.

## 7 Visually readable characters

### 7.1 Character set and type font

A type font such as alphanumeric, upper case characters described in ISO 1073-2, OCR-B, Size I, should be used for embossed characters intended for visually reading directly from the card or from card imprints.

### 7.2 Character spacing

The centreline to centreline character spacing shall be 2,54 mm  $\pm$  0,15 mm (0.100 in  $\pm$  0.006 in).

### 7.3 Relief height of embossed characters

Relief height of imprinting character surfaces above the card surface as measured from the non-embossed surface of the card to the highest point on the embossed character is shown in [Table 1](#) for unused cards and for returned cards.



**Table 1 — Relief height of embossed characters**

Dimensions in millimetres (inches)

Type of card	Machine readable characters		Visually readable characters	
	Maximum	Minimum	Maximum	Minimum
Unused card	0,48	0,40	0,46	0,36
	(0.019)	(0.016)	(0.018)	(0.014)
Returned card	0,48	0,30	0,46	0,26
	(0.019)	(0.012)	(0.018)	(0.010)

NOTE Values in the table show only the limits within which cards will function normally, and do not imply any guarantee of relief height during the valid term for issued cards.

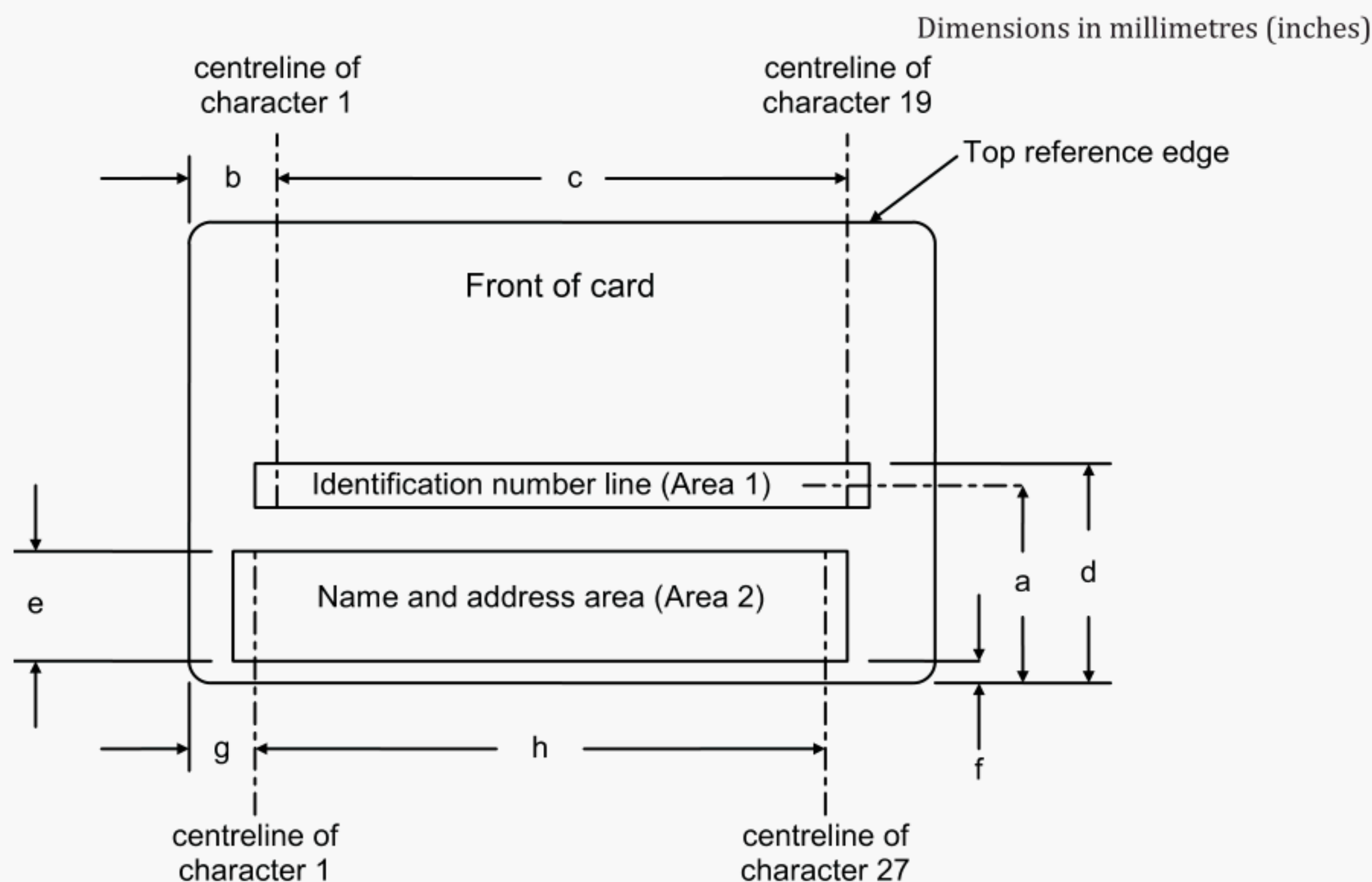
## 8 Assigned embossing areas

Two areas for embossing shall be assigned to the card as shown in [Figure 2](#).

- Area 1      Area reserved for the identification number line according to ISO/IEC 7812-1 and ISO/IEC 7812-2. The characters in this area and imprints of the area are intended both for visual and machine reading.
- Area 2      Area provided for the card holder's identification data such as name, address, and other data which may be required. It is called "name and address area". Data contained in this area of the card or imprinted from the card is only intended for visual reading.

When the technology used to form the raised areas causes a physical deformation of the card such as mechanical embossing, then special care shall be taken that such deformation of the card does not adversely affect the required characteristics of the contained components such as IC, antenna, connecting wires, etc. A minimum distance of 3 mm between the contained components and any deformed part of the card is recommended.

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Identification number line (Area 1)		Name and address area (Area 2)	
a	21,42 ± 0,12 (0.843 ± 0.005)	e	14,53 (0.572) maximum
b	10,18 ± 0,25 (0.401 ± 0.010)	f	2,54 (0.100) minimum 3,30 (0.130) maximum
c	65,31 ± 0,76 (2.571 ± 0.030)	g	7,65 ± 0,25 (0.301 ± 0.010)
d	24,03 (0.946) maximum	h	66,04 ± 0,76 (2.600 ± 0.030)

Figure 2 — Assigned embossing area locations and tolerances

8.1 Identification number line

The identification number line provides space for a single line of characters of the type specified in 6.1 and comprises a maximum of 19 character positions at a nominal centreline to centreline spacing of 7 characters per 25,4 mm (1.00 in).

The actual number of utilised (embossed) character positions will depend upon application requirements. The location and tolerances for embossed characters shall be as shown in Figure 2.

- NOTE When designing a new system, it is advisable to provide for maximum flexibility of use, e.g.:
- justify the embossed identification number to the left;
  - make allowances for an identification number with maximum length;
  - for financial applications if a character position is available, it is recommended to insert a blank space between the issuer identification and the individual account identifier of the identification number (refer to ISO/IEC 7812-1 and ISO/IEC 7812-2).



## 8.2 Name and address area

The name and address area provides space for four lines of 27 characters each at a nominal centreline to centreline spacing of 10 characters per 25,4 mm (1.00 in) of the type specified in [7.1](#). Any information embossed in the name and address area should always be embossed as far as possible from the identification number.

The location and tolerances for embossed characters shall be as shown in [Figure 2](#).

**WARNING — Those card issuers who require embossing of four name and address lines should be aware that the imprinted documents produced from their cards may not be acceptable in an interchange environment due to OCR clear area requirements on some types of OCR reading equipment.**

**NOTE** The first character in the name and address area need not be justified to the left. However the use of 27 character positions is based on a 7,65 mm (0.301 in) distance to the edge of the card as shown in [Figure 2](#).

## **Annex A** **(informative)**

### **Pictorial representation of numeric data**

0 1 2 3 4 5 6 7 8 9

**Figure A.1 — OCR-A**

0 1 2 3 4 5 6 7 8 9

**Figure A.2 — OCR-B**

0 1 2 3 4 5 6 7 8 9

**Figure A.3 — Farrington 7B**



Annex B  
(normative)

7 B print specifications

B.1 Character set

The 7 B font consists of numeral characters 0 to 9 inclusive.

B.2 Character dimensions and tolerances — Printed image

Printed images for characters are as shown in [Figures B.1](#) to [B.10](#). Dimensions and tolerances common to all characters are shown in [Table B.1](#). Characters are shown as printed on document and not necessarily as embossed.

Table B.1 — Character dimensions for 7 B font

Dimensions in millimetres (inches)

Feature	Dimension/tolerance
Overall character height	4,32 (0.170) nominal
Overall character width	2,54 (0.100) nominal
Stroke width for all characters	0,51 ± 0,25 (0.02 ± 0.01)
Fairing radius for all characters	0,13 ± 0,13 (0.005 ± 0.005)
Tolerances on all character centreline dimensions	±0,08 (±0.003)

Dimensions in millimetres (inches)

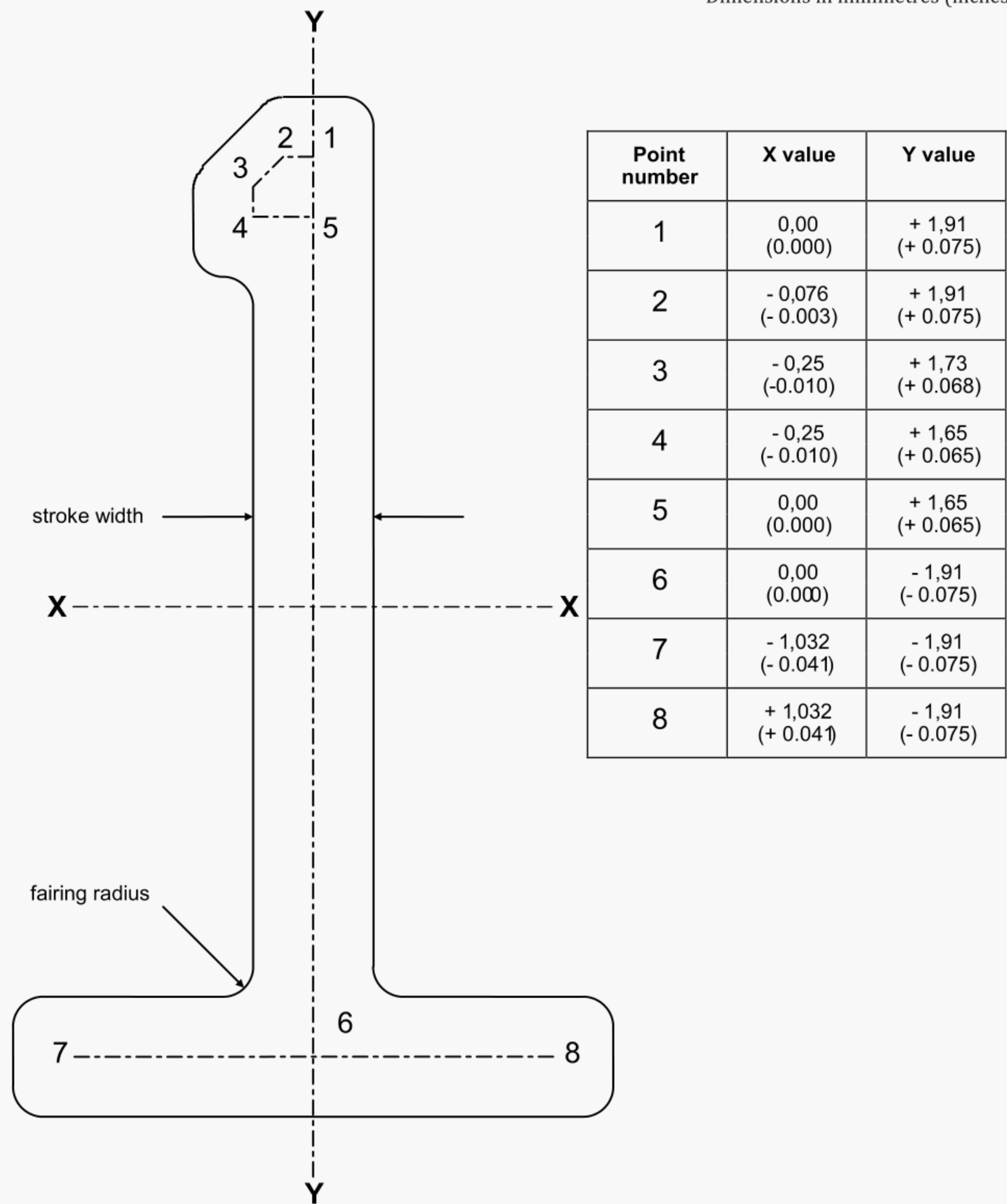
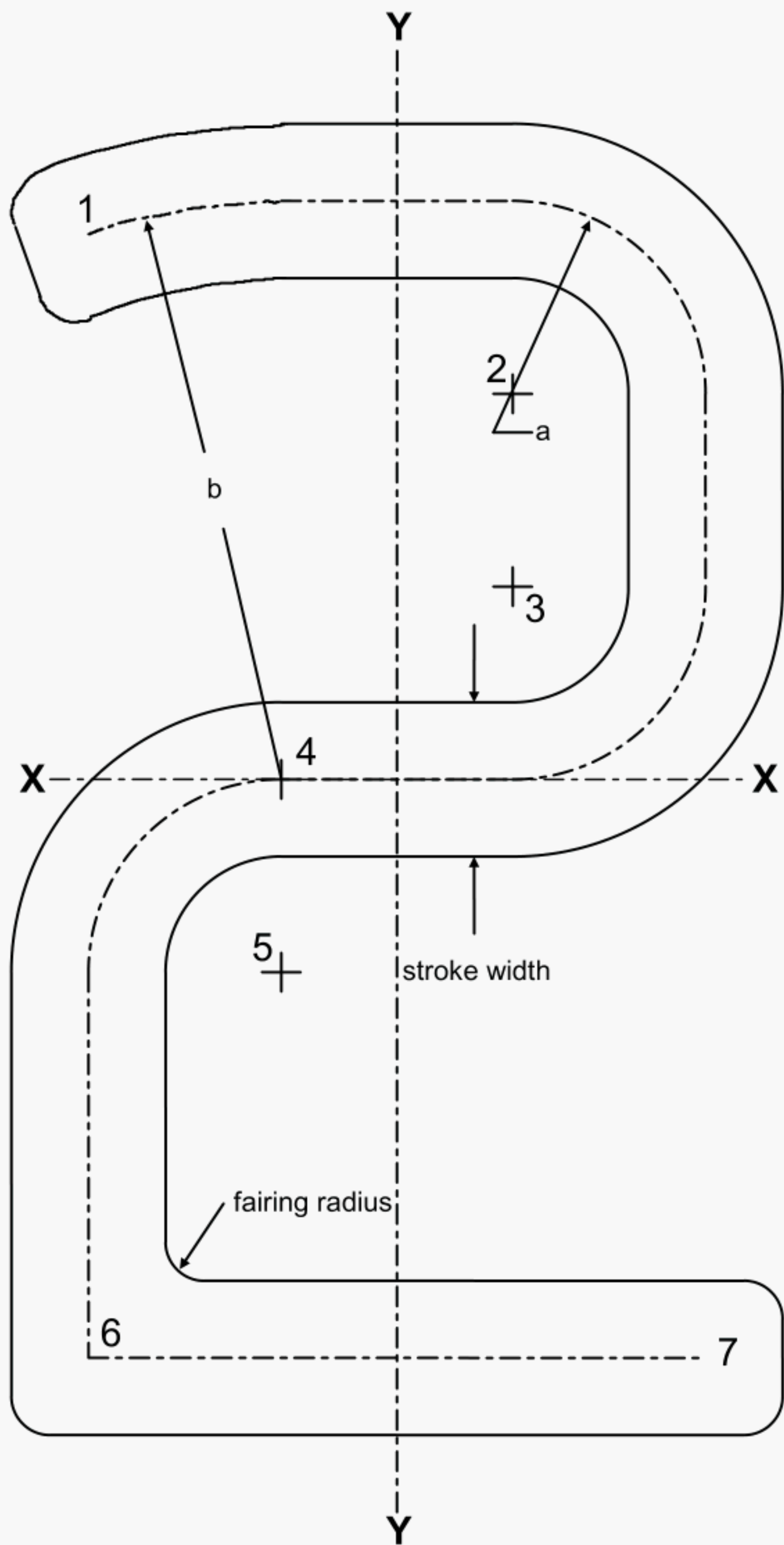


Figure B.1 — Printed image for 7B font-1



Dimensions in millimetres (inches)

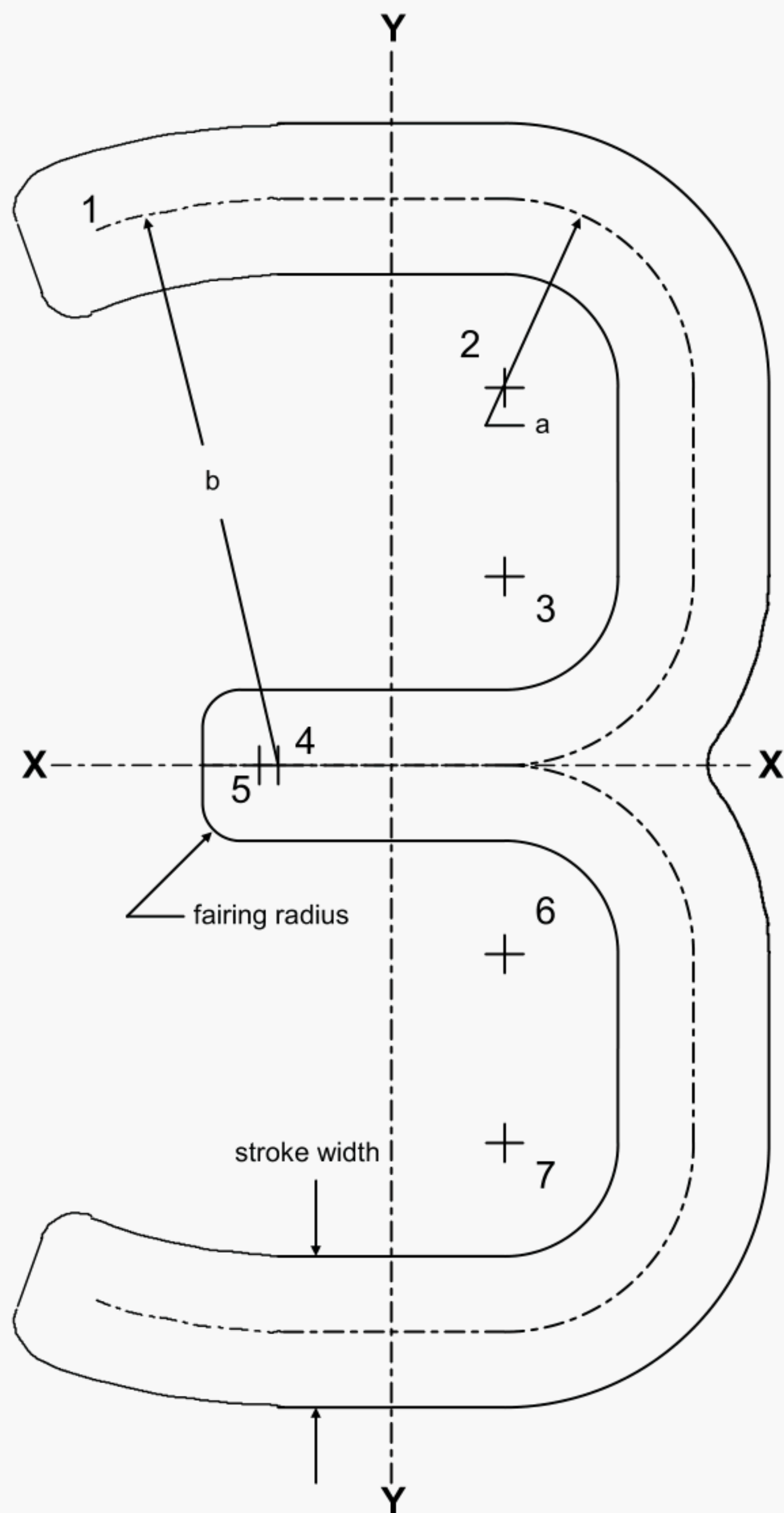


Point number	X value	Y value
1	- 0,98 (- 0.038)	---- ----
2	+ 0,38 (+ 0.015)	+ 1,27 (+ 0.050)
3	+ 0,38 (+ 0.015)	+ 0,64 (+ 0.025)
4	- 0,38 (- 0.015)	0,00 (0.000)
5	- 0,38 (- 0.015)	- 0,64 (- 0.025)
6	- 1,02 (- 0.040)	- 1,91 (- 0.075)
7	+ 1,02 (+ 0.040)	- 1,91 (- 0.075)

Centreline radius	
a	0,64 (0.025)
b	1,91 (0.075)

Figure B.2 — Printed image for 7B font-2

Dimensions in millimetres (inches)



Point number	X value	Y value
1	- 0,98 (- 0.038)	---- ----
2	+ 0,38 (+ 0.015)	+ 1,27 (+ 0.050)
3	+ 0,38 (+ 0.015)	+ 0,64 (+ 0.025)
4	- 0,38 (- 0.015)	0,00 (0.000)
5	- 0,51 (- 0.020)	0,00 (0.000)
6	+ 0,38 (+ 0.015)	- 0,64 (- 0.025)
7	+ 0,38 (+ 0.015)	- 1,27 (- 0.050)

Centreline radius	
a	0,64 (0.025) 4 places
b	1,91 (0.075) 2 places

Figure B.3 — Printed image for 7B font-3



Dimensions in millimetres (inches)

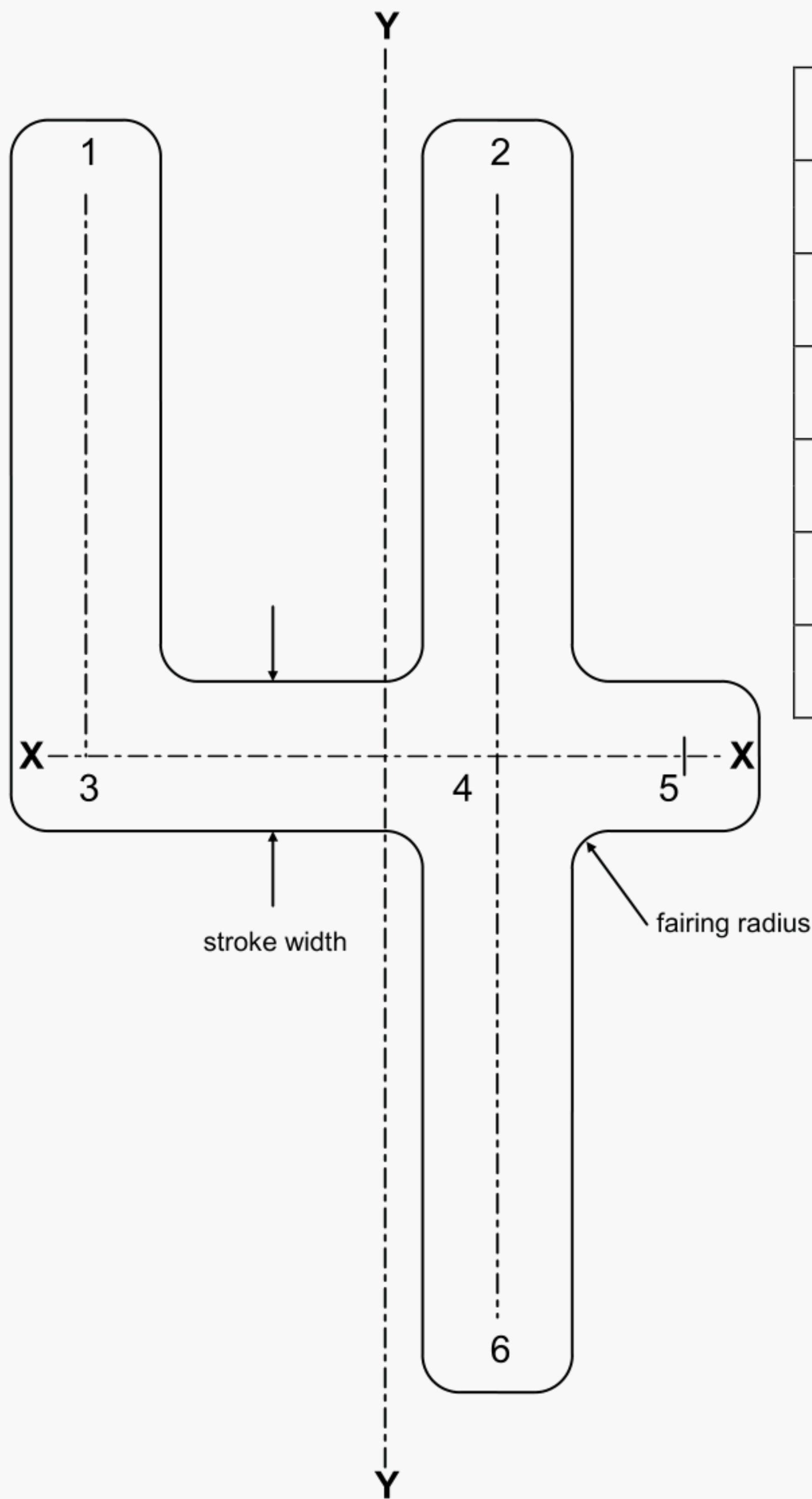
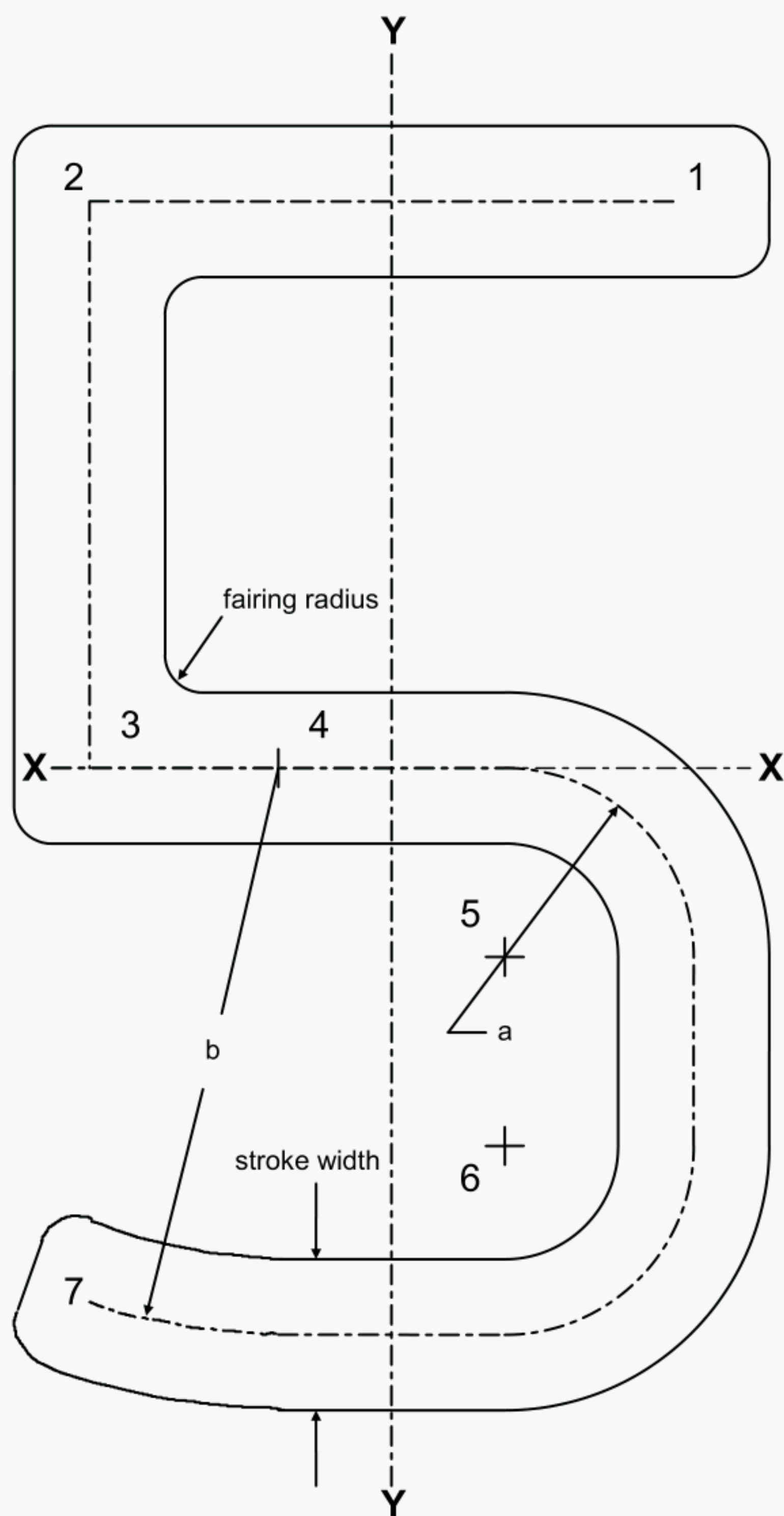


Figure B.4 — Printed image for 7B font-4

Dimensions in millimetres (inches)



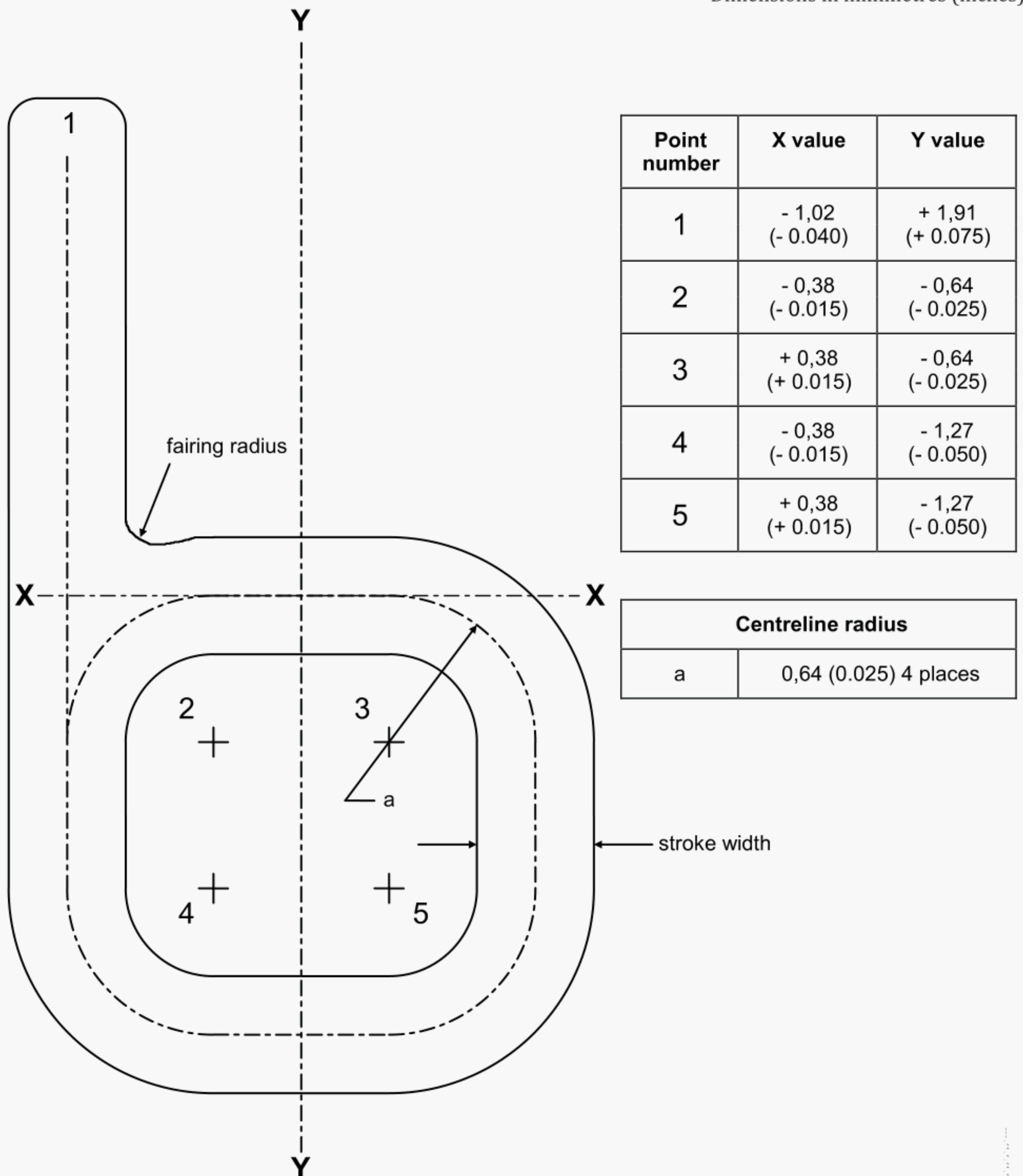
Point number	X value	Y value
1	+ 1,02 (+ 0.040)	+ 1,91 (+ 0.075)
2	- 1,02 (- 0.040)	+ 1,91 (+ 0.075)
3	- 1,02 (- 0.040)	0,00 (0.000)
4	- 0,38 (- 0.015)	0,00 (0.000)
5	+ 0,38 (+ 0.015)	- 0,64 (- 0.025)
6	+ 0,38 (+ 0.015)	- 1,27 (- 0.050)
7	- 0,98 (- 0.038)	----

Centreline radius	
a	0,64 (0.025) 2 places
b	1,91 (0.075) 1 place

Figure B.5 — Printed image for 7B font-5



Dimensions in millimetres (inches)



**Figure B.6 — Printed image for 7B font-6**

Dimensions in millimetres (inches)

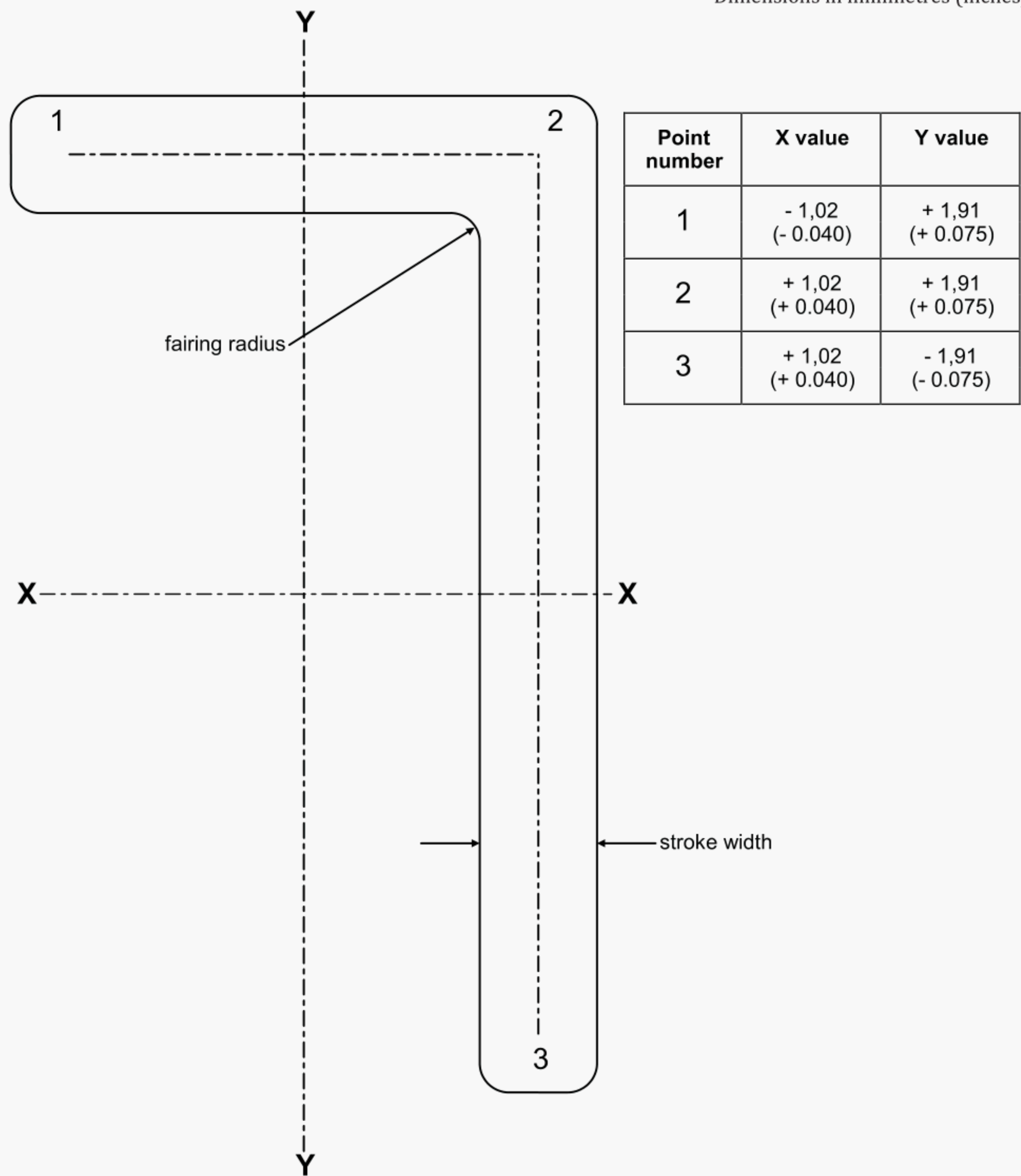
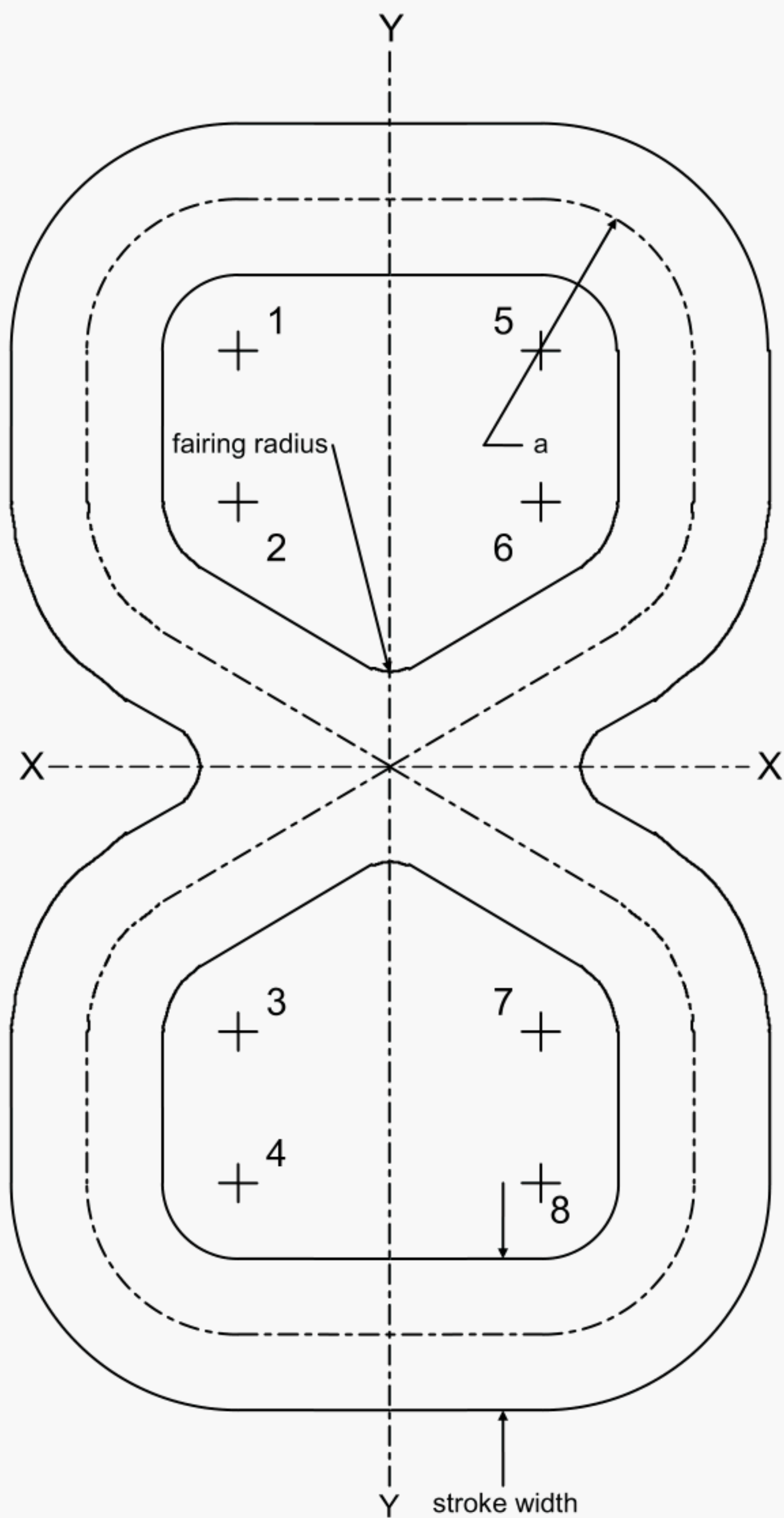


Figure B.7 — Printed image for 7B font-7



Dimensions in millimetres (inches)



Point number	X value	Y value
1	- 0,51 (- 0.020)	+ 1,35 + (0.055)
2	- 0,51 (- 0.020)	+ 0,88 (+ 0.035)
3	- 0,51 (- 0.020)	- 0,88 (- 0.035)
4	- 0,51 (- 0.020)	- 1,35 - (0.055)
5	+ 0,51 (+ 0.020)	+ 1,35 + (0.055)
6	+ 0,51 (+ 0.020)	+ 0,88 (+ 0.035)
7	+ 0,51 (+ 0.020)	- 0,88 (- 0.035)
8	+ 0,51 (+ 0.020)	- 1,35 - (0.055)

Centreline radius	
a	0,51 (0.020) 8 places

Figure B.8 — Printed image for 7B font-8

Dimensions in millimetres (inches)

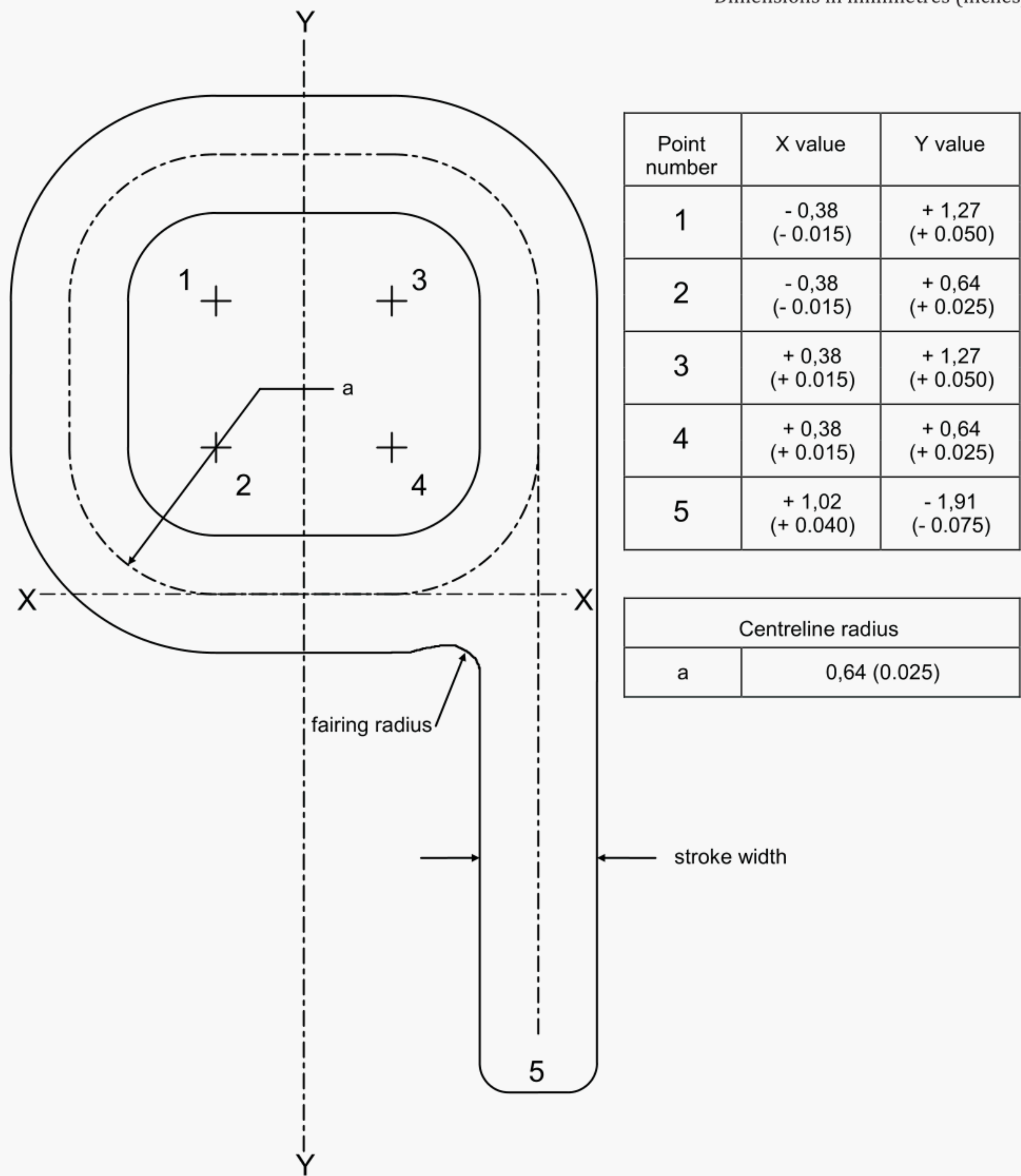


Figure B.9 — Printed image for 7B font-9



Dimensions in millimetres (inches)

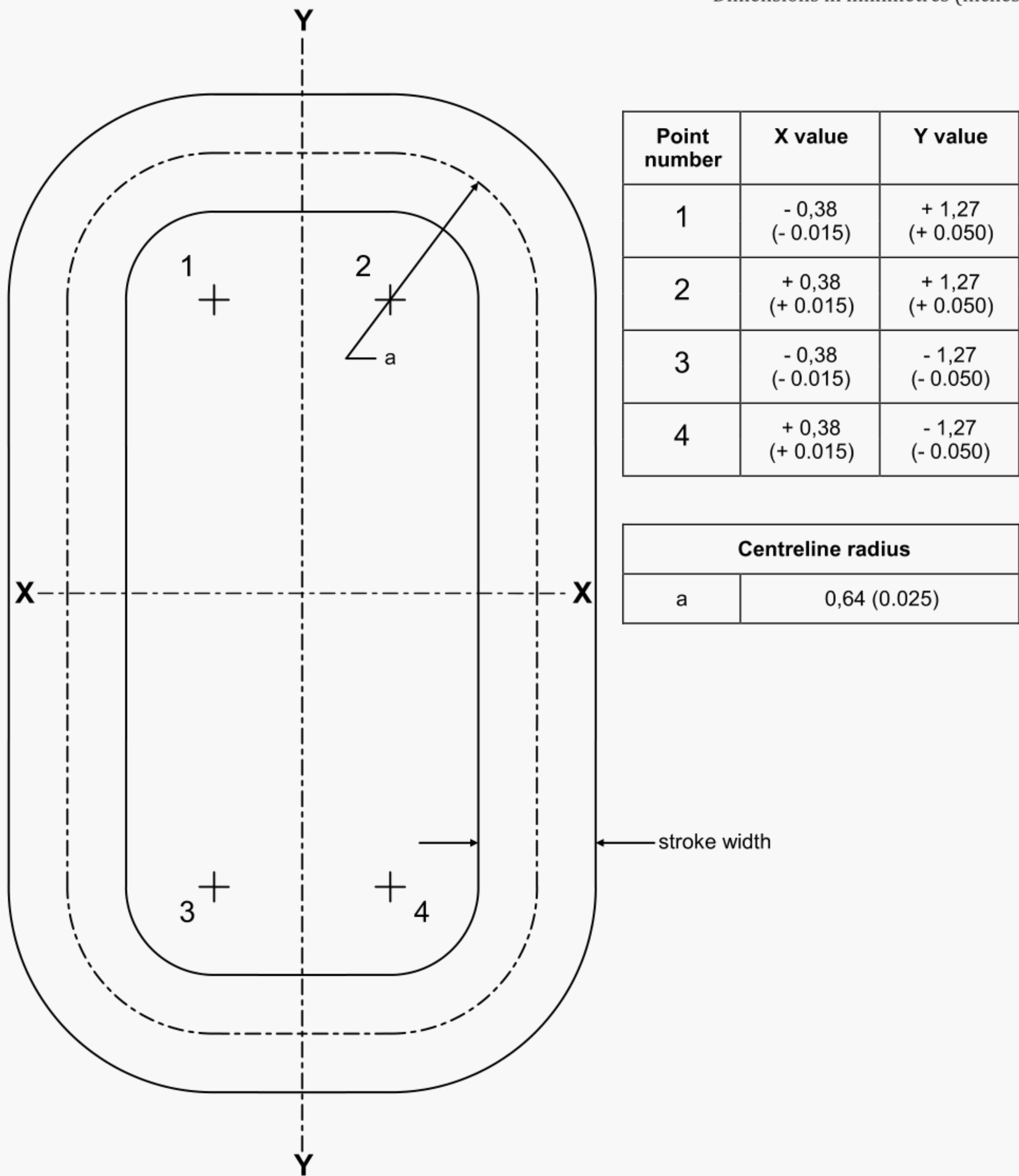


Figure B.10 — Printed image for 7B font-0

B.3 Character spacing and alignment

Table B.2 — Character spacing and alignment

Character spacing	7 characters per 25,4 mm (1 in) minimum
Horizontal separation between adjacent characters	0,38 mm (0.015 in) minimum
Vertical misalignment between adjacent characters	2,03 mm (0.080 in) maximum
Skew of characters	3° maximum
Total line skew shall not exceed the limits of the print zone defined in <a href="#">Clause 8</a> .	

B.4 Printing characteristics for imprinted forms (see ISO 1831)

B.4.1 Ink density

For optimum performance, the ink (carbon) density of the printed character shall be such that its reflectance is not more than 20 % of the average reflectance of the form on which the character is printed. At worst, the ink density of the printed character must be such that its reflectance is not more than 60 % of the average reflectance of the document on which the character is printed.

Reflectance is measured with an incident illumination of 45° and a viewing angle of 90° to the surface of the form, and using an aperture of measurement 0,20 mm² (0.0003 in²) on the document.

Acceptable voids and acceptable extraneous marks as defined in [B.4.2](#) and [B.4.3](#) are exceptions to the ink density requirement.

B.4.2 Voids

A void is any area within the maximum stroke width dimension of a printed character in which the reflectance exceeds 60 % of the average reflectance of the document on which a character is printed. Voids are acceptable provided they can be entirely contained within a circle of 0,25 mm (0.01 in) diameter, there is a minimum separation of 0,71 mm (0.28 in) centre to centre between the voids, and the resulting minimum effective stroke width dimension is not less than 0,20 mm (0.008 in). Unacceptable voids are not allowed.

B.4.3 Extraneous marks

An extraneous mark is any mark within either the printing or clear zone, but not within the printed character area, in which the reflectance is less than 60 % of the average reflectance of the document on which the marks occur. Extraneous marks are acceptable provided they can be entirely contained within a circle of 0,25 mm (0.010 in) diameter, and there is a minimum separation between the marks of 0,71 mm (0.028 in) centre to centre. Unacceptable extraneous marks are not allowed.

B.4.4 Imprinting

Deformation of the form surface as a result of imprinting shall not exceed 0,13 mm (0.005 in).



## Annex C (informative)

### Impact resistance test

#### C.1 Scope

The purpose of this test is to help identify cards that may not be suitable for embossing (see ISO/IEC 7811-1).

#### C.2 Apparatus

The impact apparatus is shown in [Figure C.1](#) and comprises the following:

- a) **card support anvil**, made of steel and mounted to a rigid, heavy base. A vent hole of at least 5 mm diameter shall be provided at the bottom of the anvil to allow air to escape during the impact;
- b) **cylindrical dart**, made of steel and supported in a bearing;
- c) **impact weight**, made of steel and supported in guide bearing with friction no greater than 0,45 N (0.1 lb);
- d) portions of the apparatus that contact the card must have a hardness of  $R_c = 50-55$  ( $H_v = 513-595$ ) ( $H_b = 481-560$ ) and surface finish of  $R_a = 0,2 \pm 0,06 \mu\text{m}$  ( $7.9 \pm 2.4 \mu\text{in}$ ). See ISO 3274 for surface roughness measurement parameters;
- e) **height gauge**, accurate to 0,01 mm (0.0005 in) with measuring probe surface diameter between and 3 mm and 8 mm.

#### C.3 Procedure

Pre-condition the sample cards to the test environment of ISO/IEC 10373-1 for 24 h before testing. Conduct the test under the environment defined in ISO/IEC 10373-1.

Using the height gauge, measure the thickness of the test card in the area where the impact testing will be performed.

**NOTE 1** The presence of card features such as IC's, signature panels, magnetic stripes, etc., near impact area can affect test results.

**CAUTION — Use care in operating the impact apparatus to avoid injury. Safety glasses are recommended to be worn during this test to prevent eye injury. Keep fingers and hands clear of the impact area.**

Place the test card under the cylindrical dart centreline at least 20 mm (0.8 in) from any sample edge or previous impact test area. Lift the impact weight to the height specified in the base standard (see NOTE 2 below). Drop the impact weight onto the cylindrical dart as it rests on the sample card. Inspect the impact area for cracks; they will usually appear in the shoulder of the depression. At least 2 impact test areas shall be used to determine whether cracking occurs.

**NOTE 2** Experience has shown that cards having cracks for a drop height of 127 mm (5 in) will have durability problems.

Place the test card on a flat rigid surface with the deformation side up and apply a force of  $4,5 \text{ N} \pm 0,5 \text{ N}$  ( $1 \text{ lbf} \pm 0.1 \text{ lbf}$ ) to the top of the deformation to cause the card to flatten against the rigid surface.

Using the height gauge, measure the height of the deformation area relative to the surface of the card.

C.4 Test report

The test report shall state the drop height, deformation height, and whether any cracking occurred.

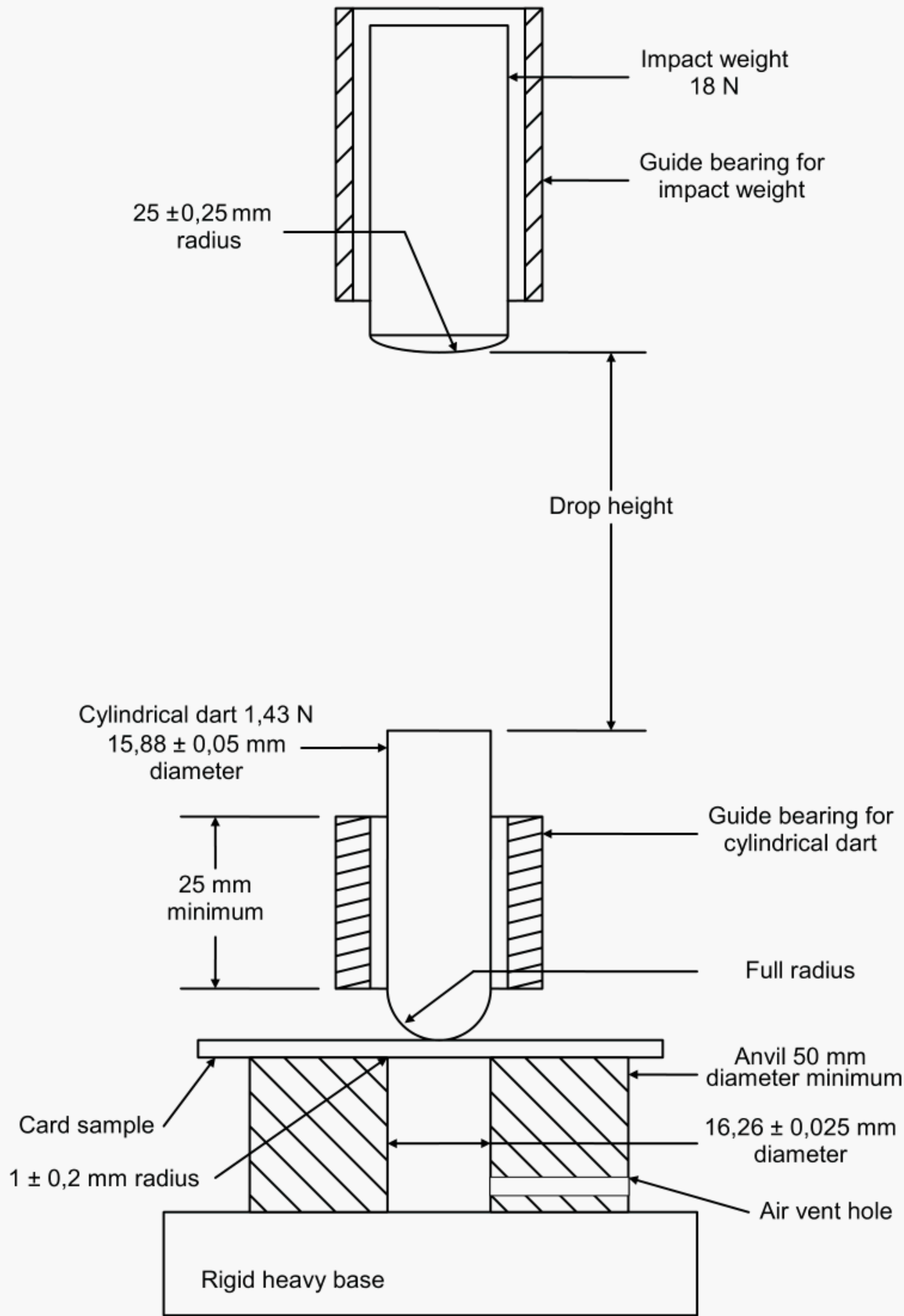


Figure C.1 — Impact resistance test apparatus



## **Annex D**

### **(normative)**

## **Embossing with contactless integrated circuit cards**

### **D.1 Scope**

The purpose of this annex is to advise on minimum locations for embossing on ISO/IEC 7810 ID-1 size contactless integrated circuit cards to avoid damage to antenna and IC components inside the card body when deforming the card material if the embossing method is used.

When embossed characters are formed by the addition of material to the surface of the card without card body deformation and stress, limitations specified here do not apply.

### **D.2 Embossing area**

If an ISO/IEC 14443-1 Class 2 antenna is integrated into an ID-1 size card, the Class 2 antenna area specified in ISO/IEC 14443-1:2018, Annex A should be located outside of the embossing areas defined in ISO/IEC 7811-1 and ISO/IEC 7811-9. Regardless of the type of antenna used (e.g. antenna as used for making cards compliant with ISO/IEC 14443-1, ISO/IEC 15693-1) if it is located inside an embossing area, special care shall be taken that possible later embossing in the embossing area does not adversely affect the performance of the antenna.











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## Textiles — Determination of dimensional change in washing and drying

*Textiles — Détermination des variations dimensionnelles au lavage et au  
séchage domestiques*





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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 5077 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 2, *Cleansing, finishing and water resistance tests*.

This second edition cancels and replaces the first edition (ISO 5077:1984), which has been technically revised.



# Textiles — Determination of dimensional change in washing and drying

## 1 Scope

This International Standard specifies a method for the determination of the dimensional change of fabrics, garments or other textile articles when subjected to an appropriate combination of specified washing and drying procedures.

In the case of textile articles or deformable materials, it is necessary to exercise all possible caution in the interpretation of the results.

## 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 139, *Textiles — Standard atmospheres for conditioning and testing*

ISO 3759, *Textiles — Preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional change*

ISO 6330, *Textiles — Domestic washing and drying procedures for textile testing*

## 3 Principle

The specimen is conditioned in the specified standard atmosphere and measured before subsection to the appropriate washing and drying procedures. After drying, conditioning and remeasuring of the specimen, the changes in dimensions are calculated.

## 4 Apparatus and reagents

Use apparatus and reagents as specified in ISO 3759 and ISO 6330.

## 5 Atmospheric conditions

The atmospheric conditions required for conditioning and testing are specified in ISO 139.

## 6 Test specimens

**6.1** The selection, dimensions, marking and measuring of test specimens are specified in ISO 3759.

**6.2** When possible, three specimens from each sample should be used. One or two specimens may be used when insufficient sample is available.

## 7 Procedure

**7.1** Determine the original length and width dimensions, as appropriate, after the specimens have been conditioned and measured according to the procedure specified in ISO 139 and ISO 3759.

**7.2** Wash and dry the specimens according to one of the procedures specified in ISO 6330, as agreed between the interested parties.

**7.3** After washing and drying, condition and measure the specimens and calculate the dimensional change of the specimens according to the procedure specified in ISO 3759.

## 8 Expression of results

**8.1** Calculate the mean changes in dimensions in both the length and width directions in accordance with the arrangement in ISO 3759 as follows:

$$\frac{x_t - x_o}{x_o} \times 100$$

where

$x_o$  is the original dimension;

$x_t$  is the dimension measured after treatment.

Record the changes in measurement separately as a percentage of the corresponding original value.

**8.2** Express the average dimensional changes to the nearest 0,5 %.

**8.3** State whether the dimension has decreased (shrinkage) by means of a minus sign (–) or increased (extension) by means of a plus sign (+).

## 9 Test report

The test report shall specify the following:

- a) the number and year of this International Standard;
- b) the number of specimens washed and dried;
- c) the procedure used for washing and drying from ISO 6330;
- d) for fabric specimens, the average dimensional change in the length (warp or wale) and the average dimensional change in the width (weft or course) to the nearest 0,5 %;
- e) for garments, the description, make and size of the garment tested;
- f) for garments, an adequate description of each measuring position and the average dimensional change to the nearest 0,5 % at each position for each garment tested.