BS ISO 1004-1:2013

BSI Standards Publication

Information processing — Magnetic ink character recognition

Part 1: Print specifications for E13B

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee IST/12, Financial services.

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

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Part 1: Print specifications for E13B

Traitement de l'information — Reconnaissance des caractères à encre magnétique —

Partie 1: Spécifications d'impression E13B

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Foreword

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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 ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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The committee responsible for this document is ISO/TC 68, *Financial services*, Subcommittee SC 7, *Core banking*.

This first edition of ISO 1004-1, together with ISO 1004-2, cancels and replaces ISO 1004:1995, which has been technically revised.

ISO 1004 consists of the following parts, under the general title *Information processing — Magnetic ink character recognition*:

— *Part 1: Print specifications for E13B*

— *Part 2: Print specifications for CMC7*

Annexes A to D of this International Standard are for information only.

Introduction

The characters specified in this part of ISO 1004 were developed initially for use in banks to permit automatic document handling for financial institution data processing, but they have application to other automatic handling systems as well.

INTERNATIONAL STANDARD ISO 1004-1:2013(E)

Information processing — Magnetic ink character recognition —

Part 1: Print specifications for E13B

1 Scope

This part of ISO 1004 specifies the shape, dimensions, magnetic signal level, and tolerances for the E-13B characters which include 10 numerals and four special symbols printed in magnetic ink and used for the purpose of character recognition. It describes the various known types of printing defects and other printing considerations, together with the tolerances permitted.

2 Character configuration

2.1 Designation

The series of standard magnetic ink characters shall consist of 10 numerals and four special symbols. They shall be identified as follows:

Name	Character appearance
One (1)	
Two (2)	
Three (3)	
Four (4)	
Five (5)	
Six (6)	
Seven (7)	
Eight (8)	
Nine (9)	
Zero (0)	
Symbol 1 (Transit)	
Symbol 2 (Amount)	
Symbol 3 (On-us)	
Symbol 4 (Dash)	

2.2 Dimensions

Detailed dimensions and the reference centre-lines of the printed characters for the 10 numerals and four special symbols shall be as shown in Figure 1 to Figure 14.

Figure 15 illustrates the character design matrix. All radii are 0,165 mm except in the character zero. All radii shall be blended with adjacent edges. Tolerance of each average edge = ± 0,038 mm. The minimum horizontal bars width is 0,279 mm. This minimum dimension does not apply to vertical bars (see 5.5).

3 Character spacing and alignment

3.1 Spacing

3.1.1 Character spacing

The distance between the right average edges of adjacent characters shall be 3,175 mm ± 0,254 mm. See Figure 16. Average edge is discussed in 5.2.

3.1.2 Tolerance accumulation

The accumulation of spacing tolerances in any common field shall be limited to the extent that the accumulation does not infringe upon the boundaries defining this field.

3.1.3 Special cases

Normally a spacing of 6,35 mm ± 0,508 mm is accumulated when two characters within a field are separated by one space.

Additional spacing tolerance of ± 1,5588 mm shall apply within a field or from field to field when printing does not guarantee to meet adjacent character spacing but only when surrounding spaces are utilized as a safety band. For those instances where a full space is not used, adjacent character spacing shall never be less than 2,921 mm or more than 4,064 mm.

3.2 Alignment

3.2.1 Reference point

Alignment is the relative vertical location of a character with respect to adjacent characters within a given field. The horizontal centre-line of each character is shown in Figure 1 through Figure 14. These centre-lines serve to establish vertical alignment of all characters, since all characters are designed about the same horizontal centre-line.

3.2.2 Tolerance

Alignment of a line of characters printed in any field shall be such that the bottom edges of adjacent characters within each field do not vary vertically by more than 0,762 mm (see Figure 17). These tolerances shall not accumulate so that the field exceeds the 6,35 mm encoding strip.

On the symbols that do not come down to the “base-line” (On-Us and Dash, Figure 13 and Figure 14), the same 0,762 mm tolerance shall apply to the horizontal centre-line.

4 Character skew

The maximum allowable character skew shall be ± 1,5° measured with respect to the aligning (bottom) edge of the document. See Figure 18.

5 Character tolerances

5.1 Dimensions

See Figures 1 to 14 for dimensions of the printed characters, and subclause 2.2.

5.2 Average edge definition

The typical edge of a printed character is not a straight line. The term "average edge" shall be used for horizontal and vertical edges and is defined as an imaginary line, parallel to either the vertical centre-line or the horizontal centre-line that divides the irregularities. The result is that the summation of the white areas on one side of the line is equal to the summation of the black areas on the other side. The average edge of the radii shall be tangent to the average edge of the stroke. See Figure 19.

5.3 Average edge tolerance

The average edge tolerance for all stroke edges shall be ± 0,038 mm applied to the dimensions (measured from the vertical centre-line and horizontal centre-line) that locate the edges. A typical illustration of this tolerance is shown at the top of Figure 20. The average edge of the radii shall be tangent to the average edges of the character, and the tolerance of the radii shall also be ± 0,038 mm.

5.4 Edge irregularity tolerance

5.4.1 Average edge irregularities

Peaks and valleys located about the average edge shall be permitted to extend to ± 0,089 mm from the average edge. An example is shown in Figure 20. However, when these occur, the summation of the edge present in the 0,038 to 0,089 mm zone shall not exceed 25 % of the total edge.

5.4.2 Edge voids

An occasional void can be present at the edge of a character stroke and creates a valley that exceeds the 0,089 mm limit mentioned in 5.4.1. See Figure 20.

No two voids as described shall occur within 0,889 mm of each other as measured from the points of maximum excursion from the average edge.

Valleys that exceed the 0,089 mm zone are voids and are controlled by the void limits given in Clause 6 and shall be measured from the average edge of a character stroke. However, any portion of an edge void that is within the 0,089 mm zone shall be included in the measurement of the percentage of the edge present in the 0,038 to 0,089 mm zone.

Figures 1 to 14 show dimensions for printed characters, in accordance with the following requirements.

— All radii shall be 0,165 mm except in character zero.

— All radii shall be blended with adjacent edges.

— Tolerance (average edge) = ± 0,038 mm

— Minimum horizontal bars width shall be 0,279 mm. This does not apply to vertical bars (see 5.5).

— All dimensions on figures below are in millimetres.

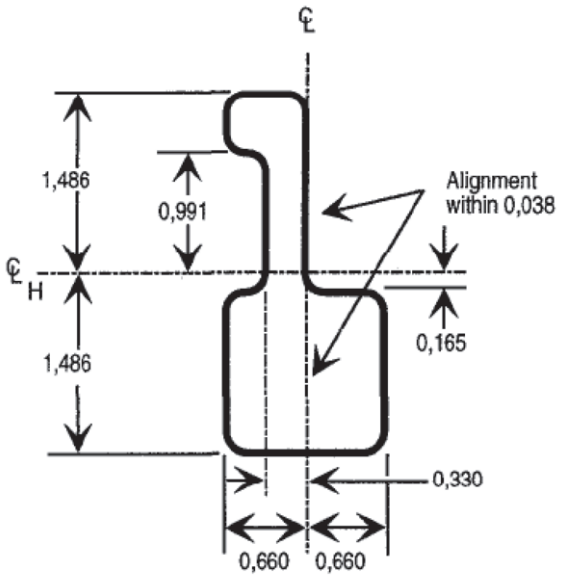


Figure 1 — One

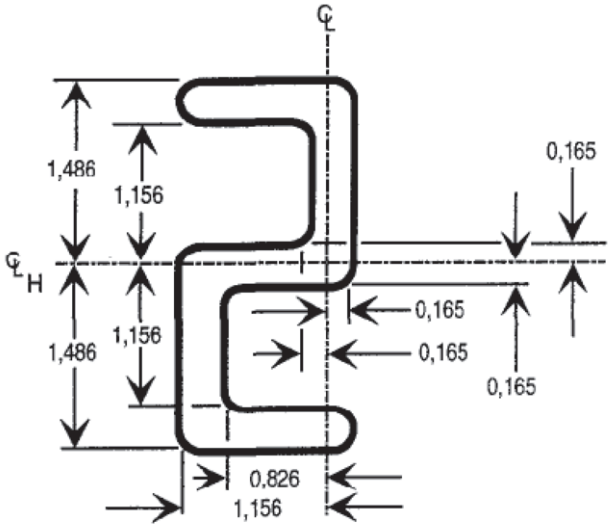


Figure 2 — Two

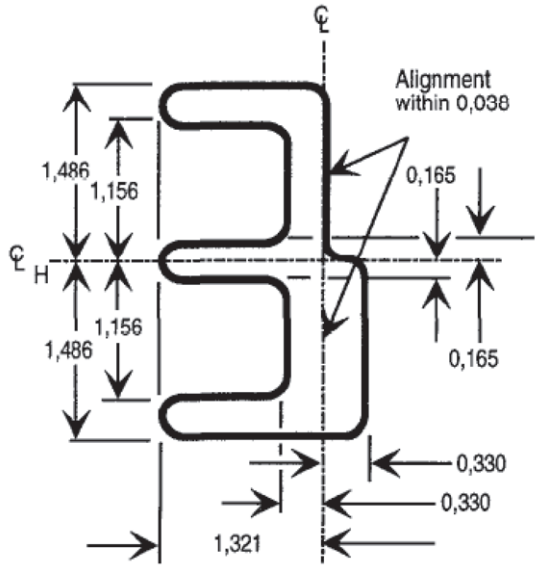


Figure 3 — Three

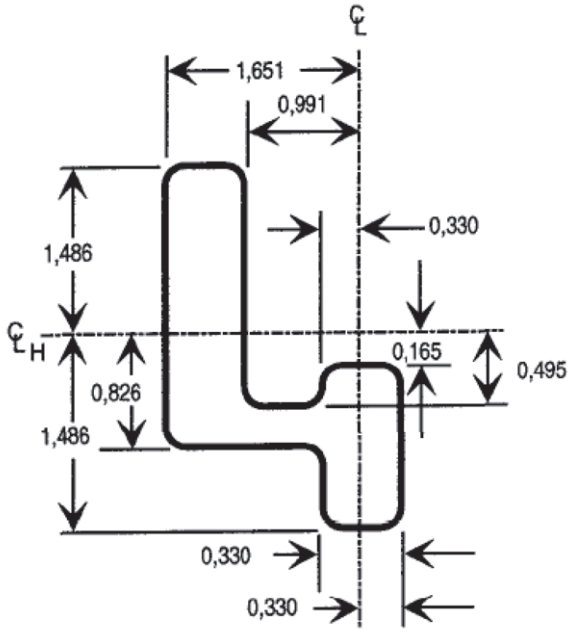


Figure 4 — Four

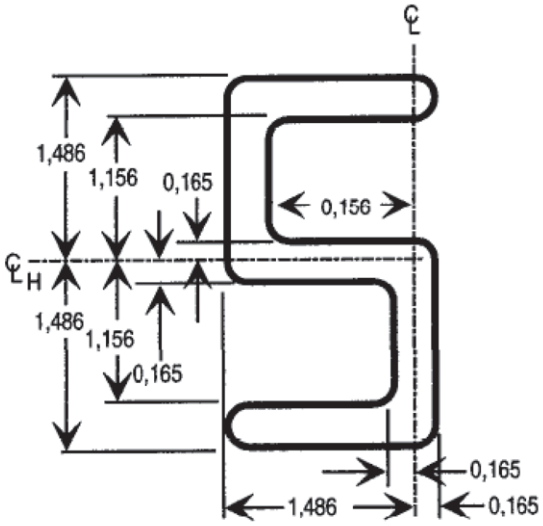


Figure 5 — Five

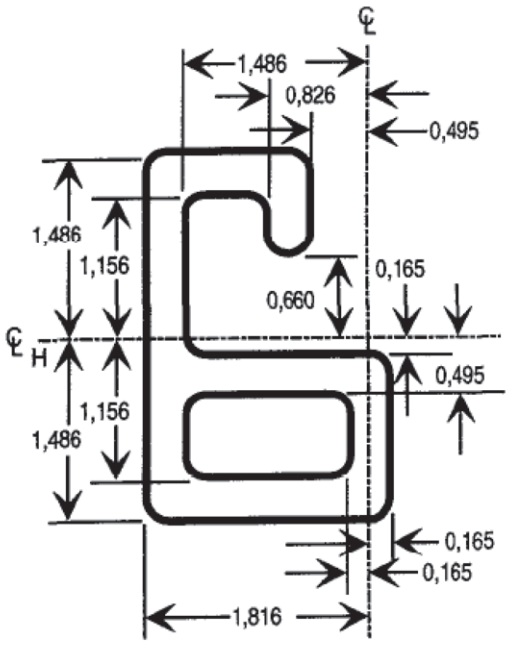


Figure 6 — Six

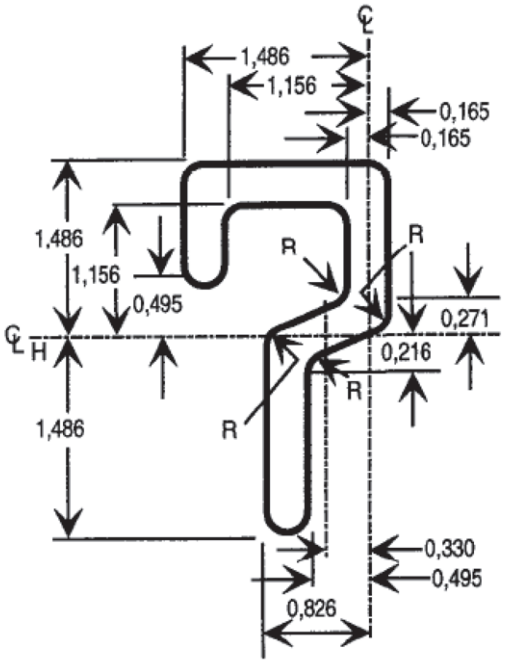


Figure 7 — Seven

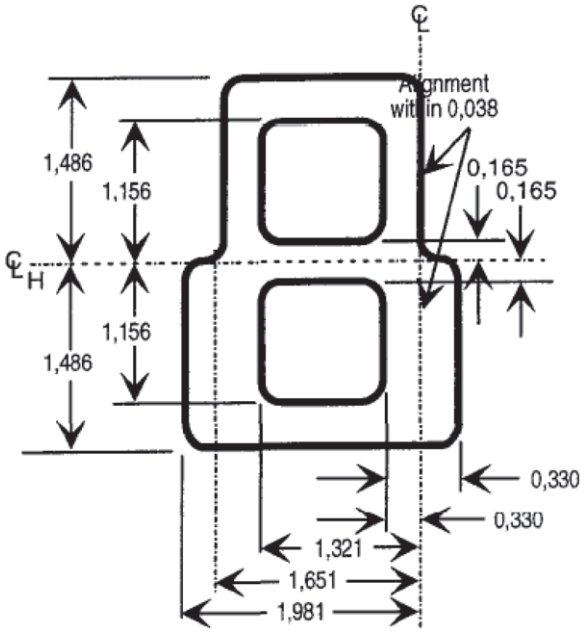


Figure 8 — Eight

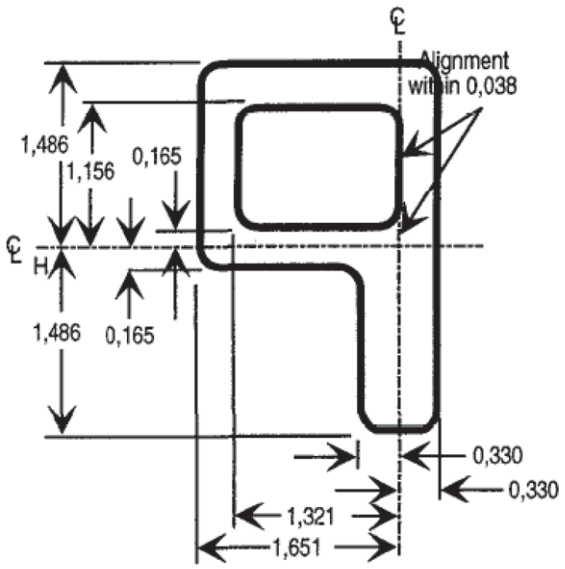


Figure 9 — Nine

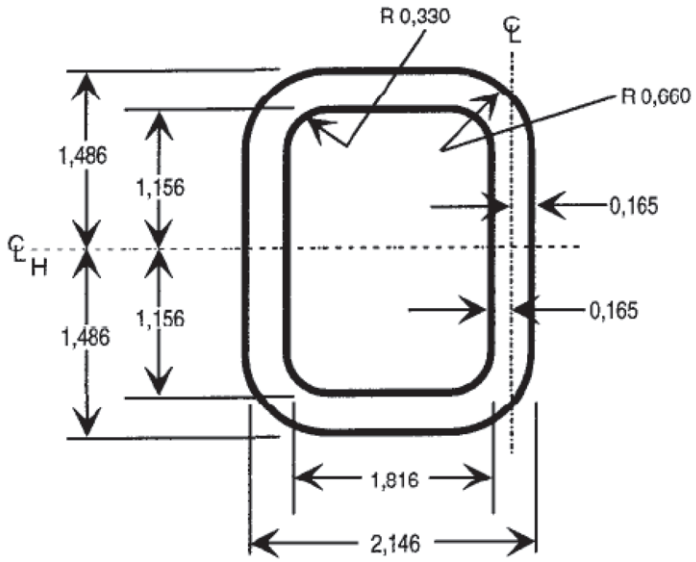


Figure 10 — Zero

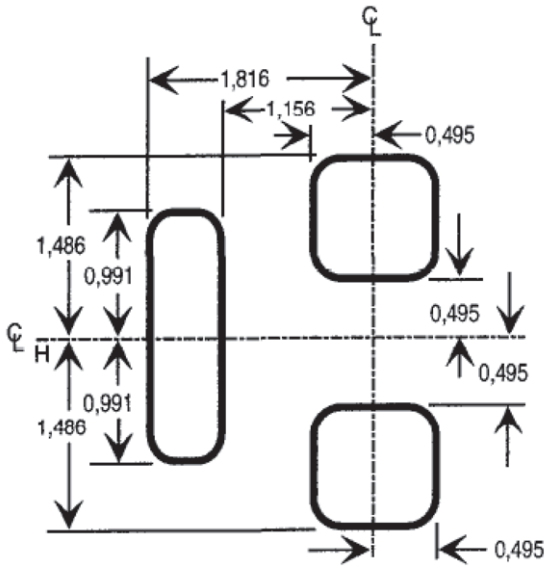


Figure 11 — Transit symbol (Symbol 1)

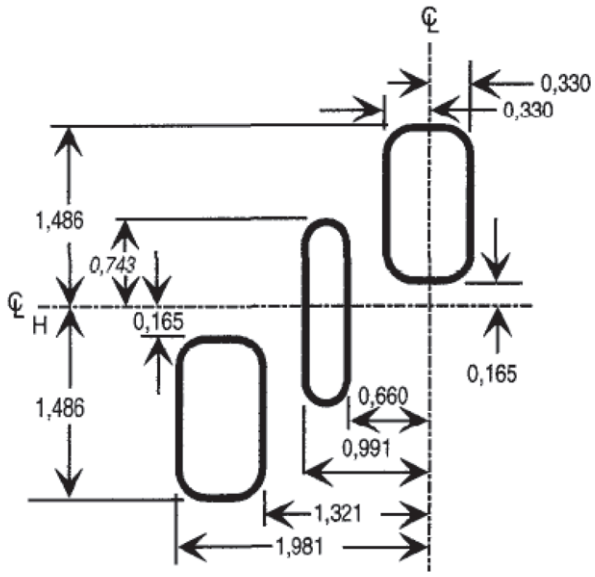


Figure 12 — Amount symbol (Symbol 2)

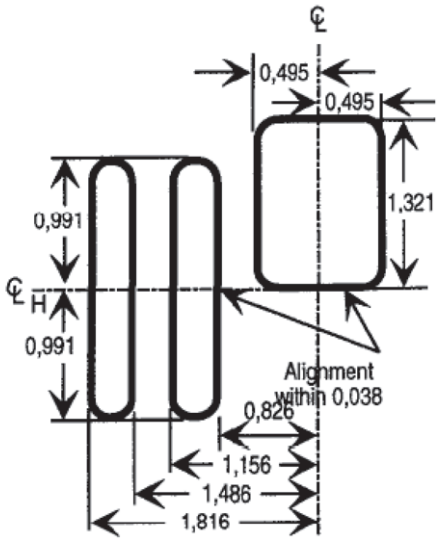


Figure 13 — On-Us symbol (Symbol 3)

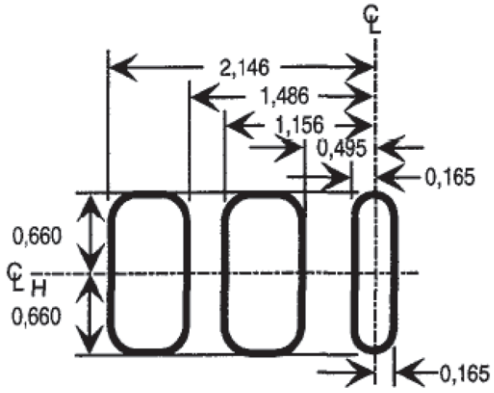


Figure 14 — Dash symbol (Symbol 4)

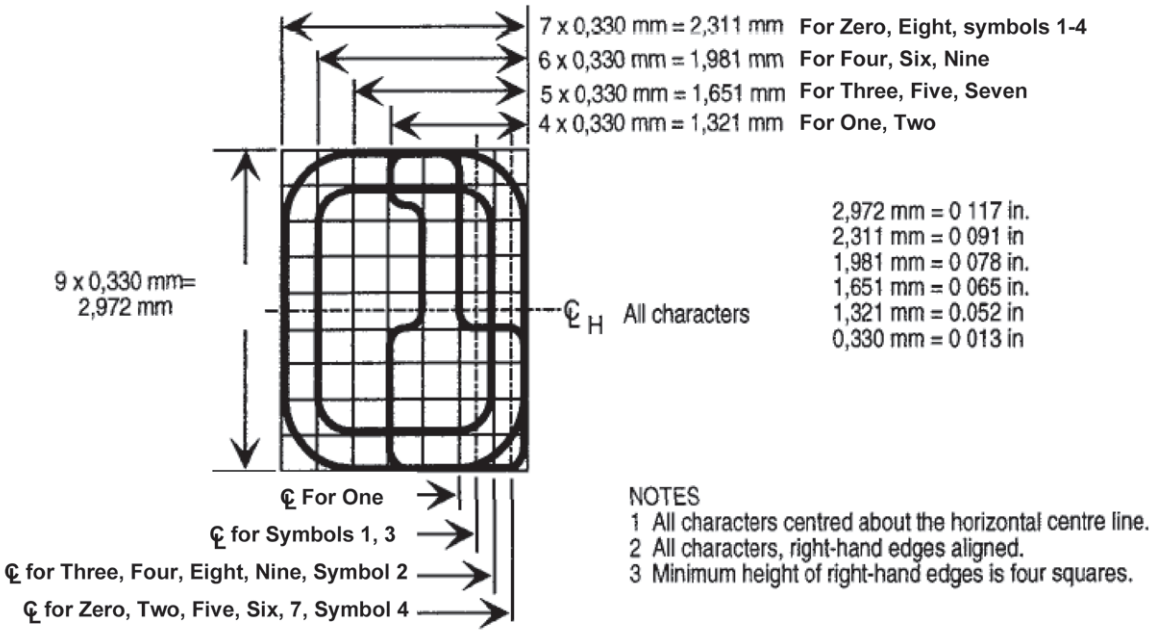


Figure 15 — Character design matrix

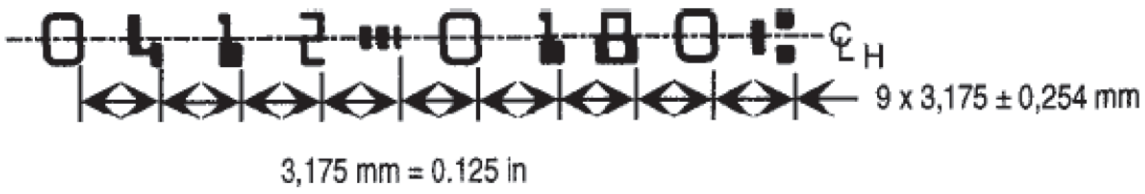


Figure 16 — Distance between characters

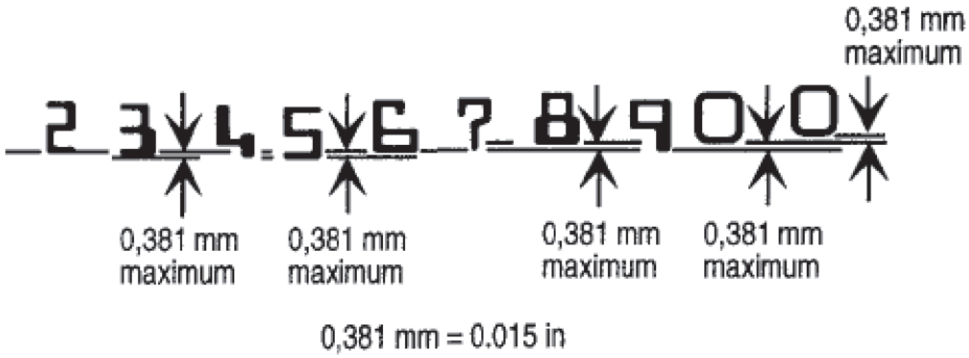


Figure 17 — Allowable variation in vertical alignment of adjacent characters in millimetres

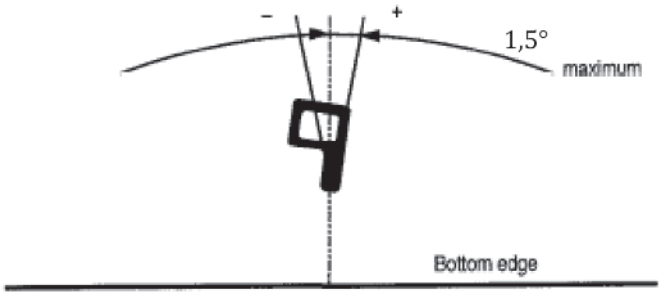


Figure 18 — Allowable character skew

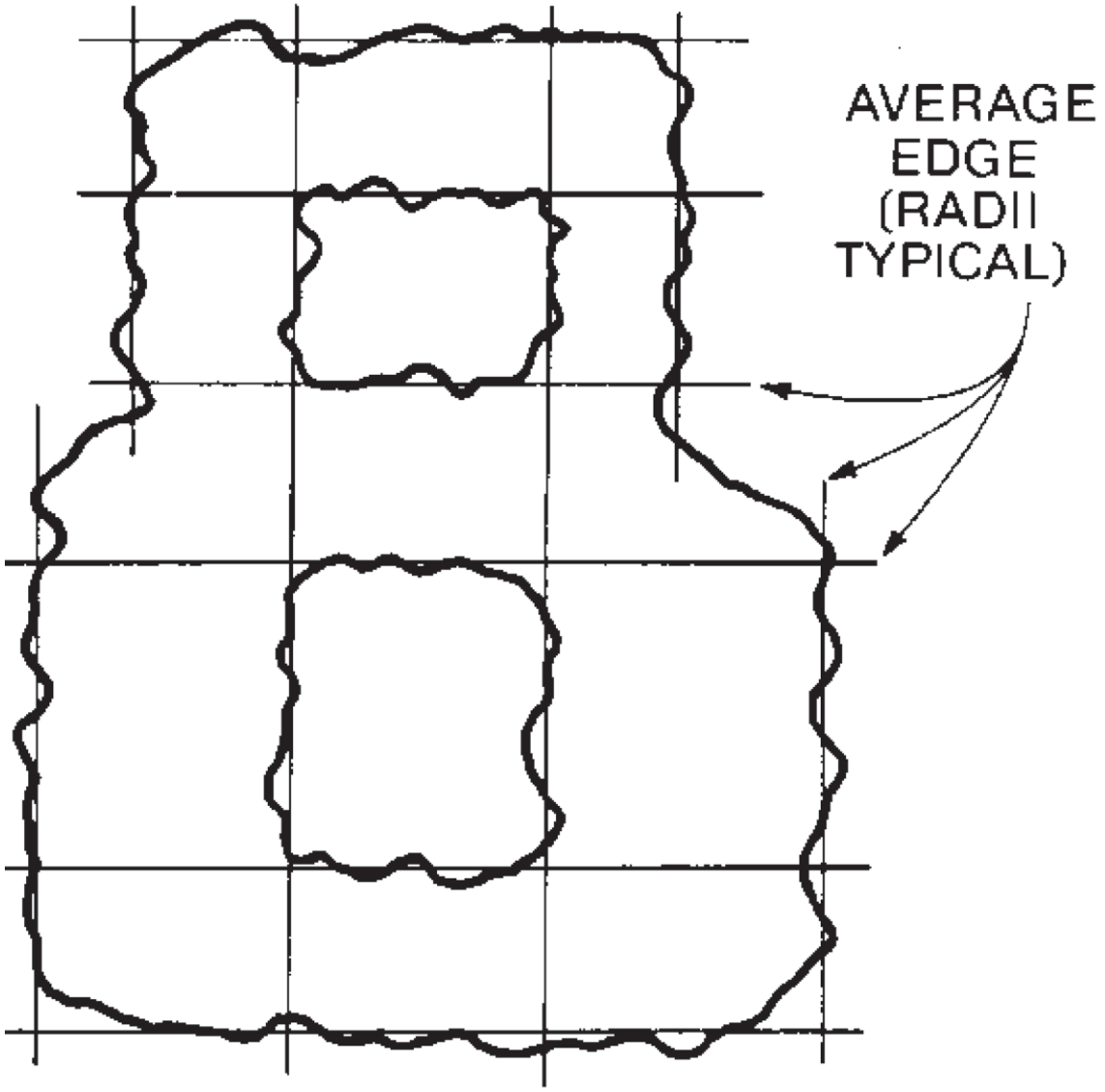


Figure 19 — Average edge example

5.5 Extraneous ink — attached

An occasional excursion (such as feathering or stringing out) can be present at the edge and extend beyond the 0,038 mm to 0,089 mm zone. Such occasional excursions shall not be considered as edge irregularities and are defined as extraneous ink that is “attached” to the character. These occasional

excursions are allowed if each can be contained in a 0,076 mm × 0,076 mm square. Those excursions that cannot be contained in a 0,076 mm × 0,076 mm square are acceptable, provided that they can be contained in a 0,102 mm × 0,102 mm square and shall be limited to one per character and shall total not more than five per field.

In measuring the size of such excursions, only that portion extending beyond the 0,089 mm limit shall be considered since the portion of the excursion within the 0,038 mm to 0,089 mm zone is controlled by character edge irregularity limits given in 5.4.

5.6 Minimum width of horizontal bars

The distance between the average edges of any horizontal bar shall be at least 0,279 mm. This specification is an adjunct to the dimension specification locating each edge. This specification does not apply to vertical bars, since vertical bars are controlled entirely by dimensions locating each edge.

6 Voids

6.1 Maximum allowable single voids

6.1.1 Voids

The maximum allowable single void (the absence of ink within the specified outline of the printed character) anywhere in the character, including at an edge, shall be of a size that can be contained entirely within the boundary of a 0,203 mm × 0,203 mm square, with the following exceptions.

If the portion of the character involving a single void occupies two or more 0,330 mm × 0,330 mm square zones (see Figure 15), then the maximum allowable single void shall be completely surrounded by ink and contained entirely within the boundary of a 0,254 mm × 0,254 mm square. In this case, voids at the edges are not included and shall be limited to a 0,203 mm × 0,203 mm square. See Figure 21.

6.1.2 Needle voids

Single voids that are long and narrow are called “needle” type voids. They shall be allowable in any length anywhere within the character provided that they are no wider than 0,051 mm average edge to average edge.

6.2 Maximum allowable combined voids

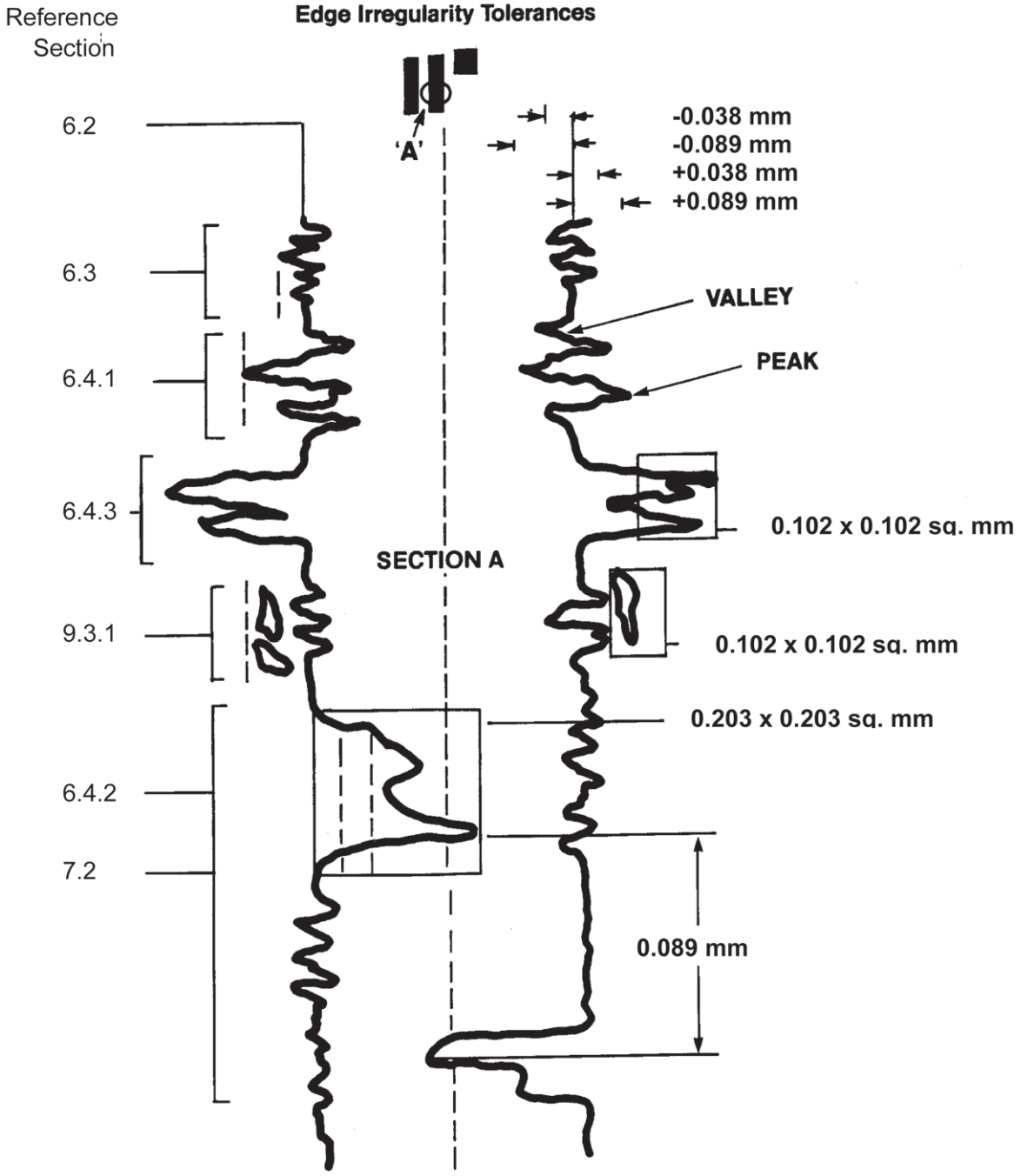
The combined area of all voids, in any vertical 0,330 mm column of zones or horizontal 0,330 mm row of zones, shall not exceed 20 % of the area of that column or row. See Figure 15 and Figure 22.

7 Uniformity of ink distribution

The magnetic ink deposited shall be uniformly distributed within the outlines of each character. Conditions to be avoided include excessive squeeze-out, halo, and other uneven deposits. A ridge of ink that outlines a character and appears dense in relation to the ink deposited within the character is acceptable, provided that its width does not exceed 0,038 mm between its average edges. Such ridges are predominant in letterpress printing and in some impact printing.

Each printed MICR character should also be magnetically uniform, as observed from its waveform as measured with a signal level tester, waveform measurement system, or its equivalent.

NOTE Evaluation of real world ink samples often indicates that ink, which appears visually uniform, has an actual thickness variation, and therefore a variation in its magnetic signal properties. Such variation can be due to technical peculiarities of the printing process, and may be evident in an evaluation of the magnetic signal waveform. The user is cautioned that magnetic non-uniformity does not always correlate positively with rejects experienced in MICR document processing equipment. To resolve borderline situations, much depends on the degree of non-uniformity. The user or quality control analyst should re-examine the questionable documents optically, and then decide whether to accept or reject the document.



NOTE This drawing is for illustrative purposes only and is not meant to represent an actual edge.

Figure 20 — Tolerances for average edge and edge irregularity

8 Extraneous ink

8.1 Magnetic

Any magnetic ink which appears in the 15,875 mm MICR clear band other than the MICR characters shall be considered extraneous ink. See 8.3.1, 8.4 and Figure 23 . The clear band is applicable to both front and back of the document.

8.2 Nonmagnetic

Any ink appearing in the 7,620 mm optical clear band that interferes with optical reading of MICR characters shall be considered non-magnetic extraneous ink. It includes splatter, smear, tracking, feathering, stringing out, toning, back offset, and so forth. See 8.3.2 and Figure 23. This clear area is defined in ISO 1831 and includes the printing band for the MICR characters. The optical clear band applies only to the document front.

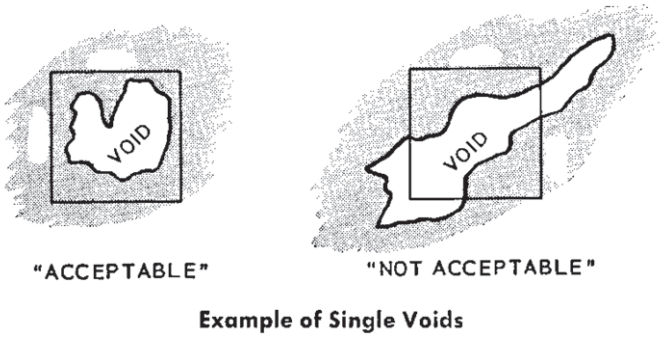


Figure 21 — Single voids

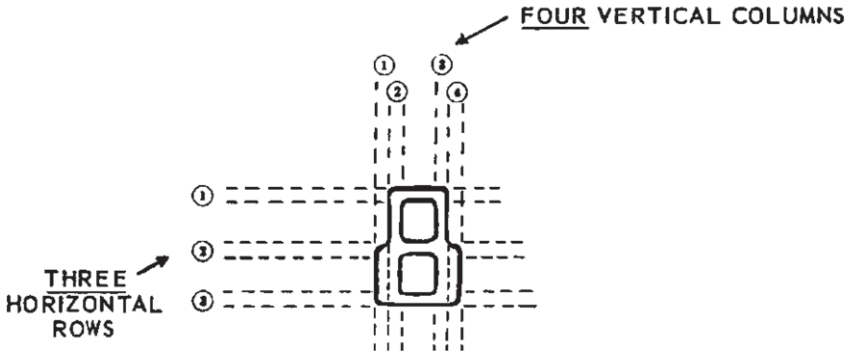
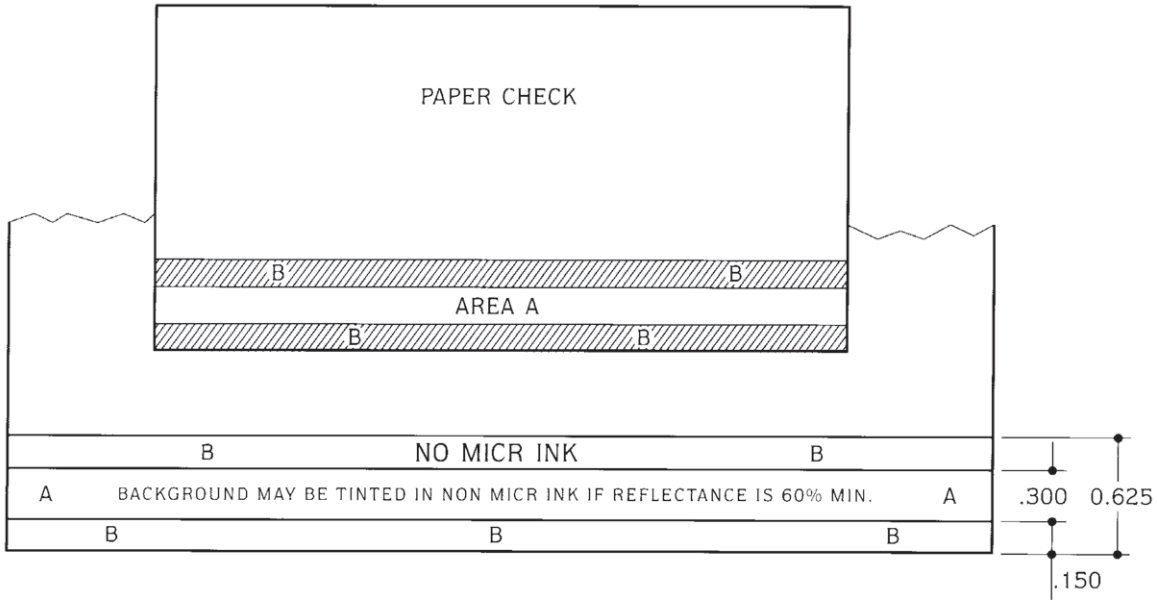


Figure 22 — Example of rows and columns for character 8



Area A The rules in 8.2, 8.3.2, 13.3, and 14 apply here.

Area B The rules in 8.1, 8.3.1, 8.4, and 13.2 apply here.

Figure 23 — MICR clear band and optical clear band — Extraneous ink restriction areas

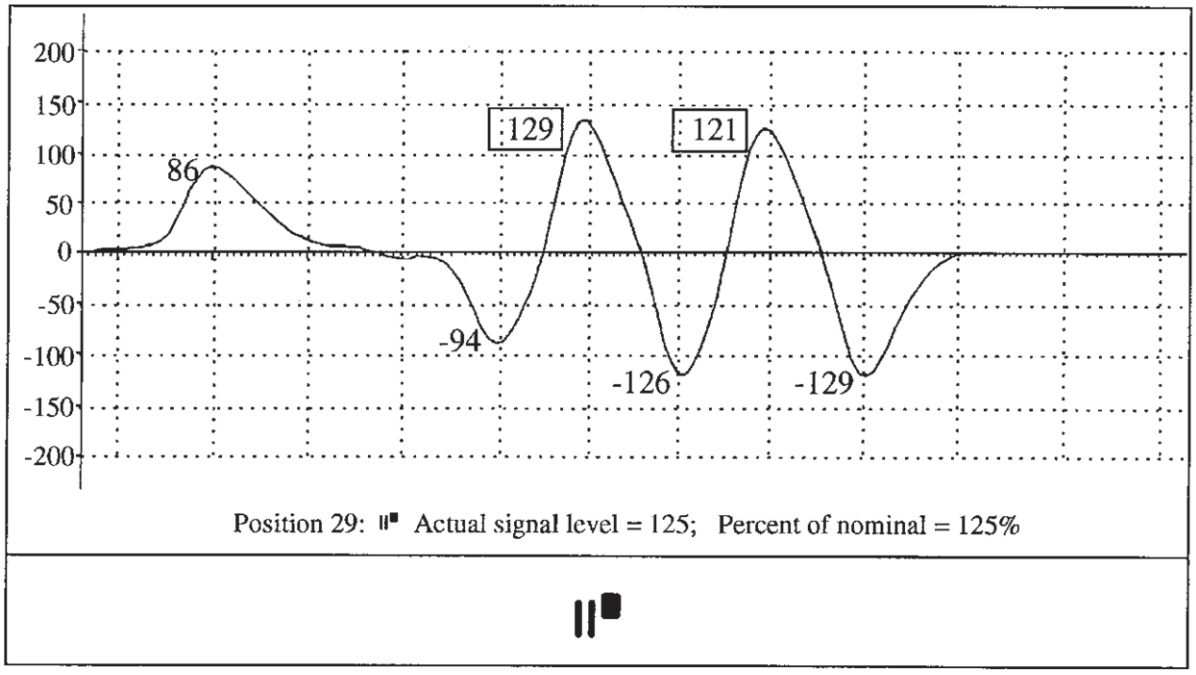


Figure 24 — Example of a waveform of the On-Us symbol X

8.3 Extraneous ink front

8.3.1 Magnetic ink

Extraneous magnetic ink on the front of the document within the 15,875 mm MICR clear band shall be acceptable if the spots can be contained in a 0,076 mm × 0,076 mm square.

Spots that cannot be contained in a 0,076 mm × 0,076 mm square shall be acceptable provided they can be contained in a 0,102 mm × 0,102 mm square and are limited to one per character space and total not more than five per field.

Spots that are found to be located within the outermost limits established by the character edge irregularity tolerance shall be considered under the character edge irregularity specifications.

8.3.2 Non-magnetic ink

Spots within the 7,620 mm optical clear band that can be contained inside a circle 0,203 mm in diameter shall be acceptable as long as no two spots are closer than 1,016 mm to each other or an E-13B character.

8.4 Extraneous magnetic ink back

Extraneous magnetic ink on the back of the document within the area of the MICR clear band shall be acceptable if the spots are entirely contained in a 0,152 mm × 0,152 mm square.

9 Debossment

Penetration of the printed character into the surface of the paper is known as debossment. Debossment of the printed character is undesirable. Where it is excessive, it can be the cause of rejects or misreads. Signal levels may be reduced or distorted because the magnetic ink characters are displaced from the MICR reader magnetic pick-up device by the debossment depth. Debossment on the face of the document may or may not cause fractures of the paper fibres that are detectable on the reverse side.

For the purposes of this part of ISO 1004, 0,025 mm debossment shall be established as an objective. Due to practical manufacturing constraints, this specification is frequently exceeded by letterpress printing, press numbering, ribbon encoding, and post-encoding processes. Additional tolerances beyond 0,025 mm may be acceptable before rejects by MICR recognition equipment will occur. See Annex A.

Debossment of MICR characters can be compounded by the signal strength of the ink used, the uniformity of the ink coverage, the evenness of debossment, or the combination of these.

EXAMPLE 1 Uneven debossment such as deeper penetration by a vertical narrow stroke of a character, as compared to a broader portion of the same character coupled with insufficient signal from the ink can cause rejects.

EXAMPLE 2 Although uniform debossment of an entire character with adequate signal strength probably will not cause rejects, given that these conditions can occur, a further explanation of tolerances acceptable under certain circumstances is contained in Annex A.

10 Embossment

This part of ISO 1004 establishes an embossment limit of 0,0152 mm that shall not be exceeded unless additional precautions have been taken to minimize character abrasion. For most dry ink images, an embossment value of 0,0152 mm or less shall result in acceptable reader/sorter wear. See Clause 15 for a discussion of permanence of MICR printing.

NOTE 1 Certain MICR dry ink printing technologies (xerography, ionography, or magnetography) may result in raised or embossed printing. The range of embossment for dry ink printing technologies is normally from 0,0076 mm to 0,0152 mm.

NOTE 2 The steel-die engraving form of intaglio printing, which simultaneously prints and embosses, can result in embossment on the order of 0,025 mm. Such highly embossed MICR characters and check borders are known to cause excessive MICR read head wear in high speed reader/sorters. The paper stock used in intaglio printing, e.g. travellers checks, often causes problems when the MICR amount field is impact encoded. Other forms of intaglio printing are available which do not result in high levels of embossment.

NOTE 3 Excessive embossment of the printed MICR characters is undesirable since it can lead to increased abrasive wear of the MICR characters, contamination of the reader/sorter and, in the case of highly embossed intaglio printing, accelerated wear of the MICR read heads. Severely abraded characters can ultimately result in rejects or misreads. However, the actual wear performance might depend upon the specifics of each dry ink formulation. Furthermore, how well the dry ink has been fused and the properties of the paper play an important role in determining the embossment level that is acceptable. Embossed values exceeding 0,0152 mm may be acceptable if the image is endowed with low friction properties as a result of its formulation or treatment during printing.

11 Signal level

11.1 Definition of signal level

Signal level shall be defined as the amplitude of the voltage waveform which results when a d-c magnetized and fully saturated MICR printed character is moved at a specified speed past a specifically defined magnetic read head whose output is amplified with a defined transfer function. The usual unit of measure for voltage is mv or volts. However, it is common practice to scale the output voltage such that 100 units of measure shall be equal to the value of the average of peaks three and five of an ideal reference On-Us symbol. For convenience, we call the units of signal measure when appropriately scaled, Signal Units (SU). See Figure 24 for a waveform of a typical On-Us symbol. Its signal level is 125 SU, which is the average of peak 3 (129 SU) and peak 5 (121 SU).

11.2 Nominal signal level

Nominal signal level shall be the signal obtained from a properly printed reference sample (On-Us symbol), calibrated as 100 signal units (SU) using the wire card calibration (WCC) procedure, when suitable test equipment is used. All other characters are then referenced to the On-Us symbol to obtain an individual nominal signal level, in signal units (SU), using a designated peak or the average of two designated peaks. See Table 1 for the nominal signal level values for each character and the peak number as shown on its respective reference waveform.

11.3 Relative signal level

Relative signal level shall be the ratio, stated as a percentage, that the signal level in signal units (SU) of a MICR character being measured bears to the nominal signal level for that same character. For example, for a sample character “2”, if the signal level of its first peak (the designated peak) is 155 signal units (SU), then its relative signal level is 155/105 × 100 % = 147,6 %.

11.3.1 Relative signal level tolerance

The relative signal level from any printed MICR character shall be within the range from 50 % to 200 % of its nominal signal level as indicated in Table 1. Figures 25 to Figure 38 illustrate the reference waveforms for the nominal signal level of each character with each character’s permissible relative range of 50 % to 200 % noted in SU.

11.3.2 Residual signal level

Residual signal level shall be the signal delivered by a MICR character that has been eradicated or from the signal obtained from embedded magnetic particles within the paper. Whenever mis-encoded information is eradicated, the residual signal level shall not exceed 5 SU with respect to the nominal signal level of the On-Us symbol (100 SU). The method employed for eradication should permit re-encoding of the document and re-reading in MICR equipment. In the case of embedded magnetic particles anywhere within the MICR clear band, the residual signal level shall not exceed 5 SU.

12 Paper

See Annex C for paper characteristics that have proven useful in predicting performance of paper documents.

It is recognized that certain particles embedded in the paper can be a cause for machine rejects. Paper should be used from which magnetic particles, such as iron and other ferromagnetic materials, have been eliminated or reduced to a minimum.

13 Format

13.1 Reference edges

13.1.1 Horizontal dimensions

All horizontal format dimensions shall be measured from the leading edge of the document. The right edge of the first or right hand character shall be located not less than 6,350 mm from the leading edge.

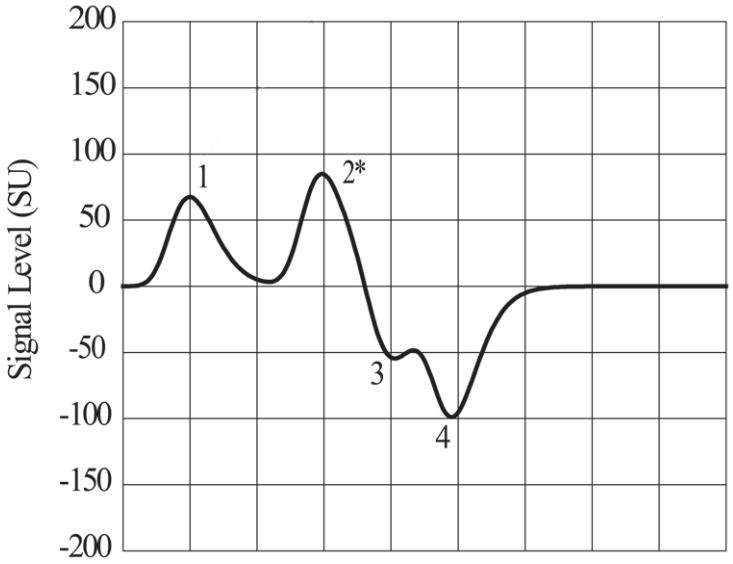
13.1.2 Vertical dimensions

All vertical format dimensions shall be measured from the aligning edge of the document.

Table 1 — Nominal signal level (SU) for each character

Character	Designated peak number [a]	Nominal signal level (SU)
1	2	85
2	1	105
3	1	85
4	3	105
5	1	105
6	5	105
7	1	75
8	4	105
9	1	165
0	1	130
Transit sym.	3	105
Amt. sym.	1 & 5 (avg.)	70
On-Us sym.	3 & 5 (avg.)	100
Dash sym.	3 & 5 (avg.)	67

[a] Counting each vertical edge right to left on the printed character; counting each peak left to right on the displayed waveforms including positive and negative peaks.

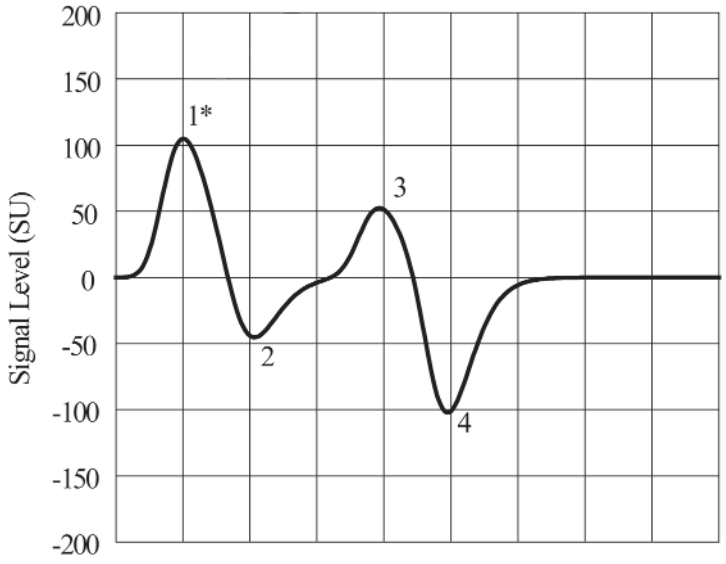


Signal level (SU)

Percent of nominal	**Peak number**			
	1	**2** *	**3**	**4**
50%		43		
100%		**85**		
200%		170		

* Designated peak.

Figure 25 — Signal level table and the reference waveform — Nominal Character one

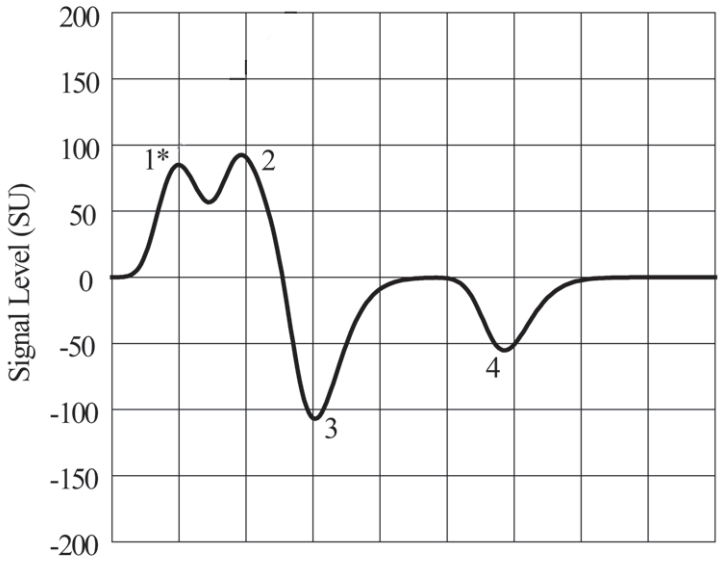


Signal level (SU)

Percent of nominal	**Peak number**			
	1 *	**2**	**3**	**4**
50%	53			
100%	**105**			
200%	210			

* Designated peak.

Figure 26 — Signal level table and the reference waveform — Nominal Character two

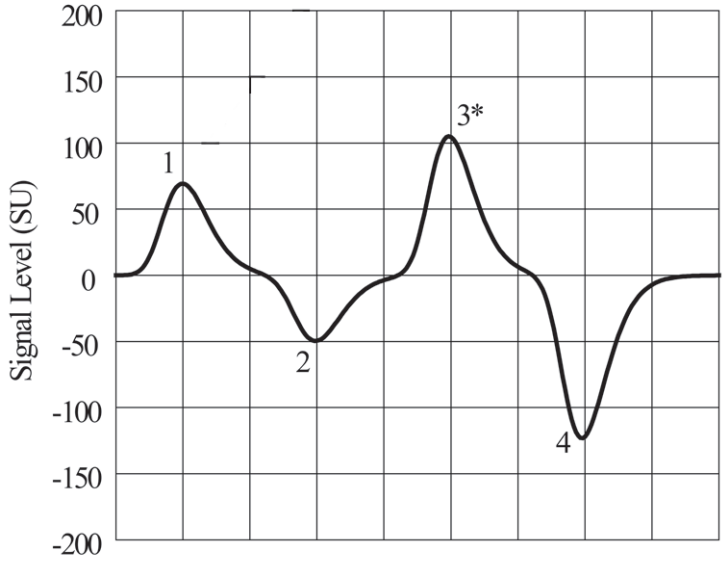


Signal level (SU)

Percent of nominal	**Peak number**			
	1 *	**2**	**3**	**4**
50%	43			
100%	**85**			
200%	170			

* Designated peak.

Figure 27 — Signal level table and the reference waveform — Nominal Character three

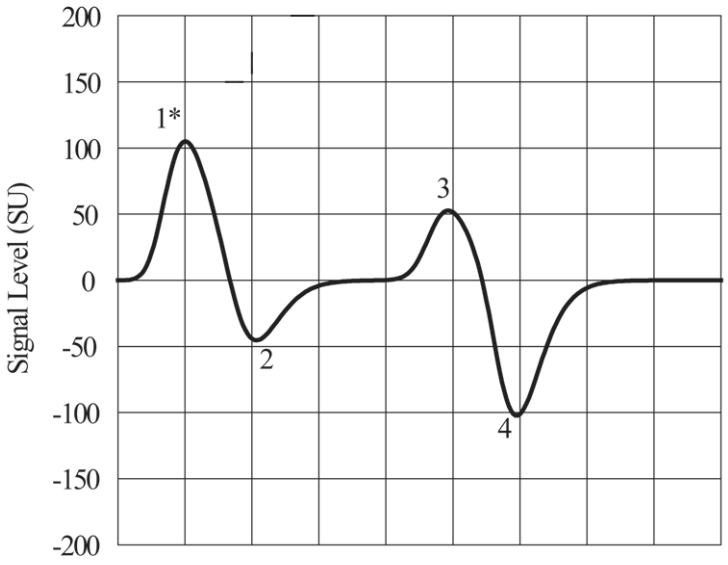


Signal level (SU)

Percent of nominal	**Peak number**			
	1	**2**	**3** *	**4**
50%			53	
100%			105	
200%			210	

* Designated peak.

Figure 28 — Signal level table and the reference waveform — Nominal Character four

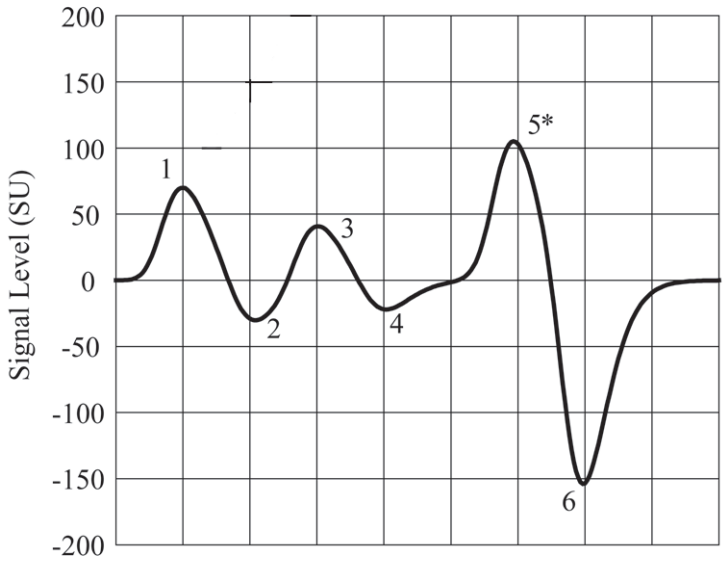


Signal level (SU)

Percent of nominal	**Peak number**			
	1 *	**2**	**3**	**4**
50%	53			
100%	105			
200%	210			

* Designated peak.

Figure 29 — Signal level table and the reference waveform — Nominal Character five

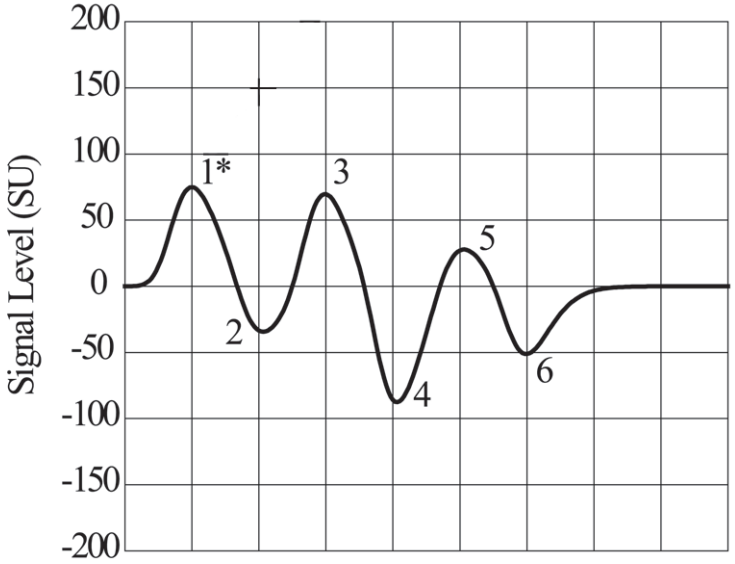


Signal level

Percent of nominal	**Peak number**					
	1	**2**	**3**	**4**	**5** *	**6**
50%					53	
100%					**105**	
200%					210	

* Designated peak.

Figure 30 — Signal level table and the reference waveform — Nominal Character six

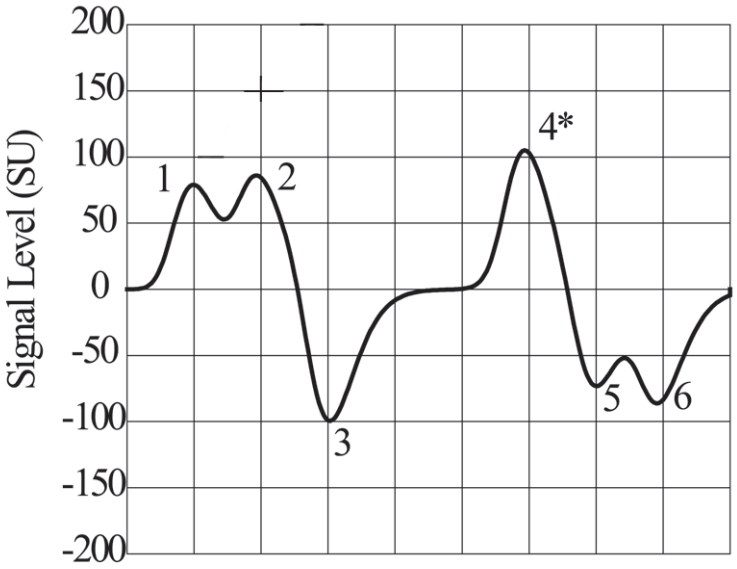


Signal level

Percent of nominal	**Peak number**					
	1 *	**2**	**3**	**4**	**5**	**6**
50%	38					
100%	**75**					
200%	150					

* Designated peak.

Figure 31 — Signal level table and the reference waveform — Nominal Character seven

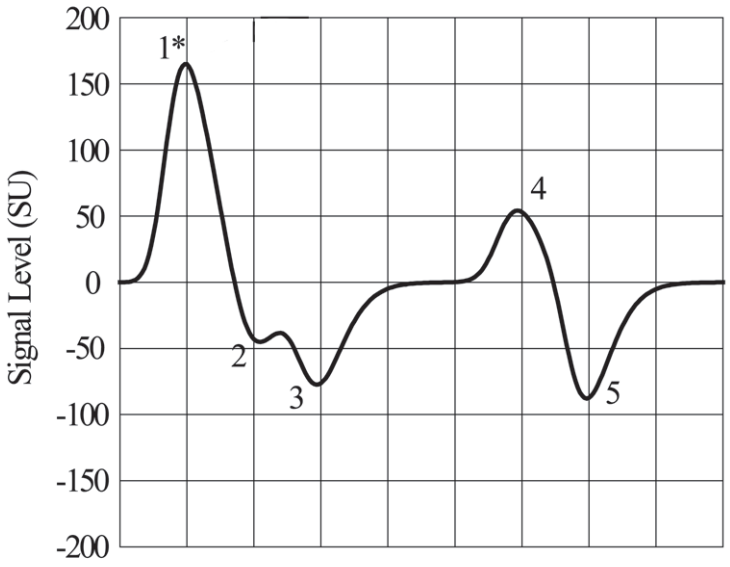


Signal level

Percent of nominal	Peak number					
	1	**2**	**3**	**4** *	**5**	**6**
50%				53		
100%				**105**		
200%				210		

* Designated peak.

Figure 32 — Signal level table and the reference waveform — Nominal Character eight

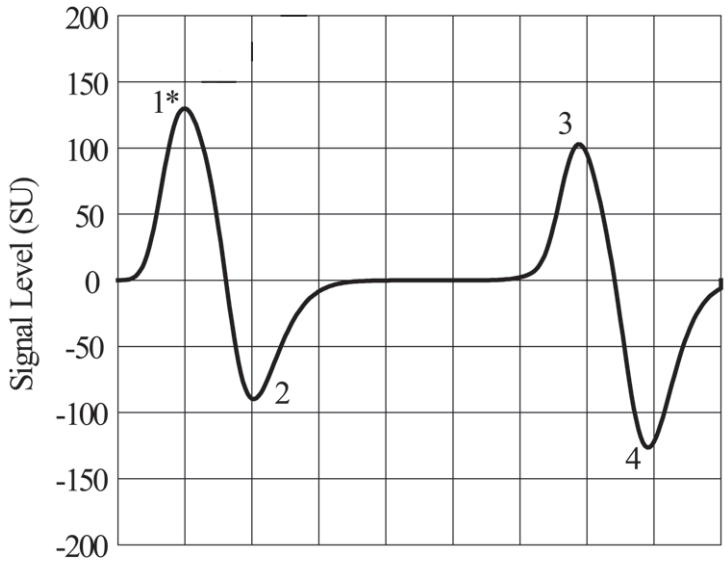


Signal level

Percent of nominal	**Peak number**				
	1 *	**2**	**3**	**4**	**5**
50%	83				
100%	**165**				
200%	330				

* Designated peak.

Figure 33 — Signal level table and the reference waveform — Nominal Character nine

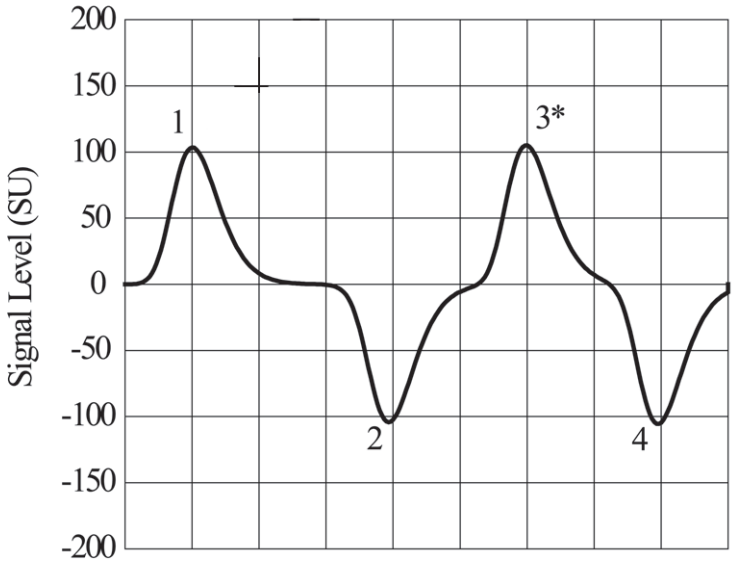


Signal level (SU)

Percent of nominal	**Peak number**			
	1 [a]	**2**	**3**	**4**
50%	65			
100%	**130**			
200%	260			

[a] Designated peak.

Figure 34 — Signal level table and the reference waveform — Nominal Character zero

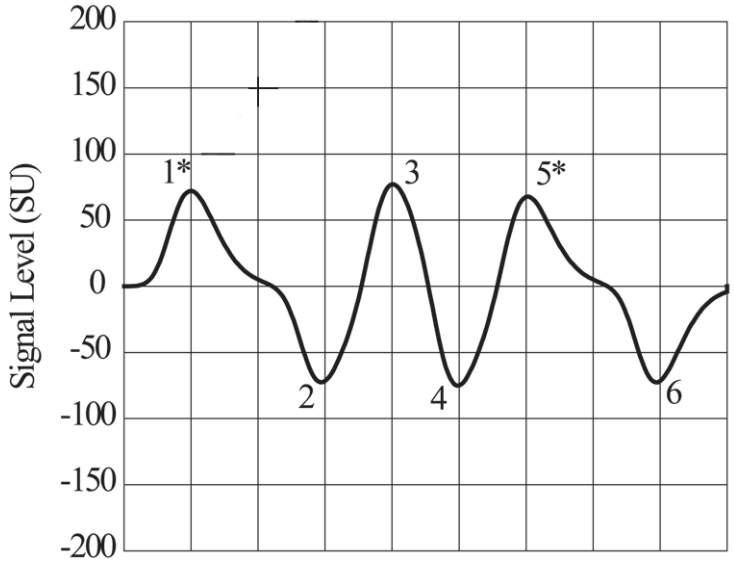


Signal level (SU)

Percent of nominal	**Peak number**			
	1	**2**	**3** *	**4**
50%			53	
100%			**105**	
200%			210	

* Designated peak.

Figure 35 — Signal level table and the reference waveform — Nominal Transit symbol

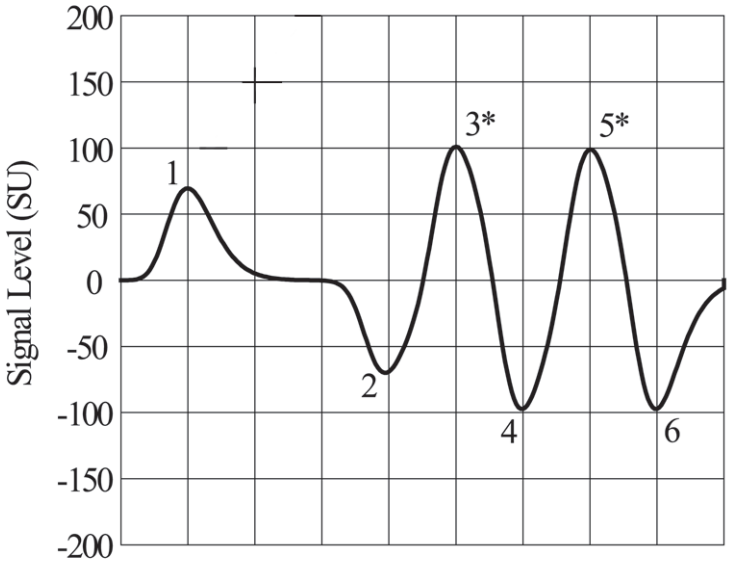


Signal level

Percent of nominal	**Peak number**					
	1 *	**2**	**3**	**4**	**5 ***	**6**
50%	36				34	
100%	**72**				**68**	
200%	144				136	

* Designated peak (take average of both peaks).

Figure 36 — Signal level table and the reference waveform — Nominal Amount symbol

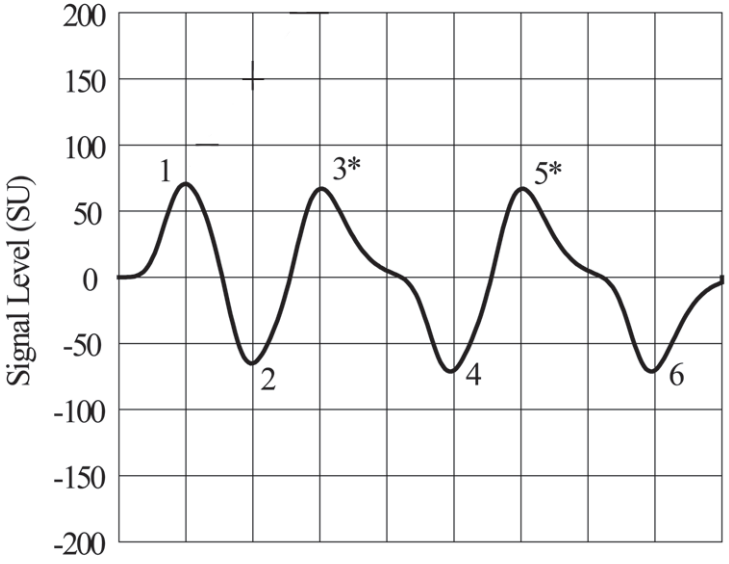


Signal level

Percent of nominal	Peak number					
	1	**2**	**3** *	**4**	**5** [a]	**6**
50%			50		50	
100%			101		**99**	
200%			202		198	

* Designated peak (take average of both peaks).

Figure 37 — Signal level table and the reference waveform — Nominal On-Us symbol



Signal level

Percent of nominal	Peak number					
	1	**2**	**3** *	**4**	**5** *	**6**
50%			34		34	
100%			**67**		**67**	
200%			134		134	

* Designated peak (take average of both peaks).

Figure 38 — Signal level table and the reference waveform — Nominal dash symbol

13.2 Clear band (MICR)

The MICR clear band shall be a horizontal band 15,875 mm high, measured from the aligning reference edge. The MICR clear band shall extend the full width of the document, from the leading (right hand) edge to the trailing (left hand) edge and is on the front and back of the document. The MICR clear band shall be kept free of any magnetic ink, other than the E-13B characters, subject to the limitations of 8.3 and 8.4. See Figure 23.

13.3 Optical clear band

The optical clear band shall be a rectangle within the MICR clear band with height of 7,620 mm, located 3,810 mm above the aligning edge of the check, which has included within it the 6,350 mm MICR encoding strip. The optical clear band shall extend across the entire face of the check. Borders having a print contrast signal (PCS) greater than 0,30 may pass through this optical clear band on the right side as long as they extend 5,080 mm or less from the leading edge of the check and on the left side as long as they extend 4,039 mm or less from the trailing edge of the check. See Figure 23.

14 Optical clear band background

14.1 General

Recognition of E-13B characters in the optical clear band, area A in Figure 23, either by automatic optical recognition or visually (original copy, image, or microfilm), requires an adequate reflectance difference between the MICR-printed character and the background of the optical clear band.

14.2 Background reflectance

Background is defined as the colour in the optical clear band of the document, separate from lines and information on it. The background reflectance shall be 60 % minimum.

14.3 Print contrast signal (PCS) — Magnetic ink printed character

The minimum PCS for magnetic ink printed characters shall be 0,60.

14.4 Print contrast signal (PCS) — Within the background

Within the optical clear band, excluding the MICR characters, any design or pattern shall have a maximum PCS of 0,30.

15 Permanence of MICR printing

MICR printing permanence shall be defined as the ability of a MICR image to retain its human and machine readability over the life cycle of the document.

15.1 Permanence specification

MICR printing shall be maintained within these print specifications at all times during the normal processing of documents by financial institutions. For testing purposes, MICR printing should withstand at least 20 passes without degrading the MICR reader performance.

NOTE 1 Printing that uses wet ink and pressure, e.g. lithography or letterpress, during which the ink is forced to become deeply embedded among the paper's fibres will, in general, be permanent. In some non-impact printing processes, which use toner or dry ink, the normal printed character is both embedded among the paper's fibres and partly above the surface of the paper. This condition is referred to as embossment.

NOTE 2 Most reader/sorter systems physically contact the moving document under pressure. This occurs in the areas of the magnetic write and read heads and in the reader/sorter paper guides and transports. This raises concern over the image permanence since the potential for wear or abrasion of the embossed MICR image is increased in these areas. Wear or abrasion of the image may cause smear and possibly the transfer of magnetic particles to other documents. There is also the possibility that the reader/sorter components will become contaminated leading to an increase in reader/sorter reject rate.

The importance of good toner fusing and dry ink image permanence cannot be over-emphasized. It is not only important to the wear and abrasion issue but is crucial for the quality of the bond at the dry ink-paper interface. Well fused images will be resistant to toner flaking off when checks are folded on a MICR character and when subjected to the normal reader/sorter stresses.

Annex A
(informative)

Debossment of E-13B font

As stated in Clause 9, excessive debossment may cause rejects or misreads. Actual results from debossment vary with such conditions as signal level of the ink, uniformity of ink coverage, evenness of the debossment, coarseness of the paper, and the character itself. Industry experience has shown that if the signal level is adequate, the following pragmatic values are suggested to be allowed before rejects or misreads will occur.

	Characters	Debossment
Symbols		0,0381 mm
		
		
		
Numbers		0,0381 mm
		
		
		
		
Numbers		0,0508 mm
		
		
		
		

The printing industry, manufacturers of encoding ribbons, manufacturers of encoding equipment, and bank encoding departments are encouraged to make every effort to hold all printing to the 0,025 mm specification.

Users are cautioned not to reject documents because of variances from the 0,025 mm specification without backup evaluation of the associated conditions.

Annex B
(informative)

MICR Document Sampling References

B.1 General

This annex provides references for both acceptance sampling for quality inspection of new MICR documents and process quality control during MICR document production. Text references are informational and educational in nature while acceptance sampling plan references assume familiarity with the concepts described in the text references.

B.2 Text references for quality control and inspection

Statistical quality control, either by acceptance sampling of incoming lots or by process quality control, is a complex topic with many unique concepts that must be understood before an appropriate testing program can be developed. References[6],[7],[8],[21] and[22] contain this information and are recommended for anyone responsible for developing a testing program, regardless of their background. This is not intended as a complete bibliography of available literature; other references not included here may suffice.

B.3 References for Acceptance Sampling Plans

There are three generally accepted sources for acceptance sampling plans:

— International Organization for Standardization (ISO) (References[1],[2] and[3]);

— American National Standards Institute (ANSI) (References[4] and[5]);

— US Department of Defence Military Standards (obtainable from the US. Government Printing Office) (References[19] and[20]).

Annex C
(informative)

Paper Characteristics for MICR

C.1 Scope

Automatic processing of MICR documents requires that certain characteristics of the base stock paper be maintained to certain criteria to provide durability of the paper document and the printed MICR information. The following describes the key attributes of the base paper and the testing methods for conformance to this part of ISO 1004.

A majority of the test procedures used in establishing conformance to these specifications shall be those that have been approved by the Technical Association of the Pulp and Paper Industry (TAPPI). They are recognized in the industry as the standard tests that shall be used for determining various characteristics of paper.

For a ready reference of the designated test methods and specifications for the various attributes covered in this part of ISO 1004, see Table C.1.

C.2 Basis weight

Basis weight is the terminology for expressing the weight per unit area of paper. The accepted international method for expressing weight is grams per square meter (g/m^2 or gsm). The test method shall be TAPPI T410.

Conducting basis weight measurements on finished products with applied inks and coatings should normally give results that match or nearly match the original intended weight. The recommended weight considered to be ideal for paper documents would range from 90 g/m^2 to near 110 g/m^2.

C.3 Grain direction

The paper's grain direction refers to the primary orientation of the fibres composing the paper in relation to the way the document is cut from the paper. Grain direction is the key to determining which specifications apply to a given document since the specifications applicable to a document can change based upon its grain direction.

The fibres of machine-manufactured paper are oriented with the fibre's length parallel to the direction of the movement on the paper wire web machine. Paper grain parallel of the manufacturing machine can be referred to as machine direction and is commonly called the long grain direction. Paper grain at right angles to machine direction is referred to as cross direction and is commonly called the short grain direction.

A MICR document can be cut from paper to be either defined as short grain or long grain, thus giving the document different characteristics, such as stiffness, relative to the automated MICR reading equipment. Short grain documents have a different range of tolerances for some paper attributes compared to long grain. Therefore, it is critical to know the grain of the document being tested in order to compare its paper attributes to the correct set of specifications. The test method for determining grain direction shall be TAPPI T409.

C.3.1 Short grain direction

When a document is cut with the grain direction parallel to the document height (short dimension), the document is said to be short grain. See Figure C.1.

Documents cut to be short grain shall have a minimum basis weight of 90 g/m^2.

C.3.2 Long grain direction

When a document is cut with the grain direction parallel to the document length (long direction), the document is said to be long grain. See Figure C.2.

Documents cut to be long grain shall have a minimum basis weight of 75 g/m^2.

C.4 Porosity

Porosity of paper is the resistance of paper to the passage of air under a specific pressure through the paper. Paper with low resistance to air flow are more likely to have feed reliability problems with the automated MICR reading equipment. Two methods are available for measuring porosity: the Gurley method of air resistance and the Sheffield method air permeance.

C.4.1 Porosity by air resistance (Gurley method)

The Gurley method shall conform to TAPPI T460. For both short and long grain documents, the minimum requirement shall be 12 s, the time required to pass 100 ml of air through one 6,4 cm^2 of paper under a pressure of 12,40 cm of water.

C.4.2 Porosity by air permanence (Sheffield method)

The Sheffield method shall conform to TAPPI T547. Porosity, as measured by the Sheffield Instrument, measures the rate of air flow through a sheet of paper by a specific area to air pressure of 10,3 kPa (±0,2) on one side and atmosphere pressure on the other side. The orifice size shall be 1,91 cm^3 in diameter. For both and short grain documents, the maximum requirement shall be 208,8 Sheffield units.

C.5 Stiffness

Stiffness of paper is defined as the bending movement that the paper can withstand. Stiffness is measured both with the grain in the mill's machine directions (Stiffness, Mill Direction or Stiffness, MD) and at right angle to the machine direction, in the cross direction (Stiffness, Cross Direction or Stiffness, CD), by deflecting a small weighted pendulum. Two methods are available for measuring stiffness: the Taber V-5 and the Gurley methods.

Stiffness is lower (less stiff) in the short grain direction than it is in the long grain direction. This is why short grain documents shall be restricted to paper with a basis of 90 g/m^2 or heavier. The ability of a documented to be handled in automated MICR reading equipment is related to its stiffness. Paper with too low a stiffness is more likely to cause feed reliability problems.

C.5.1 Stiffness, machine direction (Stiffness MD)

The stiffness in the machine direction is the measure of the resistance the paper has to bending with the grain direction. The machine direction establishes the grain direction, which is always parallel with the travel of the paper over the paper machine's wire web.

C.5.1.1 Stiffness, MD using the Taber V-5 method

This measurement shall conform to TAPPI T489 when using the Taber V-5 method. When measured by a Taber V-5 device, stiffness, machine direction shall have a minimum of 2,5 g-force centimeters (gf·cm) for short grain paper and shall have a minimum of 1,8 g-force centimeters (gf·cm) for long grain paper.

C.5.1.2 Stiffness, MD Using the Gurley Method

This measurement shall conform to TAPPI T543 when using the Gurley method. When measured by a Gurley device, stiffness, machine direction shall have a minimum of 200,0 g-force centimeters (gf·cm) or a minimum

of 0,25 millinewton-meters (mN·m) for short grain paper and shall have a minimum of 144,0 grams-force centimeters (gr·cm) or a minimum of 0,18 millinewton-meters (mN·m) for long grain paper.

C.5.2 Stiffness, cross direction (Stiffness CD)

The stiffness in the cross direction is the measure of the resistance the paper has to bending across the grain direction; that is, at right angles to the grain direction.

C.5.2.1 Stiffness, CD using the Taber V-5 method

This measurement shall conform to TAPPI T489 when using the Taber V-5 method. When measured by a Taber device, stiffness, cross direction shall have a minimum of 1,1 g-force centimeters (gf·cm) for short grain paper and shall have a minimum of 0,8 g-force centimeters (gf·cm) for long grain paper.

C.5.2.2 Stiffness, CD Using the Gurley Method

This measurement shall conform to TAPPI 543 when using the Gurley method. When measured by a Gurley device, stiffness, cross direction shall have a minimum of 88,0 g-force centimeters (gf·cm) or a minimum of 0,11 millinewton-meters (mN·m) for short grain paper and shall have a minimum of 64,0 grams-force centimeters (gr·cm) or a minimum of 0,08 millinewton-meters (mN·m) for long grain paper.

C.6 Tear

Tear resistance is defined as the average force in grams required to completely tear through a sample as described in the TAPPI T414 test methodology, after the tear has been started. Tear is a basic measure of the physical strength of paper and relates to its ability to withstand the starting, stopping and high-speed transfer in a reader/sorter transport system.

C.6.1 Tear, machine direction (Tear MD)

Tear in the machine direction is the measure of the force required to tear a sample as described in the TAPPI T414 test methodology, after the tear has been started in the grain direction. The machine direction establishes the grain direction, which is always parallel with the travel of the paper over the paper machine's wire web.

This measurement shall conform to TAPPI T414 when using the Elmendorf method. When measured by an Elmendorf device, tear, machine direction shall have a minimum of 55,0 g-force (gf) units or a minimum of 539,0 millinewtons (mN) for short grain paper and shall have a minimum of 45,0 g-force (gf) units or a minimum of 441,0 millinewtons (mN) for long grain paper.

C.6.2 Tear, cross direction (Tear CD)

Tear in the cross direction is the measure of the force required to tear a sample as described in the TAPPI T414 test methodology, after a tear has been started at right angles to the direction of the grain.

This measurement shall conform to TAPPI T414 when using the Elmendorf method. When measured by an Elmendorf device, tear, cross direction shall have a minimum of 62,0 g-force (gf) units or a minimum of 608,0 millinewtons (mN) for short grain paper and shall have a minimum of 53,0 g-force (gf) units or a minimum of 520,0 millinewtons (mN) for long grain paper.

C.7 Burst

Burst represents a measure of paper strength and the paper's ability to resist puncturing. Burst testing shall conform to TAPPI T403 using the Mullen method. Burst strength shall be a minimum of 165,0 kilopascals (kPa) for short grain documents and shall be a minimum of 138,0 kilopascals (kPa) for long grain documents.

C.8 Smoothness

Smoothness testing measures the degree of roughness of the surface of the document. This attribute measures the average amount of deviation from an ideal plane across the surface of a sheet of paper. A low value means there are fewer deviations from the plane and corresponds to a smoother sheet. Smoothness is associated with post encoding in the MICR clear band. It also affects handling in the sorting system. The determination of smoothness on intaglio, non-impact and impact printed items will not be accurate if measurements are taken in printed areas.

The Sheffield smoothness of paper is defined as the measurement of the airflow between the paper (backed by flat glass) and two concentric annular lands impressed by dead weight into the sample. The rate of airflow leaked across the surface is related to the smoothness of the paper. The testing method for smoothness shall conform to TAPPI T538. Smoothness shall be between 50 and 200.

C.9 Caliper

Caliper is the thickness of a particular sample of paper. Different grades of paper have varying thicknesses. Because caliper is usually a variable factor that is a result of a combination of other paper attribute requirements, no minimum or maximum measurements shall be set for specific MICR document papers. To determine caliper, TAPPI T411 methods shall be used.

C.10 Opacity

Paper used for MICR documents shall have sufficient opacity to ensure that printing on the back of the document does not show through and interfere with the readability of information on the document front. The testing method of opacity shall conform to TAPPI T425.

C.11 Reflectance

An attribute of paper (coloured or white) is the relative reflectance of an illuminated paper surface as seen by the human eye. The eye modifies the apparent brightness at different wavelengths according to its response to the human-visible spectrum. Equipment that measures reflectance requires a filter that matches its response to that of the human eye.

The minimum reflectance of MICR document paper shall be 60 %.

C.12 Surface strength of paper

This is a measure of the force necessary to tear the surface fibres away from a sheet of paper. As the MICR document is handled and processed, paper fibres are rubbed off from the surfaces of the document. MICR ink can be adversely affected by weak surface fibre integrity because print quality problems like voids, and irregular character edges can be created as weak surface paper fibres are worn away during processing. The testing method for surface strength shall conform to TAPPI T459 and shall be a minimum wax pick measure of 10 for both long grain and short grain documents.

C.13 Recycled paper

Recycled paper is available from a number of paper suppliers and has been successfully incorporated into MICR documents. All paper used for MICR documents, whether virgin paper, any mixture of recycled paper, or 100 % recycled paper stock, shall meet all of the requirements for MICR documents specified in this part of ISO 1004.

C.14 Magnetic particle contamination

The presence of particles with magnetic properties, such as iron oxide, will interfere with the reading of MICR in reader/sorters. No practical means of detecting and measuring these particles in a quantitative way is available. The measurement of embedded magnetic contamination is possible with MICR signal level waveform equipment only after a roll of paper has been converted into check-sized documents.

The paper maker should be conscious of the potential problem and take steps that are necessary to eliminate the presence of magnetic particle contamination.

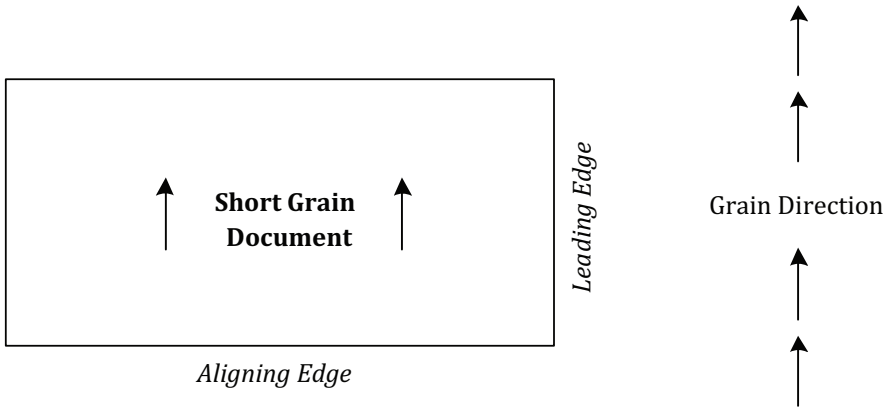


Figure C.1 — Short grain document

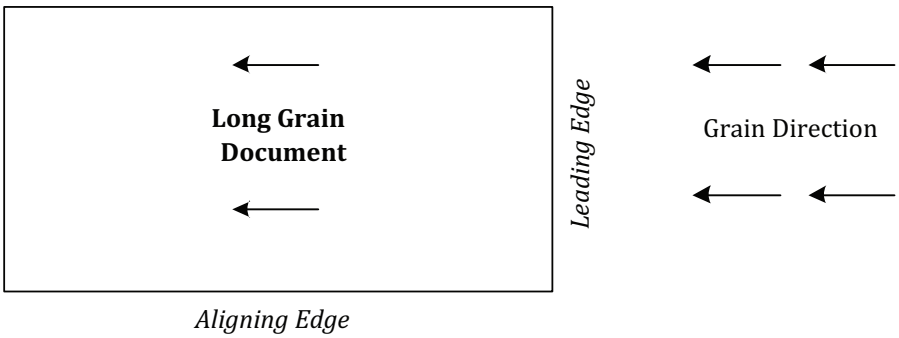


Figure C.2 — Long grain document

Table C.1 — Paper attribute specifications and test methods

Paper attribute	TAPPI test method	Specifications for short grain	Specifications for long grain
Basis Weight Grams per square meter (g/m^2)	T410		
		Recommended 90 g/m^2 to 110 g/m^2	Recommended 90 g/m^2 to 110 g/m^2
Porosity			
1. Gurley	T460		
Seconds		12 seconds minimum	12 seconds minimum
2. Sheffield	T547		
Units		208,8 maximum	208,8 maximum
Stiffness			

Table C.1 *(continued)*

Paper attribute	TAPPI test method	Specifications for short grain	Specifications for long grain
1. Taber V-5	T489		
Customary units:	(Taber)	MD 2,5 minimum	MD 1,8 minimum
grams-for ce centimetres (gf·cm)		CD 1,1 minimum	CD 0,8 minimum
2. Gurley	T543		
A. Customary units:	(Gurley)	MD 200,0 minimum	MD 144,0 minimum
Grams-force centimetres (gf·cm)		CD 88,0 minimum	CD 64,0 minimum
B. Metric units		MD 0,25 minimum	MD 0,18 minimum
Millinewton-meters (mN·m)		CD 0,11 minimum	CD 0,08 minimum
Tear			
Elmendorf	T414		
A. Customary units		MD 55,0 minimum	MD 45,0 minimum
grams-force (gf)		CD 62,0 minimum	CD 53,0 minimum
B. Metric units		MD 539,0 minimum	MD 441,0 minimum
Millinewtons (mN)		CD 608,0 minimum	CD 520,0 minimum
Burst			
Mullen	T403		
Kilopascals (kPa)		165,0 minimum	138,0 minumum
Smoothness			
Sheffield units	T538	50,0 to 200,0	50,0 to 200,0
Reflectance		60 % minimum	60 % minimum
Surface Strength	T459	10 minimum	10 minimum
Paper Testing Preparation			
1. Sampling	T400		
2. Conditioning	T402		

Annex D
(informative)

Unit conversion tables

Table D.1 — Unit conversion from inches to millimetres

Inches	Millimetres	Inches	Millimetres	Inches	Millimetres
0,005	0,127	0,150	3,810	0,775	19,685
0,010	0,254	0,175	4,445	0,800	20,320
0,015	0,381	0,200	5,080	0,825	20,955
0,020	0,508	0,225	5,715	0,850	21,590
0,025	0,635	0,250	6,350	0,875	22,225
0,030	0,762	0,275	6,985	0,900	22,860
0,035	0,889	0,300	7,620	0,925	23,495
0,040	1,016	0,325	8,255	0,950	24,130
0,045	1,143	0,350	8,890	0,975	24,765
0,050	1,270	0,375	9,525	1,000	25,400
0,055	1,397	0,400	10,160	1,125	28,575
0,060	1,524	0,425	10,795	1,250	31,750
0,065	1,651	0,450	11,430	1,375	34,925
0,070	1,778	0,475	12,065	1,500	38,100
0,075	1,905	0,500	12,700	1,625	41,275
0,080	2,032	0,525	13,335	1,750	44,450
0,085	2,159	0,550	13,970	1,875	47,625
0,090	2,286	0,575	14,605	2,000	50,800
0,095	2,413	0,600	15,240	2,750	69,850
0,100	2,540	0,625	15,875	3,060	77,724
0,105	2,667	0,650	16,510	3,625	92,075
0,110	2,794	0,675	17,145	6,000	152,400
0,115	2,921	0,700	17,780	7,060	179,324
0,120	3,048	0,725	18,415	8,750	222,250
0,125	3,175	0,750	19,050	9,000	228,600

Table D.2 — Unit conversion from millimetres to inches

Millimetres	Inches	Millimetres	Inches
0,40	0,0157	1,90	0,0748
0,45	0,0177	1,96	0,0772
0,50	0,0197	2,00	0,0787
0,55	0,0217	2,05	0,0807
0,60	0,0236	2,10	0,0827
0,65	0,0256	2,15	0,0846
0,70	0,0276	2,20	0,0866
0,75	0,0295	2,25	0,0886
0,80	0,0315	2,30	0,0906
0,85	0,0335	2,35	0,0925
0,90	0,0354	2,40	0,0945
0,95	0,0374	2,45	0,0965
1,00	0,0394	2,50	0,0984
1,05	0,0413	2,55	0,1004
1,07	0,0421	2,60	0,1024
1,10	0,0433	2,65	0,1043
1,15	0,0453	2,70	0,1063
1,175	0,0463	2,75	0,1083
1,20	0,0472	2,80	0,1102
1,25	0,0492	2,85	0,1122
1,30	0,0512	2,90	0,1142
1,35	0,0531	2,95	0,1161
1,40	0,0551	3,00	0,1181
1,425	0,0561	3,05	0,1201
1,45	0,0571	3,10	0,1220
1,50	0,0591	3,15	0,1240
1,55	0,0610	3,20	0,1260
1,60	0,0630	3,25	0,1280
1,65	0,0650	3,35	0,1319
1,70	0,0669	3,40	0,1339
1,75	0,0689	3,60	0,1417
1,80	0,0709	3,80	0,1496
1,85	0,0728	4,00	0,1575

Bibliography

[1] ISO 1831, *Printing specifications for optical character recognition*

[2] ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

[3] ISO 3951-1, *Sampling procedures for inspection by variables — Part 1: Specification for single sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection for a single quality characteristic and a single AQL*

[4] ANSI/ASQC Z1.4 1993 Sampling Procedures and Tables for Inspection by Attributes

[5] ANSI/ASQC Z1.9 1993 Sampling Procedures and Tables for Inspection by Variables for Percent Non-conforming

[6] ASTM D585, *Standard practice for sampling and accepting a single lot of paper, paperboard, fiberboard, and related product*

[7] American Society for Quality Control (ASQC). "How To" booklets on technical subjects related to Statistical Quality Control. An updated list is obtainable from ASQC, 230 W. Wells St., Milwaukee, WI 53203

[8] TAPPI T400, Sampling and accepting a single lot of paper, paperboard, containerboard, or related product

[9] TAPPI T402, Standard conditioning and testing atmoshperes for paper, board, pulp handsheets, and related products

[10] TAPPI T403, Bursting strength of paper

[11] TAPPI T410, Grammage of paper and paperboard(weight per unit area)

[12] TAPPI T414, Internal tearing resistance of paper (Elmendorf-type method)

[13] TAPPI T459, Surface strength of paper (wax pick test)

[14] TAPPI T460, Air resistance of paper (Gurley method)

[15] TAPPI T489, Surface strength of paper (wax pick test)

[16] TAPPI T538, Roughness of paper and paperboard (Sheffield method)

[17] TAPPI T543, Roughness of paper and paperboard (Sheffield method)

[18] TAPPI T547, Roughness of paper and paperboard (Sheffield method)

[19] Mil. Stds. 105D, Sampling Procedures and Tables for Inspection by Attributes

[20] Mil. Stds. 414, Sampling Procedures and Tables for Inspection by Variables for Percent Defective

[21] Rickmers A.D., & Todd H.N. *Statistics: An Introduction*. McGraw-Hill, New York, 1967

[22] Duncan A.J. *Quality Control and Industrial Statistics*. Irwin, Homewood, Ill., Fifth Edition, 1986

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