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**Mechanical pencils and leads  
for general use — Classification,  
dimensions, quality and test  
methods —**

**Part 2:  
Black leads**

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# Contents

	Page
<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Classification</b> .....	<b>2</b>
<b>5 Quality</b> .....	<b>2</b>
5.1 Bending strength.....	2
5.2 Hardness degree.....	3
<b>6 Dimensions</b> .....	<b>3</b>
<b>7 Test methods</b> .....	<b>4</b>
7.1 Test conditions.....	4
7.2 Bending strength.....	4
7.3 Hardness degree.....	5
7.3.1 General.....	5
7.3.2 Writing density.....	5
7.3.3 Writing test.....	9
7.4 Dimension.....	9
7.4.1 Diameter.....	9
7.4.2 Length.....	9
<b>8 Designation</b> .....	<b>10</b>
<b>Bibliography</b> .....	<b>11</b>
	<a href="https://standards.iteh.ai/catalog/standards/sist/737a9a2e-2726-4b07-9889-b69ed507c932/iso-20318-2-2019">https://standards.iteh.ai/catalog/standards/sist/737a9a2e-2726-4b07-9889-b69ed507c932/iso-20318-2-2019</a>

## 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.

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 (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 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 of 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 [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 10, *Technical product documentation*.

A list of all parts in the ISO 20318 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).

## Introduction

This document was developed in response to the recent increase in popularity of mechanical pencils and their leads among students who use them for general writing, and where varieties of both hardness degrees and thickness (designated as marking diameter) of leads have been expanding in response to different types of usage. It should be noted that the entire production volume of mechanical pencils has been increasing every year, whereas the production of mechanical pencils for technical drawings has been decreasing.

Despite those recent trends, ISO 9177-1 was revised in 2011 with a scope limited to technical drawing usage only.

Therefore, it is clear that this document is necessary for general use and that it should be independent of technical drawings. The ISO 20318 series consists of two parts: mechanical pencils and black leads.

A set of a mechanical pencil and lead of the same marking diameter should be completely complementary, and should be compatible even with pencils and lead from different manufacturers.

It should also be noted that there are two issues which have not been resolved since the first relevant standard was published. First, on marking of labelling the diameters on mechanical pencils and cases of leads, two designations coexist: 0,35 and 0,3 and 1 and 0,9. This document attempts to clarify this designation issue by defining diameters precisely. Second, a scientific definition of hardness degree of leads is not yet available. Even though this document tried to establish a solely quantitative evaluation method, qualitative evaluation turned out to be inevitable. The issue, therefore, remains unresolved.

The title of the 2016 third edition of ISO 9177-1 was revised to distinguish it clearly from this document with the addition of “for technical drawings”.

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# Mechanical pencils and leads for general use — Classification, dimensions, quality and test methods —

## Part 2: Black leads

### 1 Scope

This document specifies classification, dimensions, quality and test methods for black leads used for mechanical pencils for general writing, as specified in ISO 20318-1.

### 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 5-3:2009, *Photography and graphic technology — Density measurements — Part 3: Spectral conditions*

ISO 12757-1, *Ball point pens and refills — Part 1: General use*

ISO 14145-1, *Roller ball pens and refills — Part 1: General use*

ISO 20318-1, *Mechanical pencils for general use — Classification, dimensions, quality and testing methods — Part 1: Mechanical pencils*

JIS S 6005, *Leads for mechanical pencils*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20318-1 and the following apply.

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

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

#### 3.1 black lead

solid writing material for mechanical pencil, which consists of black colour materials (e.g. graphite) and a binding agent, generating lines which are erasable

#### 3.2 hardness degree

combination of two alphanumeric or alphabetical symbols used to indicated the hardness and density (darkness) of the lead when used in writing

Note 1 to entry: See [Table 1](#).

Note 2 to entry: Hardness increases from 6B to 9H, density of line increases from 9H to 6B.

Note 3 to entry: HB represents the median hardness degree.

Note 4 to entry: A scientific definition of hardness degree is not yet available

**3.3 marking diameter**

numerical symbol used to classify leads by thickness (diameter) of lead

Note 1 to entry: These are used to label or mark lead boxes to indicate a corresponding mechanical pencil specified in ISO 20318-1.

**4 Classification**

Black leads for mechanical pencils for general use shall be classified according to the hardness degree and the marking diameter as specified in [Table 1](#).

**Table 1 — Classification**

Dimensions in millimetres

Marking diameter (see 3.3)	Hardness degree (see 3.2)	Informative
		Nominal diameter (see ISO 9177-2)
0,2	F, HB, B, 2B	—
0,3	4H, 3H, 2H, H, F, HB, B, 2B	0,35
0,4		—
0,5	4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B	0,5
0,7	4H, 3H, 2H, H, F, HB, B, 2B	0,7
0,9	4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B	1
1,3	2H, H, F, HB, B, 2B	—
1,4	— <sup>a</sup>	— <sup>a</sup>
2	9H, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B, 5B, 6B	2

<sup>a</sup> 1,4 is the line width specified in ISO 128-20.

**5 Quality**

**5.1 Bending strength**

The bending strength of black leads shall conform to the specifications in [Table 2](#), in which the minimum value is specified for each marking diameter when tested in accordance with [7.2](#).

**Table 2 — Bending strength of black lead**

Dimensions in MPa

Hardness degree	Bending strength								
	Marking diameter (mm)								
	0,2	0,3	0,4	0,5	0,7	0,9	1,3	1,4	2
9H, 8H, 7H	—	—	—	—	—	—	—	—	80
6H, 5H	—	—	—	—	—	—	—	—	75
4H, 3H	—	265	230	200	180	105	—	—	
2H, H							95	90	
F, HB	300	240	215	190	160	95	85	80	70



Table 2 (continued)

Hardness degree	Bending strength								
	Marking diameter (mm)								
	0,2	0,3	0,4	0,5	0,7	0,9	1,3	1,4	2
B, 2B	230	220	185	150	140	90	80	70	40
3B, 4B	—	—	—	130	—	80	—	—	30
5B, 6B	—	—	—	—	—	—	—	—	20

## 5.2 Hardness degree

The hardness degree of black leads shall be evaluated quantitatively and qualitatively, because its scientific definition is not yet available (see 3.2).

It shall be specified quantitatively as the writing density by using a line-drawing device. The writing density of HB shall conform to the specification of A (recording type) or B (spiral type) in Table 3, and for the leads of the same brand, the order of writing density shall not reverse or alter in the order of the hardness degree, when tested in accordance with 7.3.2 a) to c).

Furthermore, it shall be confirmed qualitatively in the order of the density and the hardness by handwriting. The order of density and hardness of the same brand leads shall not reverse or alter in the order of the hardness degree, when tested in accordance with 7.3.3.

**Table 3 — The writing density of HB**

Marking diameter (mm)	Type of line-drawing device	
	A: Recording type	B: Spiral type
0,2	0,15 to 0,30	0,25 to 0,45
0,3		
0,4		
0,5		
0,7	0,25 to 0,45	0,30 to 0,50
0,9		
1,3		
1,4		
2		

## 6 Dimensions

The actual diameter of black lead shall conform to the specifications in Table 4 when measured in accordance with 7.4.

The length of leads for marking diameter 0,2 mm to 1,4 mm should be  $(60 \pm 1)$  mm, and that of marking diameter 2 mm should be  $(130 \pm 1)$  mm, respectively. However, the length may be any dimension as selected upon agreement between the purchaser and the supplier.