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JIS S 6005 : 2000

(JPMA/JSA)

Leads for mechanical pencils

ICS 97.180

Descriptors : pencils, lead, cadmium, arsenic, stationery, graphite

Reference number : JIS S 6005 : 2000 (E)

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Pencil Manufacturers Association (JPMA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law. Consequently **JIS S 6005 : 1996** is replaced with this Standard. In this revision, for the purpose of making it closer to conform to **ISO 9177-2 : 1989** and **ISO 9177-3 : 1994**, the leads for pencils, coloured pencils and mechanical pencils specified in **JIS S 6005 : 1996** are separated, i.e., leads for pencils and coloured pencils are integrated into **JIS S 6006 : 2000**, and this revision specifies only lead for mechanical pencils. Thus, the title of this Standard is altered "*Leads for mechanical pencils*" from "*Leads for pencils, coloured pencils and mechanical pencils*".

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Leads for mechanical pencils

Introduction This Japanese Industrial Standard has been made on the basis of **ISO 9177-2** *Mechanical pencils—Part 2 : Black leads—Classification and dimensions* published in 1989 as the first edition and **ISO 9177-3** *Mechanical pencils—Part 3 : Black leads—Bending strengths of HB leads* published in 1994 as the first edition without modifying the corresponding parts [definitions, classification, dimensions, quality (bending strength), test method (bending strength) and marking] but adding some items and contents of provision not included in the corresponding International Standards.

In the provision [definitions, classification, dimensions, quality (bending strength), test method (bending strength) and marking] of this Standard, the portions underlined with dots are the matters not specified in the corresponding International Standards.

1 Scope This Standard specifies black leads and coloured leads used for the mechanical pencils specified in **JIS S 6013** (hereafter referred to as “leads for mechanical pencils” and “coloured leads for mechanical pencils” respectively).

Remarks : The International Standards corresponding to this Standard are as follows:

ISO 9177-2 : 1989 *Mechanical pencils—Part 2 : Black leads—Classification and dimensions*

ISO 9177-3 : 1994 *Mechanical pencils—Part 3 : Back leads—Bending strengths of HB leads*

2 Normative references The standards listed in Attached Table 1 contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) shall be applied.

3 Definitions For the purposes of this Standard, the following definitions apply:

3.1 Leads for mechanical pencil

- a) **leads for mechanical pencil** Solid writing material which consists of carbon (e.g. graphite) and a binding agent. This lead generates lines which are erasable.
- b) **polymer lead** Lead for mechanical pencils in which the binding agent is an organic polymer (expressed with letter “P”).
- c) **ceramic lead** Lead for mechanical pencils in which the binding agent is clay (expressed with letter “C”).
- d) **hardness degree**⁽¹⁾ Classification indicating increasing hardness from 6B to 9H and increasing line density from 9H to 6B. The median hardness degree is HB.

Note ⁽¹⁾ A scientific definition of hardness degree is not yet available.

3.2 Coloured lead for mechanical pencil

- a) **coloured lead for mechanical pencil** Solid writing materials composed of pigment, dyestuff, fat and oil, wax, extender, binding agent, etc.

4 Classification Classification is as given in Table 1.

Table 1 Classification

Classification	Type of lead	Usage	Nominal diameter	Hardness degree
Lead for mechanical pencil	P or C	for drawing	0.35 ⁽²⁾ , 0.5, 0.7, 1 ⁽²⁾	6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B
			2	9H, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B, 5B, 6B
		for general use	0.35 ⁽²⁾ , 0.5, 0.7, 1 ⁽²⁾	6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B
			2	9H, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B, 5B, 6B
Coloured lead for mechanical pencil	—	—	0.7, 1 ⁽²⁾ , 2	

Note (2) 0.3 and 0.9 marked on mechanical pencils or boxes of leads for mechanical pencils completely correspond to and comply with the nominal diameter 0.35 and 1 in this Standard respectively.

5 Colour names of coloured leads for mechanical pencils The colours shall be 12 as given in Table 2 and other colours.

Table 2 Colour names

Colour name	(Japanese)	Colour name	(Japanese)
Red	あか (赤)	Light blue	みずいろ (水色)
Brown	ちゃいろ (茶色)	Blue	あお (青)
Orange	だいだいいろ (だいだい色)	Purple	むらさき (紫)
Yellow	きいろ (黄色)	Pink	ももいろ (桃色)
Yellow green	きみどり (黄緑)	White	しろ (白)
Green	みどり (緑)	Black	くろ (黒)

Remarks : Colour names of other colours are, as a rule, as specified in **JIS Z 8102**.

6 Quality The quality of the leads for mechanical pencils and the coloured leads for mechanical pencils shall, when tested in accordance with clause 8, conform to the requirements in Table 3 and Table 4.

Table 3 Bending strength of leads and coloured leads for mechanical pencils

Unit: MPa

Classification		Hardness degree	Bending strength					Test method
			Nominal diameter					
			0.35 ⁽²⁾	0.5	0.7	1 ⁽²⁾	2	
Lead for mechanical pencils	for drawing	HB	240 min.	190 min.	160 min.	95 min.	70 min.	<u>8.3.1 a)</u>
	for general use	<u>9H, 8H, 7H</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>80 min.</u>	<u>8.3.1 b)</u>
		<u>6H, 5H, 4H, 3H, 2H, H</u>	<u>265 min.</u>	<u>200 min.</u>	<u>180 min.</u>	<u>105 min.</u>	<u>75 min.</u>	
		<u>F, HB</u>	<u>240 min.</u>	<u>190 min.</u>	<u>160 min.</u>	<u>95 min.</u>	<u>70 min.</u>	
		<u>B, 2B</u>	<u>220 min.</u>	<u>150 min.</u>	<u>140 min.</u>	<u>90 min.</u>	<u>40 min.</u>	
		<u>3B, 4B</u>	<u>—</u>	<u>130 min.</u>	<u>—</u>	<u>80 min.</u>	<u>30 min.</u>	
		<u>5B, 6B</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>20 min.</u>	
<u>Coloured lead for mechanical pencil</u>		<u>—</u>	<u>—</u>	<u>—</u>	<u>70 min.</u>	<u>60 min.</u>	<u>25 min.</u>	<u>8.3.2</u>

Table 4 Other items

Quality	Other items		Test method
	Lead for mechanical pencil	Coloured lead for mechanical pencil	
Hardness	The density of HB shall be 0.30 to 0.47, except the case of 0.35 nominal diameter.	—	8.4
	For the leads of the same brand, the density and hardness shall not be reversed in the decrease of the hardness from 9H to 6B (for leads of nominal diameter of 0.35, 0.5, 0.7 and 1, from 6H to 4B) as a result of writing test ⁽³⁾ .		—
Harmful substance	Leads shall not include more than 60 mg/kg of antimony, 25 mg/kg of arsenic, 1 000 mg/kg of barium, 75 mg/kg of cadmium, 60 mg/kg of chromium, 90 mg/kg of lead, 60 mg/kg of mercury and 500 mg/kg of selenium.		8.5
Chromaticity	—	12 colours of the nominal diameter 2 shall conform to the Attached Table 2.	8.6
Light fastness	—	Change in colour shall be class 3 or superior. For pink, and other colours shall be of class 2 or superior.	8.7

Note ⁽³⁾ The writing test is that the density and hardness are judged by comparing the writings made on the same paper at the approximately same pressure.

7 Dimensions The dimensions of leads and coloured leads for mechanical pencils shall, when tested in accordance with 8.8, conform to the requirements in Table 5.

Table 5 Dimensions of lead and coloured lead for mechanical pencils

Unit: mm

Classification	Hardness degree	Nominal diameter	Dimensions	
			Diameter	Length
Lead for mechanical pencil	6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B	0.35 ⁽²⁾	0.37 to 0.39	Leads P used for mechanical pencil of push-type F are 60 ± 1, 90 ± 1, 100 ± 1
		0.5	0.55 to 0.58	
		0.7	0.69 to 0.73	Leads P used for mechanical pencil of screw-type S are 30 ± 1, 45 ± 1
		1 ⁽²⁾	0.88 to 0.92	
	9H, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B, 5B, 6B	2	1.95 to 2.05	Leads C used for mechanical pencil of push-type L are 25 ± 1 (for compass), 130 ± 1
Coloured lead for mechanical pencil	—	0.7	0.69 to 0.73	45 ± 1, 60 ± 1, 100 ± 1, 130 ± 1
		1 ⁽²⁾	0.88 to 0.92	
		2	1.95 to 2.05	

8 Test method

8.1 Test condition The test condition shall, unless particularly specified, be at the ordinary temperature (20 ± 15 °C) and the ordinary humidity [(65 ± 20) %] specified in JIS Z 8703.

General matters common to chemical analysis are as specified in JIS K 0050.

8.2 Rounding off of numerical values Test results shall be obtained down to one decimal place lower than the specified numerical value and rounded off in accordance with JIS Z 8401.

8.3 Bending strength The test on bending strength shall be as follows:

8.3.1 Leads for mechanical pencil

a) for drawing use

- 1) A lead sample is taken at random.
- 2) The test method is that, as shown in Fig. 1, a load is applied on the lead at a distance halfway between the two supporting anvils at a loading rate⁽⁴⁾ of 0.1 N/s in the case of 0.35 to 1 in nominal diameter and 0.5 N/s in the case of 2 in nominal diameter, and the load at the time when the lead is broken is measured, and the bending strength is calculated by the following formula.

The shape of the tops for applying load and of the two supporting anvils shall be R0.2 ± 0.02 mm.

$$\sigma = \frac{8Fl}{\pi d^3}$$

where σ : bending strength (MPa)

F : load (N)

l : distance between supporting anvils (mm) (according to Table 6)

d : diameter of lead (mm)

Note (4) These loading rates shall be verified beforehand using a rigid test piece instead of a lead. In this case, the permissible tolerance on the rate of loading shall be $\pm 10\%$.

b) for general use

- 1) Ten lead samples are taken at random from one smallest container. If one smallest container contains 10 leads or less, all leads shall be taken as the samples.
- 2) The test method is that, as shown in Fig. 1, a load is applied on the lead at a distance halfway between the two supporting anvils at a loading rate of 10 mm per minute and the load at the time when the lead is broken is measured and the bending strength is calculated by the following formula.

The shape of the tops for applying load and of the two supporting anvils shall be approximately R0.2 mm.

$$\sigma = \frac{8Fl}{\pi d^3}$$

where, σ : bending strength (MPa)

F : load [average of 10 leads (all leads when one smallest container contains 10 leads or less)] (N)

l : distance between supporting anvils (mm) (according to Table 6)

d : diameter of lead [average of 10 leads (all leads when one smallest container contains 10 leads or less)] (mm)

8.3.2 Coloured leads for mechanical pencil

- a) 10 lead samples are taken at random from one smallest container. If one smallest container contains 10 leads or less, all leads are taken as sample.
- b) The samples are stored, as a rule, in advance in a desiccator the inside of which is kept at a temperature of $23 \pm 2^\circ\text{C}$ and the samples conditioned for at least 6 h are taken away and tested immediately thereafter. The test shall be carried out under the condition at the temperature of $23 \pm 2^\circ\text{C}$ and the humidity of $(65 \pm 5)\%$.
- c) The test method is that, as shown in Fig. 1, a load is applied on the lead at a distance halfway between the two supporting anvils at a loading rate 10 mm per minute and the load at the time when the lead is broken is measured and the bending strength is calculated by the following formula.

The shape of the tops for applying load and of the two supporting anvils shall be approximately R0.2 mm.

$$\sigma = \frac{8Fl}{\pi d^3}$$

where, σ : bending strength (MPa)

F : load [average of 10 leads (all leads when one smallest container contains 10 leads or less)] (N)

l : distance between supporting anvils (mm) (according to Table 6)

d : diameter of lead [average of 10 leads (all leads when one smallest container contains 10 leads or less)] (mm)

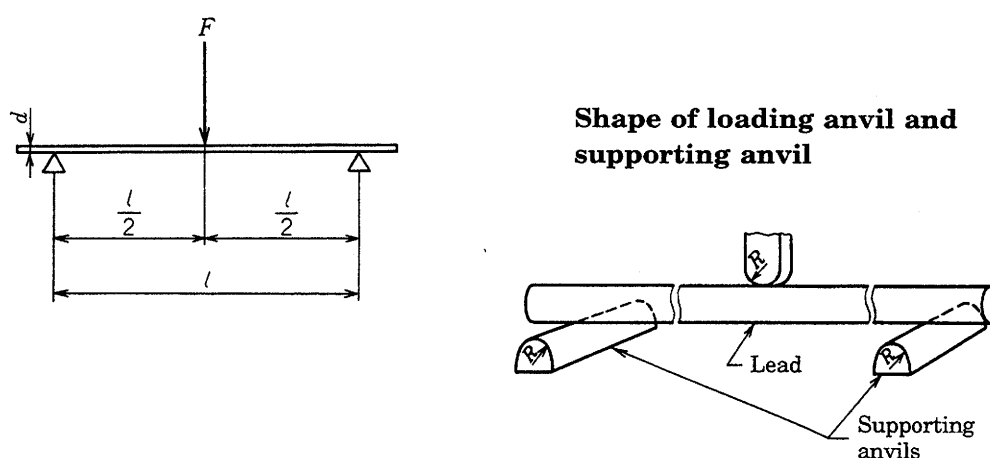


Fig. 1 Method for bending strength test

Table 6 Distance between supporting anvils

Unit: mm

Classification	Distance between supporting anvils
Leads for mechanical pencil [nominal diameter 0.35 ⁽²⁾ to 1 ⁽²⁾] and coloured leads for mechanical pencil [nominal diameter 0.7 to 1 ⁽²⁾]	20 to 40
Leads for mechanical pencil [nominal diameter 2] and coloured leads for mechanical pencil [nominal diameter 2]	40 to 60

8.4 Density Density test shall be as follows:

- The sample shall be five leads taken at random from one smallest container. If five or less leads are contained in one smallest container, all leads are made sample.
- By using a recording type line-drawing device as shown in Fig. 2, the line shall be drawn with sample on the line-drawing paper conditioned in advance by holding in a thermohygrostatic chamber at the temperature of 23 ± 2 °C and the humidity of (65 ± 5) % for 12 h or more. Then the density of the line shall be measured

at four places at the middle of line drawing width as shown in Fig. 3 by using densitometer and the average value of four measured values be obtained and furthermore the average value of all samples be obtained.

The measuring conditions shall be as follows:

- 1) **The line drawing paper** The line drawing paper shall be Kent paper of grammage of 200 ± 20 g/m².
- 2) **Temperature of room to draw lines** 23 ± 2 °C
- 3) **Humidity of room to draw lines** (65 ± 5) %
- 4) **Weight at the time of line-drawing** 300 g
- 5) **Speed of line-drawing** 50 mm/s
- 6) **Pitch of line-drawing** 0.5 mm
- 7) **Distance of line-drawing** 6 m
- 8) **Holding angle of lead** 75°
- 9) **Form of lead top** For the leads of nominal diameter 2, sharpen lead at an angle 17 ± 1 degrees in circular conic shape and make its top diameter 0.6 mm. For leads of nominal diameters 0.5, 0.7 and 1, use as it is.
- 10) **Movement of lead** During one rotation of line-drawing, lead also rotates once.
- 11) **Density measuring apparatus** The spectrophotometer specified in **JIS Z 8722** or the apparatus capable of measuring **ISO** visual density in 8.1 of **JIS K 7653 (ISO 5/3)** [ISO visual density, $D_T (S_H : V_T)$, $D_R (S_A : V)$] or the one equivalent or superior thereto in precision.
- 12) **Diameter of spot of densitometer** Diameter 4 mm

Remarks : Test method for the grammage of line drawing paper is as specified in **JIS P 8124**.

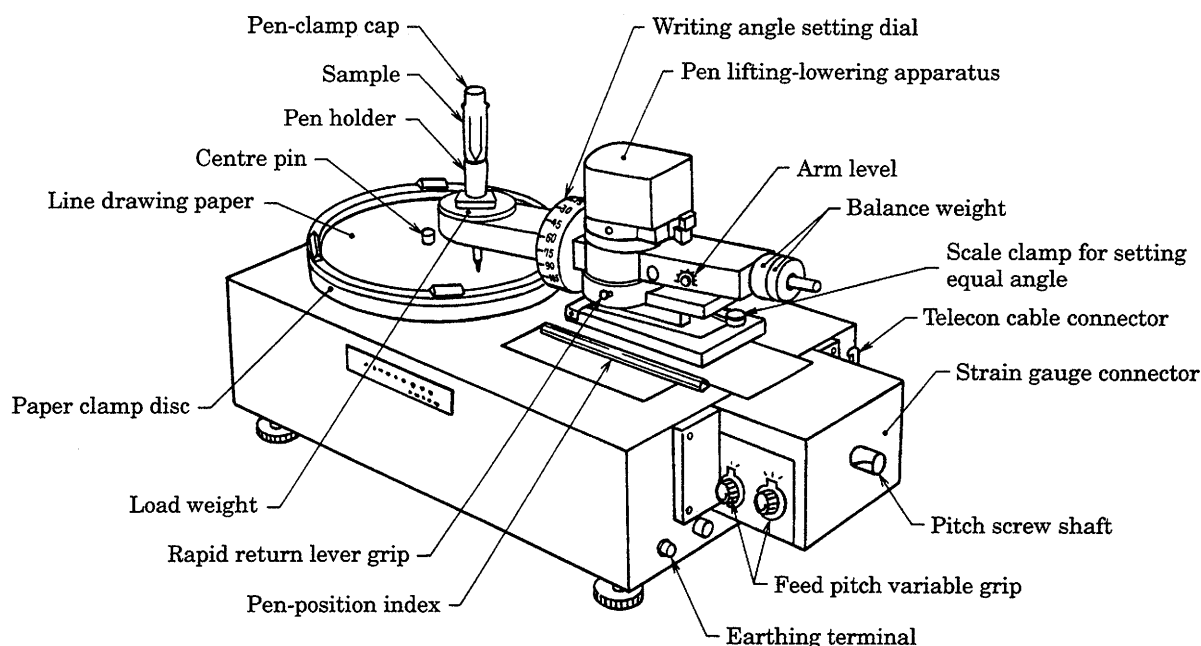


Fig. 2 An example of recording type line-drawing device

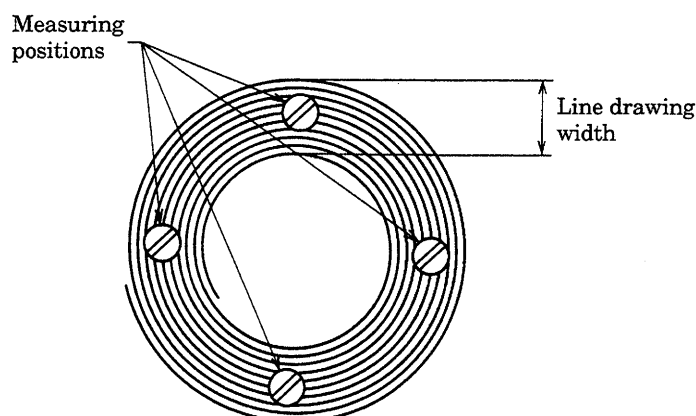


Fig. 3 Measuring positions of density

- c) When using the spectrophotometer, the density shall be calculated by the following formula and, in the case of the apparatus capable of measuring **ISO** visual density, it shall be D_R (the density of line-drawing paper is 0):

$$D = \log \frac{1}{R}$$

where, D : density

R : reflectance (the reflectance of line-drawing paper is made 100 %)

8.5 Harmful substance The test shall be carried out as follows:

- a) Test procedure for samples not containing grease, oil, wax or similar material
- 1) Cut the sample in the uncompressed condition into small pieces of 6 mm or less in length and diameter, and weigh at least 0.1 g to obtain a test portion.

- 2) Using an appropriate sized container⁽⁵⁾, mix the test portion so prepared with 50 times its mass of an aqueous solution (37 ± 2 °C) of 0.07 mol/l hydrochloric acid⁽⁶⁾. Shake for 1 min.

Notes ⁽⁵⁾ Containers of gross volume between 1.6 times and 5.0 times that of the volume of hydrochloric acid extractant.

⁽⁶⁾ Prepare using the hydrochloric acid specified in **JIS K 8180**.

- 3) Examine the acidity of the mixture with pH meter⁽⁷⁾ and if the pH is greater than 1.5 add by drops, while shaking the mixture, an aqueous solution of 2 mol/l hydrochloric acid⁽⁶⁾ until the pH becomes between 1.0 and 1.5.

Note ⁽⁷⁾ pH meter to be used shall be of ± 0.2 pH until in precision.

- 4) Protect the mixture from light. Agitate the mixture at 37 ± 2 °C for 1 h continuously and then allow to stand for 1 h at 37 ± 2 °C.
- 5) Filter the mixture and analyse the obtained solution using an atomic absorption photometer or inductively coupled plasma emission spectral analysis in accordance with **JIS K 0121** or **JIS K 0116**.

When filtering, use a membrane filter with a pore size of 0.45 µm, and if necessary, centrifuge at 49 000 m/s² or under to separate the solids efficiently.

b) Test procedure for samples containing grease, oil, wax or similar material

- 1) Cut the sample in the uncompressed condition into small pieces of 6 mm or less in length and diameter and weigh at least 0.1 g to obtain a test portion.
- 2) Wrap the test portion with hardened filter paper, remove grease, oil, wax or the component of the similar materials by means of the solvent extraction using an appropriate solvent. In this case, use the analysing method to secure that the elimination of grease, oil, wax or the component of the similar materials is quantitative.
- 3) With the test portion remaining in the hardened filter paper, macerate the test portion so prepared with 25 times the mass of the original portion taken in 1) of distilled water or ion-exchange water (37 ± 2 °C) and mix by stirring so that the resulting mixture is homogeneous. Quantitatively transfer the mixture to the appropriate sized container⁽⁵⁾. Add to the mixture an aqueous solution of 0.14 mol/l hydrochloric acid⁽⁶⁾ at (37 ± 2 °C) in the proportion of 25 times the mass taken in 1). Shake for 1 min.
- 4) Examine the acidity of the mixture with pH meter⁽⁷⁾ and if the pH is greater than 1.5 add by drops, while shaking the mixture, an aqueous solution of 2 mol/l hydrochloric acid⁽⁶⁾ until the pH becomes between 1.0 and 1.5.
- 5) Protect the mixture from light. Agitate the mixture at 37 ± 2 °C for 1 h continuously and then allow to stand for 1 h at 37 ± 2 °C.
- 6) Filter the mixture and analyse the obtained solution using atomic absorption method or inductively coupled plasma emission spectral analysis in accordance with **JIS K 0121** or **JIS K 0116**.

When filtering, use a membrane filter with a pore size of 0.45 µm, and if necessary, by centrifuge at 49 000 m/s² or under to separate the solids efficiently.

- c) The result of analysis shall be corrected by the following formula using the analytical correction shown in Table 7:

$$\rho_B = \rho_{B1} - \frac{\rho_{B1} \times \rho_{B2}}{100}$$

where, ρ_B : value after correcting the result of analysis (mg/kg)
 ρ_{B1} : result of analysis (mg/kg)
 ρ_{B2} : analytical correction of analysed element (%)

Table 11 Analytical correction

Element	Antimony	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium
Analytical correction %	60	60	30	30	30	30	50	60

8.6 Chromaticity Compare visually the colour-checking paper⁽⁸⁾ with the standard sample according to **JIS Z 8723**.

Note ⁽⁸⁾ Prepare the colour-checking paper by hand-coating the sample on the drawing paper (grammage of 78.3 g/m² to 205 g/m² and whiteness of at least 75 %). Carry out the hand-coating by repeating of coating in the right-left direction and up-down direction so that the paper surface is coated uniformly. As to the underlay of paper surface use a flat glass plate or the like.

- Remarks 1 As to the standard sample, prepare according to the similar method to the colour-checking paper of Note ⁽⁸⁾, measure with a spectrophotometer specified in **JIS Z 8722** or the photometer equivalent or superior thereto in performance and, according to 6 (1) of **JIS Z 8721**, calculate the hue (*H*), brightness (*V*) and chroma (*C*). They shall comply with Attached Table 2.
- 2 Test method for grammage of drawing paper is as specified in **JIS P 8124**.
- 3 Test method for whiteness of drawing paper is as specified in **JIS P 8123**.

8.7 Light-fastness In the light fastness test, expose the colour checking paper according to **JIS L 0841**, **JIS L 0842** or **JIS L 0843**. Carry out the exposure method No. 3 specified in **JIS L 0841** until grade 2 of blue scale shows normal colour fading. The condition of exposure in the case of **JIS L 0842** and **JIS L 0843** is 37 ± 5 °C in black panel temperature and 50 % or under in relative humidity. Judge the colour fading of colour-checking paper exposed to light according to the judging method specified in clause 9 of **JIS L 0801**, using the grey scale specified in **JIS L 0804**.

8.8 Dimensions

- a) **Diameter** Measure the diameter by using the micrometer specified in **JIS B 7502** or the measuring device having the accuracy equal or superior thereto.

Carry out the measurement at three optional places and take the average value as the measured value.

- b) **Length** Measure the length by using the vernier calliper specified in **JIS B 7507**, metal rule specified in **JIS B 7516** or the measuring device having the accuracy equal or superior thereto.

9 Inspection method

9.1 Type inspection Leads for mechanical pencils and coloured leads for mechanical pencils shall be subjected to the following inspection when the new kind of material is used and the change in production technical conditions such as kind of materials⁽⁹⁾ to be used and supplier of materials comes out:

Note ⁽⁹⁾ Including the change of material for pigment.

- a) **Sampling method and sample size** Take one sample or more at random from the first manufacturing lot.
- b) **Inspection item** Harmful substance
- c) **Test method** 8.5 applies.
- d) **Criteria for judgment of acceptability** The samples are acceptable if all samples conform to the specification for harmful substance in Table 4.

9.2 Product inspection Leads for mechanical pencils and coloured leads for mechanical pencils shall be inspected on clause 6 (except harmful substance) and clause 7. In this case, 100 % inspection or reasonable sampling inspection plan shall be used.

10 Designation

10.1 Leads for mechanical pencils The designation of leads for mechanical pencils consists of the following elements. The marking shall be given clearly to every package or every container⁽¹⁰⁾ and, if possible, to the leads. a) and b) may be omitted, however.

Note ⁽¹⁰⁾ For those delivered to the hand of user, they shall be done on the every smallest container.

- a) black lead;
- b) Standard number;
- c) the type of lead (i.e. P or C);
- d) classification by users (i.e. for drawing or for general use);

Remarks : For general use may be omitted.

- e) the nominal diameter;

- f) the length (mm)
- g) the hardness;
- h) the number of leads contained;
- i) the manufacturer's name or abbreviation.

Remarks : Example of designation 1

The leads for mechanical pencil HB of 0.5 in nominal diameter, 60 mm in length, 12 of which are contained, for drawing use and conforming to the requirements in **JIS S 6005** are designated as follows:

Black leads for drawing **JIS S 6005—P—0.5—HB** 60 mm × 12 leads

Example of designation 2

The leads for mechanical pencil HB of 0.5 in nominal diameter, 60 mm in length, 12 of which are contained, for general use and conforming to the requirements in **JIS S 6005** are designated as follows:

JIS S 6005 HB 0.5 60 mm × 12 leads

10.2 Coloured leads for mechanical pencil The designation of coloured leads for mechanical pencils is as follows. The marking shall be given clearly to every package or every container⁽¹⁰⁾.

- a) Standard number;
- b) the nominal diameter;
- c) the length (mm);
- d) the name of colour⁽¹¹⁾;

Note ⁽¹¹⁾ The colour name given in Table 1 may be described in any of HIRAGANA, KATAKANA, Chinese character and English.

- e) the number of leads contained;
- f) the manufacturer's name or its abbreviation.

Remarks : Example of designation

The red leads for mechanical pencil of 0.7 in nominal diameter, 60 mm in length, 12 of which are contained and conforming to the requirements in **JIS S 6005** are designated as follows:

JIS S 6005 Red 0.7 60 mm × 12 leads

Attached Table 1 Normative references

Standard number	Title of standard	Corresponding International Standard
JIS B 7502	<i>Micrometer callipers</i>	ISO 5-3
JIS B 7507	<i>Vernier, dial and digital callipers</i>	
JIS B 7516	<i>Metal rules</i>	
JIS K 0050	<i>General rules for chemical analysis</i>	
JIS K 0116	<i>General rules for atomic emission spectrometry</i>	
JIS K 0121	<i>General rules for atomic absorption spectrochemical analysis</i>	
JIS K 7653	<i>Photography—Density measurements—Part 3 : Spectral conditions</i>	
JIS K 8180	<i>Hydrochloric acid</i>	
JIS L 0801	<i>General principles of test methods for colour fastness</i>	
JIS L 0804	<i>Grey scale for assessing change in colour</i>	
JIS L 0841	<i>Test methods for colour fastness to daylight</i>	
JIS L 0842	<i>Test methods for colour fastness to ultraviolet carbon arc lamp light</i>	
JIS L 0843	<i>Test methods for colour fastness to xenon arc lamp light</i>	
JIS P 8123	<i>Testing method for brightness by hunter of paper and pulp</i>	
JIS P 8124	<i>Paper and board—Determination of grammage</i>	
JIS S 6013	<i>Mechanical pencils</i>	ISO 536 ISO 9177-1
JIS Z 8102	<i>Names of non-luminous object colours</i>	
JIS Z 8401	<i>Guide to the rounding of numbers</i>	
JIS Z 8703	<i>Standard atmospheric conditions for testing</i>	
JIS Z 8721	<i>Colour specification—Specification according to their three attributes</i>	
JIS Z 8722	<i>Methods of colour measurement—Reflecting and transmitting objects</i>	
JIS Z 8723	<i>Methods for visual comparison of surface colours</i>	

Attached Table 2 Chromaticity

Name of colour	Standard value			Permissible range		
	Hue (H)	Brightness (V)	Chroma (C)	Hue (H)	Brightness (V)	Chroma (C)
Red	5.0R	5.0	10.0	± 2.5	± 1.0	8.0 min.
Brown	2.5YR	4.5	5.0			± 3.0
Orange	10.0R	6.0	12.0			8.0 min.
Yellow	5.0Y	8.5	12.0			
Yellow green	5.0GY	7.0	10.0			
Green	2.5G	5.0	9.0			7.0 min.
Light blue	7.5B	6.5	8.0			± 3.0
Blue	2.5PB	5.0	10.0			8.0 min.
Purple	10.0PB	4.0	10.0			
Pink	5.0RP	6.5	10.0			± 3.0
White	—	N9.0	—	—	8.0 min.	—
Black	—	N2.5	—		3.5 max.	

Comparison table between JIS and corresponding International Standards

JIS S 6005 : 2002 Leads for mechanical pencils			ISO 9177-2: 1989 Mechanical pencils—Part 2 : Black leads—Classification and dimensions ISO 9177-3: 1994 Mechanical pencils—Part 3 : Black leads—Bending strengths of HB leads			
(I) Requirements in JIS	(II) International Standard number		(III) Requirements in International Standard	(IV) Classification and details of technical deviation between JIS and the International Standard by clause Location of deviation: text Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
	Clause	Content	Content	Classification by clause	Detail of technical deviation	
1 Scope		Black leads (leads for mechanical pencil) and coloured leads (coloured leads for mechanical pencil) used for the mechanical pencils used in JIS S 6013 are specified.	ISO 9177-2 ISO 9177-3	The classification and dimensions of the black leads used for the mechanical pencils specified in ISO 9177-1 are specified. Bending strength of HB leads and test method for the mechanical pencils for drawing use specified in ISO 9177-1 are specified.	MOD/ addition	In JIS, the leads for mechanical pencil not included in ISO are additionally specified.
						Coloured leads for mechanical pencil are not specified in ISO. Proposal is not scheduled. The coloured leads for mechanical pencil has been specified in JIS additionally in accordance with the request derived from the actual domestic condition of trade.
2 Normative references		JIS B 7502, JIS B 7507, JIS B 7516, JIS K 0050, JIS K 0116, JIS K 0121, JIS K 7653, JIS K 8180, JIS L 0801, JIS L 0804, JIS L 0841, JIS L 0842, JIS L 0843, JIS P 8123, JIS P 8124, JIS S 6013, JIS Z 8102, JIS Z 8401, JIS Z 8703, JIS Z 8721, JIS Z 8722, JIS Z 8723	ISO 9177-2 ISO 9177-3	ISO 128 ISO 9177-1 ISO 9177-2	MOD/ addition	The test method not included in ISO is additionally specified in JIS and, therefore, there is difference between the normative reference in both standards.
						The same as the above

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard	(IV) Classification and details of technical deviation between JIS and the International Standard by clause		(V) Justification for the technical deviation and future measures
Clause	Content			Classification by clause	Detail of technical deviation	
3 Definitions	Leads for mechanical pencil Definitions of leads for mechanical pencil, polymer lead, ceramic lead and hardness degree are defined. Coloured leads for mechanical pencil The coloured lead for mechanical pencil is defined.	ISO 9177-2	Lead for mechanical pencil Black lead, polymer lead, ceramic lead and hardness degree are specified.	MOD/ addition	The definition of the coloured lead for mechanical pencil not included in ISO is additionally specified.	The same as the above
4 Classification	Leads for mechanical pencil classified by type of lead, use (i.e. for drawing use, or general use), nominal diameter and hardness degree Coloured leads for mechanical pencil classified by nominal diameter	ISO 9177-2	Leads for mechanical pencil classified by type of lead, nominal diameter and hardness degree	MOD/ addition	The leads for mechanical pencil for drawing use are the same in both JIS and ISO but the leads for mechanical pencil for general use and the coloured leads for mechanical pencil which are not included in ISO are additionally specified in JIS.	The same as the above
5 Colour names of coloured leads for mechanical pencils	The name of 12 colours and other colours are specified.			MOD/ addition	No specification in ISO.	

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard	(IV) Classification and details of technical deviation between JIS and the International Standard by clause Location of deviation: text Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Content	Classification by clause	Detail of technical deviation	
6 Quality	Leads for mechanical pencil Bending strength (for drawing use and general use), hardness and harmful substance are specified. Coloured leads for mechanical pencil Bending strength, harmful substance, chromaticity and light fastness are specified.	ISO 9177-3	Leads for mechanical pencil Bending strength is specified.	MOD/ addition	The bending strength of the leads for mechanical pencil for drawing use is the same in both JIS and ISO but the bending strength of the leads for mechanical pencil for general use and the coloured leads for mechanical pencil which are not included in ISO are additionally specified in JIS. Moreover, in JIS, the quality items not included in ISO are also specified.	Specification items are added with regard to the leads for mechanical pencil and they are considered that it is an idea to propose them on the occasion of reviewing ISO.
7 Dimensions	Leads for mechanical pencil Hardness degree, and diameter and length classified by nominal diameter are specified. Coloured lead for mechanical pencil Diameter and length classified by nominal diameter are specified.	ISO 9177-2	Leads for mechanical pencil Hardness degree, and diameter and length classified by nominal diameter are specified.	MOD/ addition	In JIS, the dimensions of coloured lead for mechanical pencil which are not included in ISO are specified.	No ISO Standard for coloured leads for mechanical pencil. Proposal is not scheduled.

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard	(IV) Classification and details of technical deviation between JIS and the International Standard by clause Location of deviation: text Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Content	Classification by clause	Detail of technical deviation	
8 Test method	Leads for mechanical pencil Test condition, rounding off of numerical value, bending strength (for drawing use and general use), density, harmful substance and dimensions are specified. Coloured leads for mechanical pencil Test condition, rounding off of numerical value, bending strength, harmful substance, chromaticity, light fastness and dimensions are specified.	ISO 9177-3	Leads for mechanical pencil Bending strength is specified.	MOD/ addition	The bending strength of the leads for mechanical pencil for drawing use is same in both JIS and ISO but the bending strength of the leads for mechanical pencil for general use and coloured leads for mechanical pencil is additionally specified in JIS. Moreover, the items of test method not included in ISO are additionally specified in JIS.	The leads for mechanical pencil for drawing use are additionally specified. It is considered to be an idea to propose them on the occasion of reviewing ISO.
9 Inspection method	Type inspection and product inspection are specified.				No specification in ISO .	

(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard	(IV) Classification and details of technical deviation between JIS and the International Standard by clause Location of deviation: text Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Content	Classification by clause	Detail of technical deviation	
10 Designation	Leads for mechanical pencil Black lead, standard number, type of lead, classification by use, nominal diameter, length, hardness, number of leads contained and manufacturer's name are specified. Coloured leads for mechanical pencil Standard number, nominal diameter, length, colour name, number of leads contained and manufacturer's name are specified.	ISO 9177-2	Leads for mechanical pencil Black leads, standard number, type of lead, nominal diameter and length are specified.	MOD/addition	In JIS, leads for mechanical pencil, the classification by use, hardness, number of leads contained and manufacturer's name are additionally specified. In addition, the coloured leads for mechanical pencil are also specified in the designation.	No schedule for proposal to ISO.

Designated degree of correspondence between JIS and International Standard: MOD

Remarks 1 Symbols in sub-columns of classification by clause in the above table indicate as follows:

— MOD/addition: Adds specification item(s) or content(s) not included in International Standard.

2 Symbol in column of designated degree of correspondence between JIS and International Standard in the above table indicates as follows:

— MOD: Modifies International Standard.

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