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Traditional Chinese medicine — Computerized tongue image analysis system —

Part 3: Colour chart

Médecine traditionnelle chinoise — Système d'analyse d'images numérisées de la langue —

Partie 3: Nuancier

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Foreword

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This document was prepared by Technical Committee ISO/TC 249, *Traditional Chinese medicine*.

A list of all the parts in the ISO 20498 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.

Traditional Chinese medicine — Computerized tongue image analysis system —

Part 3: Colour chart

1 Scope

This document specifies the colour character and appearance of the colour chart used in a computerized tongue image analysis system (CTIS).

This document excludes diagnostic or clinical comparison to the colour chart.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
colour chart
apparatus which consists of an array of 24 single-colour patches used for the evaluation of colour reproduction of CTIS

3.2
colour space
geometric representation of colours in space, usually of three dimensions

[SOURCE: CIE Publication 17.4, 845-03-25]

3.3
CIELAB colour difference
CIE 1976 L*a*b* colour difference
ΔE^*_{ab}
difference between two colour stimuli defined as the Euclidean distance between the points representing them in L*a*b* colour space

[SOURCE: CIE publication 17.4, 845-03-55, 56]

3.4
margin
area beyond the colour patch in the colour chart

4 Classification

4.1 Colour chart without registration mark

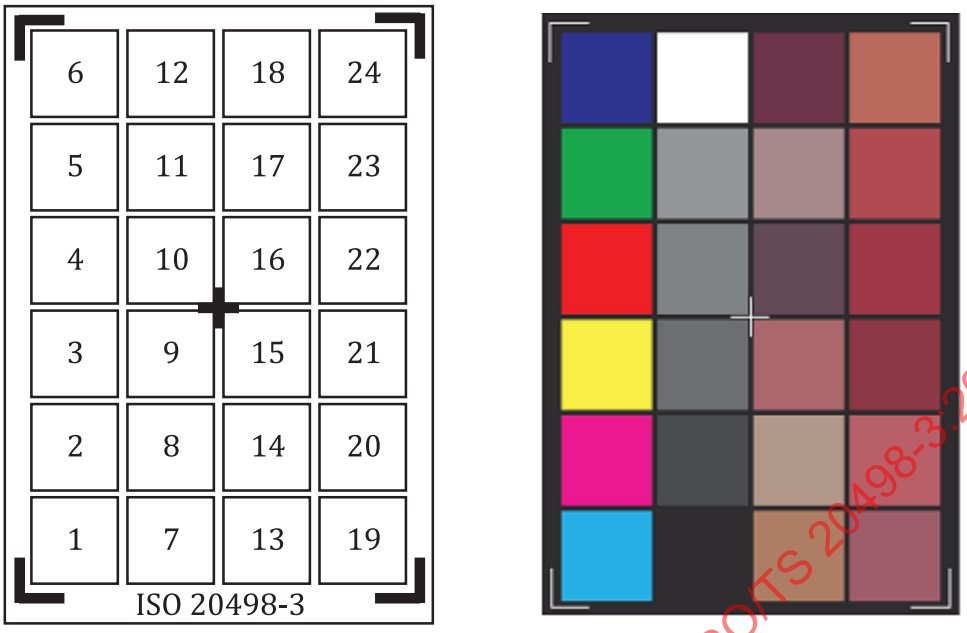
The order of colours in the colour chart and the example printed on paper using arbitral ink, dye and paint are shown in Figure 1.

NOTE The numbers listed in the figure represent the order of colours in this colour chart.

Figure 1 — The colour chart without registration mark

4.2 Colour chart with registration mark

The order of colours in the colour chart and the example printed on paper using arbitral ink, dye and paint with registration mark are shown in Figure 2.



NOTE The numbers listed in the figure represent the order of colours in this colour chart.

Figure 2 — The colour chart with registration mark

5 Technical requirements

5.1 Accuracy of L*a*b* value

The CIELAB colour difference ΔE^*_{ab} between the real value and the specified value should be less than 5. The specified values are shown in Table 1.

Compliance is checked as follows:

When calculating the colour value, the area to be analysed should be in a square or circular shape containing the centre of each patch and should be at least 20 % of each patch area.

The white and black colours of the frame's L*a*b* values are necessary. The frame colour shall differ from the white and black colour in the colour chart so that colour patches and border can be distinguished.

Use a spectral photometer for testing. Compare the real value with the specified value in Table 1. Calculate the colour difference according to Formula (1).

$$\Delta E^*_{ab} = [(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2]^{1/2} \quad (1)$$

where ΔE^*_{ab} is the colour difference calculated by the real values and specified values of a^*, b^* and L^* shown in Table 1. The result shall be in accordance with the requirements.

Table 1 — Name of colour patch and CIE L*a*b*coordinates at CIE D65 and D50 illuminates

Number	Name	L*(D65)	a*(D65)	b*(D65)	L*(D50)	a*(D50)	b*(D50)
1	Cyan	63	−17	−23	63	−21	−24
2	Magenta	56	38	−9	56	38	−9
3	Yellow	79	−12	53	80	−8	53
4	Red	47	43	25	48	44	26
5	Green	59	−38	37	59	−35	36
6	Blue	43	0	−28	42	−3	−29
7	Black	20	0	0	20	0	0
8	Gray#01	30	0	0	30	0	0
9	Gray#02	40	0	0	40	0	0
10	Gray#03	50	0	0	50	0	0
11	Gray#04	60	0	0	60	0	0
12	White	90	0	0	90	0	0
13	Tongue#01	55	14	25	56	16	25
14	Tongue#02	65	5	15	65	6	15
15	Tongue#03	52	21	11	52	22	11
16	Tongue#04	35	9	1	35	9	1
17	Tongue#05	58	9	2	58	10	3
18	Tongue#06	32	19	4	32	19	4
19	Tongue#07	47	25	4	47	26	4
20	Tongue#08	50	33	13	50	34	14
21	Tongue#09	34	32	13	35	32	13
22	Tongue#10	37	38	17	37	38	18
23	Tongue#11	44	36	17	45	36	18
24	Tongue#12	54	26	22	54	28	22
25	Recommendation 1	80	0	0	80	0	0
26	Recommendation 2	25	0	0	25	0	0

NOTE The name of the colour patch and CIE L*a*b* coordinates at D65 and D50 CIE standard illuminate in 2 ° observers are shown. Colour patch numbers 25 and 26 are the L*a*b* values of the colour of the margin.

5.2 Colour patch size and margin

The size of colour chart is arbitrary. However, the shape of the colour patch shall be square and the geometric size of each colour patch shall be the same. Single-colour interval size dimensions shall conform to the requirements in Figure 3. The width of each colour patch shall be not less than 5 mm. The margin between two conjunct colour patches shall not be less than 1 mm.

Compliance is checked as follows:

Measure the patch size and margin using a ruler. The result shall be in accordance with the requirements.

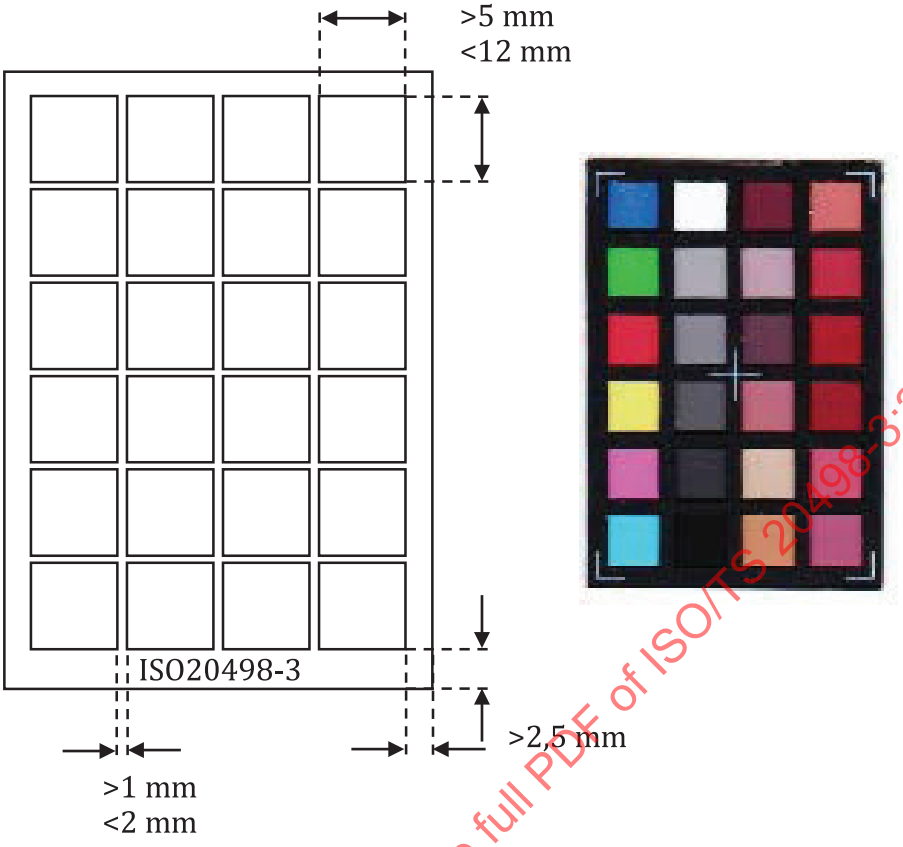


Figure 3 — The interval size dimension of colour chart and small size example using arbitral ink, dye and paint with registration mark

5.3 Optical transparency

The optical transparency (O) shall be less than 3.

Compliance is checked as follows:

Detect the L*a*b* value of 24 colour patches individually under white-back and black-back separately and calculate the colour difference according to Formula (2). Then calculate the optical transparency, O, according the Formula (3). The result shall be in accordance with the requirements.

$$\Delta E^*_{ab} = [(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2]^{1/2} \tag{2}$$

$$O = 1/24 \sum \Delta E^*_{ab} \tag{3}$$

where ΔE^*_{ab} is the colour difference between white-back and black-back.

5.4 Usage of colour chart

The characteristics of 24 colour patches and the usage of the colour chart are listed in Annex A and Annex B for additional information.

5.5 Printing condition

Since the quality of the ink, paper or other materials cannot be ensured, refer to Annex C for additional information.

Annex A
(informative)

Characteristics of each colour patch and the usage of the colour chart

A.1 Primary colours (No. 1 to No. 6)

The primary colours in this colour chart (red, green, blue, cyan, magenta and yellow) are used to evaluate the colorimetric colour characteristics of imaging devices (camera, display, printer) and to calculate the colour gamut of the imaging devices.

A.2 Black, grey and white colours (No. 7 to No. 12)

The black, grey and white colours in this colour chart are used for evaluation of tone reproduction characteristics of tongue imaging systems such as white balance and gamma.

The evaluation is done as follows:

a) Capture the black, grey and white colours in this colour chart.

b) Calculate CIEXYZ values of each colour from RGB value.

c) Check the linearity of RGB values and CIE L* values.

d) Check the balance of RGB values in grey and white in the colour chart.

NOTE Transformation between RGB, CIEXYZ and CIE L*a*b* of each colour is shown in Reference [6].

A.3 Tongue colours (No. 13 to No. 24)

The tongue colours in this colour chart are used for the evaluation of tongue colour reproduction of CTIS as follows:

a) Capture the tongue colours in this colour chart.

b) Display the captured image.

c) Measure the L*a*b* of each tongue colour chart.

d) Calculation of transformation matrix from RGB to XYZ, L*a*b* should be done to minimize the colour difference between the tongue colour chart and tongue colour image on the display.

A.4 Usage of the colour chart

The colour chart is used as follows;

a) Primary colour (No. 1 to No. 6) can be used to represent a colour gamut of imaging systems.

b) Black, grey and white colours (No. 7 to No. 12) to represent gamma and tone reproduction characteristics.

c) Tongue colours (No.13 to No.24) should be used to calculate the colour transformation matrix.

Annex B
(informative)

sRGB values of colour chart

Table B.1 — Name of colour patch and sRGB coordinates at CIE D65 and D50 illuminates

Number	Colour	R(D65)	G(D65)	B(D65)	R(D50)	G(D50)	B(D50)
1	Cyan	77	163	193	97	163	169
2	Magenta	190	108	151	198	106	131
3	Yellow	205	200	93	221	199	74
4	Red	184	77	72	192	76	60
5	Green	90	158	74	105	156	59
6	Blue	66	104	148	77	101	128
7	Black	48	48	48	53	48	40
8	Gray30	71	71	71	77	70	60
9	Gray40	94	94	94	102	93	80
10	Gray50	119	119	119	128	118	102
11	Gray60	145	145	145	156	143	124
12	White	226	226	226	243	224	196
13	Tongue#01	168	122	89	179	122	76
14	Tongue#02	177	154	131	187	152	112
15	Tongue#03	164	110	106	172	108	90
16	Tongue#04	97	77	81	103	76	69
17	Tongue#05	157	134	136	168	132	116
18	Tongue#06	105	64	70	109	62	59
19	Tongue#07	153	95	106	160	93	91
20	Tongue#08	176	95	98	183	93	82
21	Tongue#09	130	57	61	136	58	53
22	Tongue#10	147	58	62	150	56	50
23	Tongue#11	164	77	78	172	78	66
24	Tongue#12	181	111	93	189	107	78
Frame 1	White	198	198	198	213	196	171
Frame 2	Black	59	59	59	64	59	50