Lovibond Colorimeter

WSL-2

User Manual

Please read this manual carefully before use

Ⅰ Application and Characteristic

WSL-2 Lovibond Colorimeter is an authoritative instrument for color measurement. It takes advantage of the special Lovibond color system and color unit which could make the effective measurement of color come true. The instrument has a simple but solid structure and is also easy to handle, it could be used in the color measurement of different kinds of materials such as edible oil and other industrial or agricultural products.

Lovibond color unit is a special kind of chroma unit. It has the simple but perfect digital color language which is able to measure different kinds of colors simply and intuitionistically. The method is also easy to master. Lovibond Colorimeter has been widely accepted and used by various of countries throughout the world.

Ⅱ Specifications & Main technical index

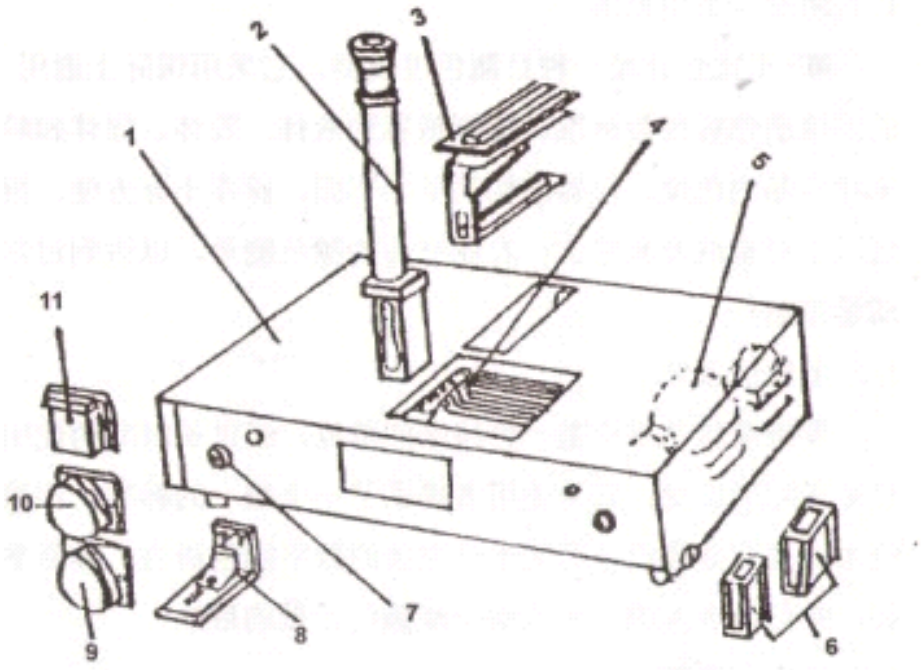
Measure range:

Red:	R0.1~79.9	Lovibond unit
Yellow:	Y0.1~79.9	Lovibond unit
Blue:	B0.1~49.9	Lovibond unit
Neutral Gray:	N0.1~3.9	Lovibond unit

Minimum value of scale division: 0.1 Lovibond unit

ⅢInstrument components

1 Structure



1.Color box 2.Observation drawtube 3.Transparent sample shelf
4.Colored glass bracket(11 pieces) 5.bulb(4 pieces. 2 pieces are for spare)

6. Cuvette(6 pieces. 2 pieces of 10mm, 3 pieces of l inch, 1piece of $5\frac{1}{4}$ inch)

7. Switch 8. Solid sample holder (not available)
9 .Standard white board (4 pieces, 2 pieces are for spare)
10. Powder sample box (1 piece)
11. Colloid sample box (not available)
The instrument is composed of color box, observation drawtube, Lovibond coloured glass set, standard white board and a series of different kinds of sample container.

2 Color box

The color box is composed of a metal shell whose inner surface is coated with uniform aphotic white paint and outside surface is silver gray. The left box and right box are composed of metal shell whose inner surfaces are both coated with aphotic white paint too. Each box contains a milk white bulb which angled 45 degree from the white board. The bulbs form the beam diffuse reflection field through two white boards, it ensures the same illumination condition in both observation vision filed. A groove is located on the bottom of the color box which allowed to place in color plate (less than 150mm in length), there are two holes which the back cover board which is used for storing the standard white board, the nether hole can also be used for storing opaque samples (all kinds of sample shelf can be ordered in our company). There is a color filter box in front of the color box, color filter bracket can be moved freely in the groove, a square hole is located on the groove board for loading observation drawtube. Power switch is installed on the front of board to control the two bulbs.

3 Lovibond colored glass set

Lovibond colored glass set, composed of 84 pieces of red, yellow, blue and neutral filters, is fixed on the 11 frameworks calibrated with scale. Red and yellow is 0.1～0.9，1.0～9.0，10.0～70.0， blue is 0.1～0.9，1.0～9.0，10.0～40.0, and neutral filter is 0.1～0.9，1.0～3.0.

4 Observation system

Beams are reflected 90 degree by the optic system in the observation drawtube. The vision filed is divided into two parts. Sample color is shown on the left side, while the filter color is shown on the right side. The blue calibration filter installed in the observation drawtube is used for make the operator work under the Lovibond observation condition which reaches corresponding standard.

Ⅳ Operation method

1 Installation

Open the accessory box, take out observation drawtube and insert it in the hole. Put one standard white board on the upper hole back of the machine. (If you test transparent color sample, put two white boards on the hole.) Connect with power (220V), check bulb performance, prepare sample and start to work.

2 Sample preparation

There are transparent samples and opaque samples, so the measuring methods are respectively transmission method and reflection method. Place standard white board and sample correctly is important to the repeatability of measuring results.

2.1 Opaque samples

When measuring opaque samples such as ink, cloth, powder, colloid and plastic, choose appropriate sample container. E.g. colloid box, (rectangle box), powder box (fit with helix cover) or solid sample shelf (could be ordered additionally). After the samples are installed, put sample box on the below hole back of machine, the sample color can be measured by the reflected beam.

2.2 Transparent samples

Fill the transparent liquid in the cuvette, place the cuvette before the sample shelf, fix it with small nylon sliding block. Then start to measure.

Attention, color depth of the measured transparent liquid is related to the length of cuvette. So when you record the colorimetric results, also record the length of cuvette. You should also pay special attention that the color depth isn't always proportionable with the length of cuvette. e.g. If the results measured by 10mm long cuvette is directly replaced by 1/2 of 20mm long cuvette measurement result, it is completely wrong. Similarly, if you want to get half of the liquid color depth result by dilute the liquid to half of the private concentration, the result would also be wrong.

If no specific standards are available, you'd better choose cuvette whose sample color is less than 20 Lovibond unit. Because the color resolution is relatively high when Lovibond unit ranges from 3 to 10, otherwise, the resolution might be descended gradually.

2.3 Colorimetric method

The user should choose good place. Don't choose the place in front of the window or anywhere facing the sunshine. It's better to install the instrument facing a white or neutral color wall without window. The seat should be properly high so that the operator could watch the vision filed directly. In addition, the user's eyesight should be focused on the center in the measurement process. Meanwhile, the staring time shouldn't be too long as the resolution descends when the eyes feel tired. In other word, it's better for

the user to watch discontinuously than continuously.
After turn on the power, you're able to observe the vision field. The left side of the vision filed will show the sample color. The right side color is adjusted by moving colored glass. When testing, press the button on the front board by left hand. Adjust the red, yellow and blue glasses respectively by right hand until color of two sides become the same. It means that sample color is equal to instrument calibration color. The metal conduit ferrule display the measuring results. Plus each original color number and record it in the book.
When one or two of the color glass are adjusted to the nearest color of sample, but the color is darker than the sample, you can use neutral gray filter to reduce sample brightness. The brightness data should be recorded separately. Don't combine it with any color glass number. Attention: When 3 kinds of original color glass are used in color comparisons, the neutral gray filter couldn't be used. You can only reduce using color glass to match the color.

2.4 Color naming

Although it is ordinary to describe some kind of color by one primary color, many departments use six kinds of color as the description style for some special purpose or for convenience. Now introduce the color naming of the method as follows:
Red: orange--the combination of red and yellow. If the majority is yellow, the color might be called yellow orange, otherwise, it's called red orange.
Yellow: green--the combination of yellow and blue. If the majority is yellow, the color might be called yellow green, otherwise, it's called blue green.
Blue: purple--the combination of red and blue. If the majority is red, the color might be called red purple, otherwise, it's called blue purple.
The "bright" and "dark" conception is existed with each color. When 3 kinds of original color are used for color comparisons, the sample color is called "dark ×× color", while the weakest original color data is called darkness degree number. When the neutral gray filter must be used in the measurement, the sample color is called "bright ×× color", while the neutral gray filter color data is called brightness degree number.
For example: Here is a measuring result: red 10.0; yellow 7.0; blue 3.0, all of the three original colors are used in the measurement. The minimum data blue 3.0 is the darkness degree (red 3.0, yellow 3.0, blue 3.0), the left red 7.0 and yellow 4.0. Contain the same 4.0(combined as orange), there is still red 3.0 left, so the color of this sample is called "dark red orange". The measuring results of various samples are listed on table 1. Users could use it as a reference and make a similar table for recording and saving measuring data.

Ⅴ. Maintenance

1. Replacing of bulbs

In normal condition, the bulb must be replaced after serving 100 hours for keeping the best color temperature of the instrument. Pay attention that 2 bulbs must be replaced at the same time.

2. Cleaning

Try your best to avoid contaminating the white coat of the interior wall, for the precision and repeatability of the instrument. The room for placing the instrument must be clean and no smoking is allowed. The cuvette must be cleaned after use. When dust occurred on top of the blue filter fixed in the drawtube helix, wipe it with soft cloth. Clean the filter with alcohol and ether when necessary.

3. Take out the following parts before use

3.1 The foam paper under the bulb.
3.2 Open the upper slot plate, take out foam paper and drier in middle of color filter frame.
3.3 When using machine, put the white board on the screw back of the machine.

Ⅵ. Complete set of the instrument

Name	Qty
Mainframe	1
Bulb	2
Accessory box (1 observation drawtube, 6 cuvettes, 4 standard white boards, 1 powder sample box, 1 brush)	1
User manual	1

Table 1 (Data record table)

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Sample No.	Measuring data				Figure for six kinds of color								Cuvette Specifica -tion
	red	yellow	bright	Bright-ness	Bright-ness	Darkness	red	orange	yellow	green	blue	purple	
1	21.0			0.7	0.7		21.0						
2	15.5	2.5	2.5			2.5	15.5						
3	14.5	35.0					14.5						
4		28.0	2.0	1.5	1.5	2.0			35.0				1 inch
5	2.0		18.6						26.0				
6			15.0	0.9	0.9						18.6		
7		1.2	11.3			1.2					15.0		
8	1.2	8.0									10.1		
9	10.5	18.0	1.2	0.7	0.7	1.2	2.5	8.0					
10	3.4	12.0	2.3			2.3		2.2	14.6				1 inch
11	17.3	15.0	15.0			1.5	5.3	9.7					1 inch
12	1.5	14.0	9.0							13.5			
13		2.5	11.0	1.2	1.2	2.5			5.0	9.0			
14	8.5										2.5	6.0	