

# Lovibond® Colour Measurement

Tintometer® Group



## TR Series Playbook

### TR Series

- TR 500
- TR 515
- TR 520
- TRA 500
- TRA 520

April 2023



## Contents

	<b>Page</b>
<b>Introduction</b>	1
<b>Value Proposition</b>	2
<b>Target Market</b>	3 – 5
<b>Competitor Analysis</b>	6 – 9
<b>Features and Benefits</b>	10
<b>Difference Between the TR Instruments</b>	11 – 12
<b>Discovery Questions</b>	13
<b>How to Demo the TR Series</b>	14 – 19

## Appendix

<b>TR Series Testimonial</b>	
<b>TR Series Brochure – Featuring Technical Specification</b>	
<b>Reflectance Glossary</b>	
<b>Reflectance Visual Sales Tools</b>	



## Introduction

Colour measurement plays a vital role in quality control across many industries, helping to ensure accuracy, efficiency, cost-effectiveness, consistency in products, brand image and compliance with regulations and industry standards. Materials such as paint, coatings, plastics, textiles, printing, food, cosmetics, and ceramics all require reliable and precise colour measurements.

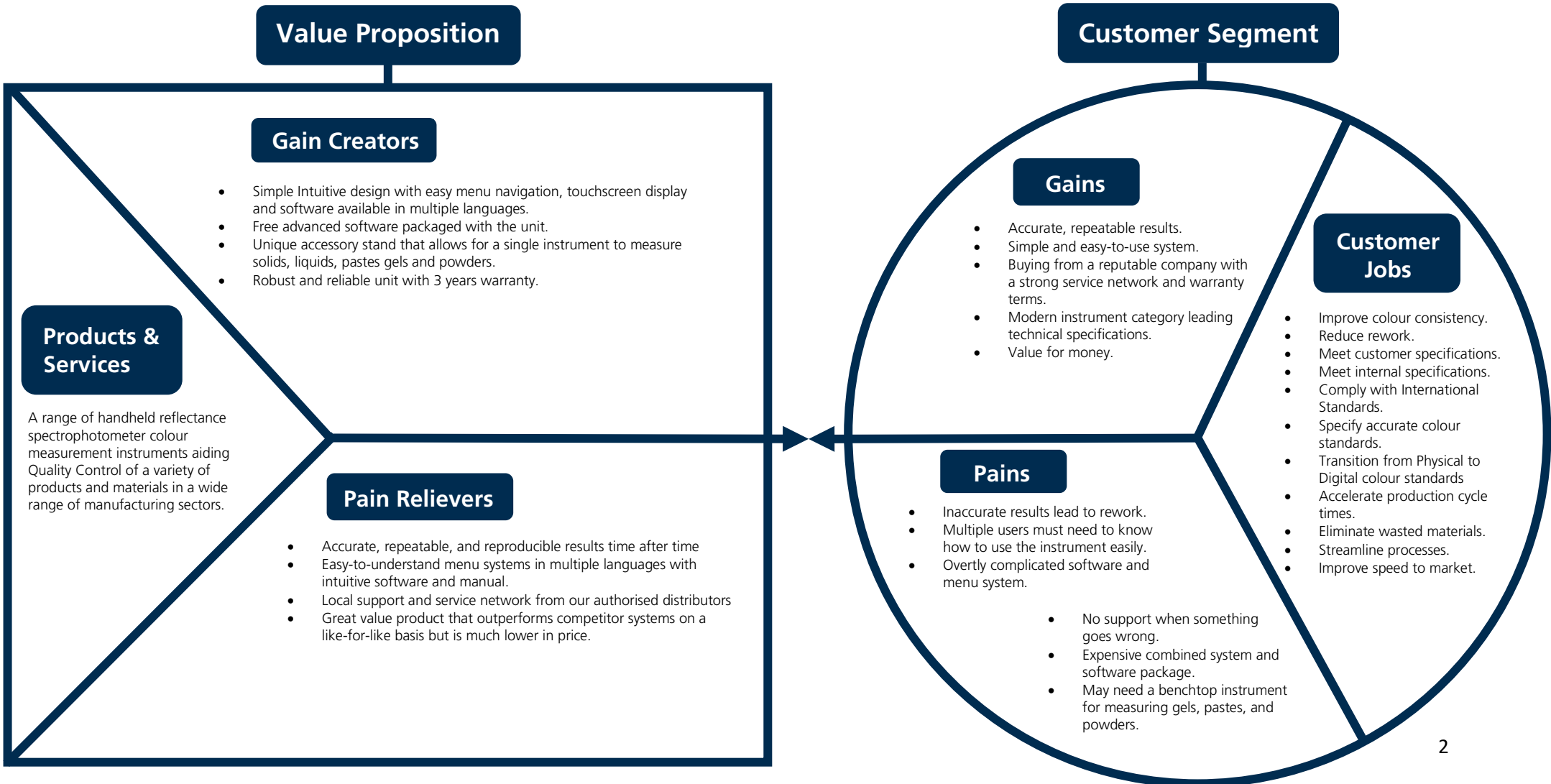
Today X-Rite, Datacolor, Hunterlab, Konica-Minolta, and BYK-Gardner generate more than \$500 million in total sales. However, their solutions are complex and expensive. The TR series is as sophisticated as any handheld spectrophotometer in today's market as is our QC Software, the series has also been positioned at a significantly more competitive price compared to others available on the market, we also include our OnShade software with the purchase of every TR Series instrument.

Historically the series has consisted of the TR 500 & TR 520, however, recently the TR 515 has been added to the range. The TR 515 as a 45°/0° geometry instrument complements our existing Sphere-based TR 500 and TR 520 giving us further options within the reflectance market.

To add further depth to the range we have manufactured the TRA portable instrument stand, the stand is supplied with both the TRA 500 & TRA 520 converting the handheld device into a benchtop unit. The TR stand provides the opportunity to measure problematic samples such as gels, liquids, pastes, and powders ensuring a consistent measurement within a controlled environment.

Lovibond® is a well-known and trusted name in the Transmission market. With the TR series, we can build on the work we have already done to further establish the Lovibond® brand in the Reflectance market.

# Value Proposition

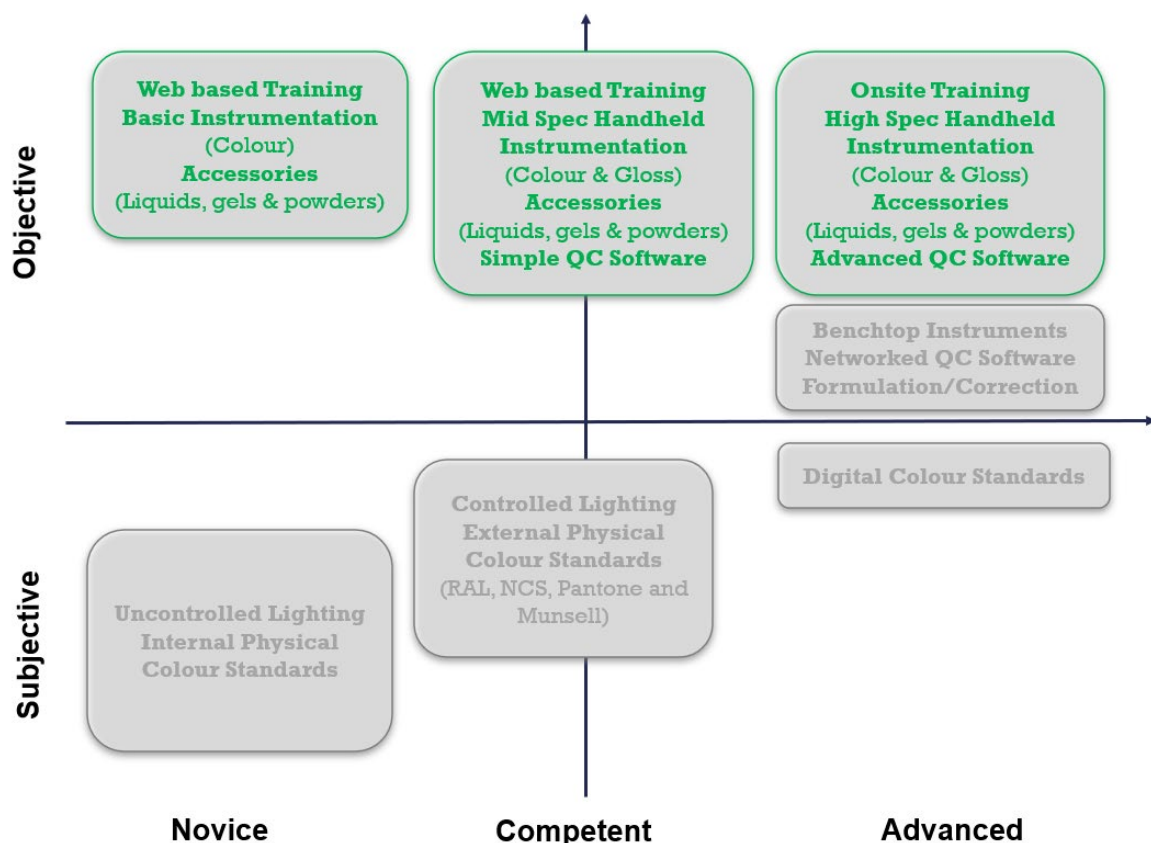


# Target Market

Our target customers wish to move from subjective to objective colour quality control. **Novice** customers are entirely new to instrument-based colour QC. **Competent** customers have some previous experience using colour QC instruments. **Advanced** customers will have established colour QC processes and will likely be experienced in using spectrophotometers and colour QC software. Each customer category has a list of possible requirements. Lovibond can support those areas with **green text** (e.g., **QC Software**). Areas with **Grey text** are unsupported by our current product range.

**Subjective** colour measurement relies to a high degree on the judgment and skill of the operator and thus their perspective, feelings, beliefs, desires, and biases will impact reliable quality control.

**Objective. Non-subjective**, colour measurement is completely unaffected by the judgment of the operator.





## Within TR Series Scope

- **Quality Control (QC):** the process of maintaining colour standards in manufactured products by testing a sample of the output against the specification. Customers require training, instrumentation, accessories, and QC software.
- **Special Colours Quality Control:** A Colour QC technique unique to the printing industry for non-CMYK Colours (e.g., Coca-Cola Red).

## Out of TR Series Scope – Lovibond® does not sell such products.

- **Colour Formulation:** Also known as “Colour Match prediction”. A system where specialist software paired with a spectrophotometer is used to measure the colour of standards and formulate recipes that will match the standard’s colour.
- **Metallic QC (Quality Control):** This requires the use of a Gonio Spectrophotometer (also known as a Multi-Angle Spectrophotometer).
- **Point of Sale:** A Colour Formulation system found in a Retail environment.
- **CMYK/Densitometry:** A QC technique unique to the printing industry.
- **Colour Management Workflow:** Software or web-based system used to provide colour consistency and predictability throughout the entire workflow locally or internationally.

## Example Target Markets

### Paint and Coatings

Industrial Paints and Coatings (Quality Control, No Colour Formulation)  
Architectural Paints & Coatings (Quality Control, No Colour Formulation)  
Automotive Paints & Coatings (No Metallic QC)  
Retail Paint (No Point of Sale)

### Plastics

Masterbatches (Quality Control, No Colour Formulation)  
Moulders (Quality Control, No Colour Formulation)  
Extruders (Quality Control, No Colour Formulation)



**Food Colour Measurement**  
(Quality Control)

**Durable Goods**  
(Quality Control)

**Consumer Packaged Goods**  
(Quality Control)

**Consumer Electronics**  
(Quality Control)

**Cosmetic Manufacturers**

Creams, Liquids, and Lotions (Quality Control)

Lipstick and Nail Polish (Quality Control)

Loose and Compact Powder (Quality Control)

Health & Beauty Packaging (Special Colours Quality Control, No CMYK/Densitometry)

**Print and Packaging**

Commercial Print (No Colour Management Workflow, Special Colours Quality Control, No CMYK/Densitometry)

Packaging Converters (No Colour Management Workflow)

Ink Room (No Colour Formulation)

Pre-Media (No Colour Management Workflow)

**Automotive**

Automotive Manufacturers (Quality Control, No Metallic QC)

Automotive Part Suppliers (Quality Control, No Metallic QC)

Automotive Designers (Quality Control, No Metallic QC)

Commercial Vehicle Manufacturers (Quality Control, No Metallic QC)

**Textiles**

Dyehouses (Quality Control, No Colour Formulation, No Colour Management Workflow)

Apparel Brands (Quality Control, No Colour Management Workflow)

Digital Textile Printing (Quality Control, No Colour Management Workflow)

**Building Materials**  
(Quality Control)

**Life Sciences**  
(Quality Control)

**Paper**  
(Quality Control)

**Ceramics**  
(Quality Control)

## Competitor Analysis - TR 515

	Lovibond	X-Rite	Datacolor	Hunterlab	Konica-Minolta	BYK-Gardner
<b>Product Name</b>	TR 515	964	Datacolor 45	Miniscan EZ 4500	CM-25Cg	Spectro2go 45/0
<b>Free Software</b>	Yes (OnShade Software)	No	No	No	No	No
<b>List Price (€)</b>	£5,500 (approx. €6,250)	€10,495	€9,450	€9,495	€9,250	€10,995



<b>Geometry</b>	45°/0° (45° ring-shaped illumination, vertical viewing)	0°/45°	45°/0° (45° ring-shaped illumination, vertical viewing)	45°/0° (Directional annular)	45°/0° (45° ring-shaped illumination, vertical viewing)	45°/0°
<b>Light Source</b>	Combined LED Light, UV Light	Gas-filled Tungsten lamp	LED	Pulsed Xenon Lamp	Pulsed Xenon Lamp	LED
<b>Detector</b>	256 Image Element Double Array CMOS Image Sensor	Blue-enhanced silicon photodiodes	Master concave holographic grating	Holographic grating	Dual 40-element silicon photodiode arrays	Not Listed
<b>Wavelength Range</b>	400-700nm	400-700nm	400-700nm	400-700nm	360-740nm	340-760nm
<b>Wavelength Pitch</b>	10nm	10nm	10nm	10nm	10nm	10nm
<b>Reflectance Range</b>	0-200%	0-200%	Not Listed	0-150%	0-175%	0-170%
<b>Measuring Aperture</b>	MAV: Ø8mm/Ø10mm SAV: Ø4mm/Ø5mm	LAV: Ø15mm/21.5mm MAV: Ø7mm/Ø9mm SAV: Ø4mm/Ø6.5mm	Ø8mm/Ø11mm	LAV Ø25.4mm/Ø31.8mm	MAV: Ø8 mm/12×16 mm, SAV: Ø3 mm /12×16 mm	MAV Ø8mm/Ø12mm
<b>Colour Space</b>	CIE Lab, XYZ, Yxy, LCh, CIE LUV, Hunter Lab,	CIE Lab, XYZ, Yxy, LCh, Hunter Lab,	CIE Lab, XYZ, Yxy, LCh, Lab (h)	CIE Lab, XYZ, Yxy, LCh, Hunter Lab,	CIE Lab, XYZ, Yxy, LCh, Hunter Lab,	CIE Lab, XYZ, Yxy, LCh
<b>Colour Difference Formula</b>	$\Delta E^*ab$ , $\Delta E^*uv$ , $\Delta E^*94$ , $\Delta E^*cmc$ (2:1), $\Delta E^*cmc$ (1:1), $\Delta E^*00$ , $\Delta E$ (Hunter)	$\Delta E^*ab$ , $\Delta E^*uv$ , $\Delta E^*94$ , $\Delta E^*cmc$ (2:1), $\Delta E^*cmc$ (1:1), $\Delta E^*00$ , $\Delta E$ (Hunter)	$\Delta E^*ab$ , $\Delta E^*94$ , $\Delta E^*cmc$ (2:1), $\Delta E^*cmc$ (1:1), $\Delta E^*00$ , $\Delta E$ (Hunter)	$\Delta E^*ab$ , $\Delta E^*uv$ , $\Delta E^*94$ , $\Delta E^*cmc$ (2:1), $\Delta E^*cmc$ (1:1), $\Delta E^*00$ , $\Delta E$ (Hunter)	$\Delta E^*ab$ , $\Delta E^*uv$ , $\Delta E^*94$ , $\Delta E^*cmc$ (2:1), $\Delta E^*cmc$ (1:1), $\Delta E^*00$ , $\Delta E$ (Hunter)	$\Delta E^*ab$ , $\Delta E^*94$ , $\Delta E^*cmc$ (2:1), $\Delta E^*cmc$ (1:1), $\Delta E^*00$ , $\Delta E$ (Hunter)
<b>Other Colorimetric Index</b>	WI (ASTM E313, CIE/ISO, AATCC, Hunter), YI (ASTM D1925, ASTM E313), MI (Metamerism Index), Staining Fastness, Colour Fastness, Colour Strength, Opacity	WI (ASTM E313), YI (ASTM E313), MI (Metamerism Index)	WI (ASTM E313, CIE/ISO, AATCC, Hunter), YI (ASTM D1925, ASTM E313), MI (Metamerism Index)	WI (ASTM E313, CIE/ISO, AATCC, Hunter), YI (ASTM D1925, ASTM E313), MI (Metamerism Index), Staining Fastness, Colour Fastness, Colour Strength, Opacity	WI (ASTM E313, CIE/ISO, AATCC, Hunter), YI (ASTM D1925, ASTM E313), MI (Metamerism Index)	WI (ASTM E313, CIE/ISO, AATCC, Hunter), YI (ASTM D1925, ASTM E313), MI (Metamerism Index), Colour Strength, Opacity
<b>Observer Angle</b>	2°/10°	2°/10°	2°/10°	2°/10°	2°/10°	2°/10°





	Lovibond	X-Rite	Datacolor	Hunterlab	Konica-Minolta	BYK-Gardner
<b>Illuminant</b>	D65, A, C, D50, D55, D75, F1, F2(CWF), F3, F4, F5, F6, F7(DLF), F8, F9, F10 (TPL5), F11(TL84), F12 (TL83/U30)	D65, A, C, D50, D75, F2 (CWF), F7, F11 (TL84) & F12 (TL83/U30)	D65, A, C, D50, D75, F2 (CWF), F7, F11 (TL84) & F12 (TL83/U30)	D65, A, C, D50, D75, F2 (CWF), F7, F11 (TL84)	D65, A, C, D50, D75, F2 (CWF), F7, F11 (TL84) & F12 (TL83/U30)	D65, A, C, D50, D75, F2 (CWF), F7, F11 (TL84) & F12 (TL83/U30)
<b>Display Data</b>	Spectrogram/Values, Chromaticity Values, Colour Difference, Values/Graph, Pass/Fail Result, Colour Offset	Spectrogram/Values, Chromaticity Values, Colour Difference, Pass/Fail Result	Not Listed	Not Listed	Spectral values/graph, colourimetric values/graph, colour-difference values/graph, pass/fail judgement, pseudocolour	Not Listed
<b>Measurement Time</b>	Approx. 1.5s	Approx. 2s	Approx. 2s	Approx. 2s	Approx. 1s	Not Listed
<b>Repeatability</b>	Spectral reflectance: MAV, Standard deviation within 0.08% Chromaticity value: within $\Delta E^*ab$ 0.05	MAV & LAV 7mm/15mm Chromaticity value: within $\Delta E^*ab$ 0.05	Chromaticity value: within $\Delta E^*ab$ 0.01	Not Listed	MAV & LAV 7mm/15mm Chromaticity value: within $\Delta E^*ab$ 0.04	$\Delta E94$ 0.01
<b>Inter-instrument Agreement</b>	Within $\Delta E^*ab$ 0.15 (Average for 12 BCRA Series II colour tiles)	Within $\Delta E^*ab$ 0.15 (Average for 12 BCRA Series II colour tiles)	Within $\Delta E^*ab$ 0.15 (Average for 12 BCRA Series II colour tiles)	Within $\Delta E^*ab$ 0.15 (Average for 12 BCRA Series II colour tiles)	Within $\Delta E^*ab$ 0.15 (Average for 12 BCRA Series II colour tiles)	Within $\Delta E94$ 0.1 (Average for 12 BCRA Series II colour tiles)
<b>Size (L x W x H)</b>	184 x 77 x 105mm	196 x 84 x 109mm	Not Listed	267 x 109 x 139mm	224 x 81 x 81 mm	87 x 110 x 188 mm
<b>Weight</b>	Approx. 600g	1.1Kg	Approx. 800g	1Kg	Approx. 600g	700g
<b>Power source</b>	Li-ion battery. 5000 measurements within 8 hours	Ni-metal hydride battery. 1,000 measurements within 8 hours	Li-Ion > 2,000 measures/charge	Ni-Metal Hydride. 4000 measurement per charge	Lithium-ion battery, approx. 3,000 measurements/charge	Internal rechargeable battery 1200 measurements/charge
<b>LED Light Source Life Span</b>	3 million measurements	Approx. 500,000 measurements	Not Listed	1,000,000 measurements	1,000,000 measurements	10 years Guarantee
<b>Display</b>	3.5-inch TFT colour LCD, Capacitive touch screen	128 x 256-pixel graphical LCD. No touch screen	Colour LCD Backlit (2.8" , 240 x 320 pixels). No touch screen	5.8 cm x 5.8 cm (2.3 in. x 2.3 in) backlit LCD. No touch screen	2.7-inch TFT colour LCD. No touch screen	3.5-inch Color touchscreen
<b>Interface</b>	USB, Bluetooth 4.0	RS-232 (no USB or Bluetooth)	USB, Bluetooth	USB 2.0	USB 2.0, Bluetooth	USB
<b>Data Memory</b>	1,000 Standards, 30,000 Samples	1,024 Standards, 2,000 Samples	2,000 Standards, 10,000 Samples	100 Standards, 750 Samples	2,500 Standards, 7,500 Samples	4,000 Standards, 10,000 Samples
<b>Language</b>	English and Chinese	English, German, French, Spanish, Italian, Portuguese	Master concave holographic grating	Chinese, English, French, German, Italian, Japanese, Spanish	Chinese, English, French, German, Italian, Japanese, Spanish	Chinese, English, French, German, Italian, Japanese, Spanish, Russian
<b>Gloss Measurement</b>	No	No	Yes	No	Yes	Yes

Summary Strengths TR 515 vs X-Rite 964	Summary Strengths TR 515 vs Datacolor 45	Summary Strengths TR 515 vs Miniscan EZ 4500	Summary Strengths TR 515 vs CM-25cG	Summary Strengths TR 515 vs Spectro2go 45/0
Lower price	Lower price	Lower price	Lower price	Lower price
Free OnShade software	Free OnShade software	Free OnShade software	Free OnShade software	Free OnShade software
Touchscreen	Touchscreen	Touchscreen	Touchscreen	More colourimetric options
More colourimetric options	More colourimetric options	More colourimetric options	More colourimetric options	
Faster measurement time	Faster measurement time	Faster measurement time		
More interface options	More data memory	More interface options		
More data memory		More data memory		

## Competitor Analysis - TR 520

	Lovibond	X-Rite	Datacolor	Hunterlab	Konica-Minolta	BYK-Gardner
<b>Product Name</b>	TR 520	CI64	Check 3	MiniScan EZ 4000	CM-26dG	Spectro2guide
<b>Free Software</b>	Yes (OnShade Software)	No	No	No	No	No
<b>List Price (€)</b>	£6,067 (approx. €7,000)	€12,000	Approx. €10,000	Starts at €8,500	Approx. €10,000	€12,995



<b>Geometry</b>	Reflect: di:8°, de:8° (diffused illumination, 8-degree viewing angle)	Reflect: di:8°, de:8° (diffused illumination, 8-degree viewing angle)	Reflect: di:8°, de:8° (diffused illumination, 8-degree viewing angle)	diffuse/8° (specular component included)	di:8°, de:8°	d:8° (spin/spex)
<b>Light Source</b>	Combined LED Light, UV Light	Gas-filled tungsten lamp + UVLEDs	Pulsed xenon (Optional UV Cut-off at 400nm)	Pulsed Xenon Lamp	Pulsed Xenon lamp (UV100 / UV0)	Not Listed
<b>Detector</b>	256 Image Element Double Array CMOS Image Sensor	Blue-enhanced silicon photodiodes	Dual 256-diode array	256-element diode array and high-resolution, a concave holographic grating	Dual 40-element silicon photodiode array	Not Listed
<b>Wavelength Range</b>	400-700nm	400-700nm	400-700nm	400 nm - 700 nm	360-740 nm	400 - 700 nm
<b>Wavelength Pitch</b>	10nm	10nm	10nm	10 nm	10 nm	10nm
<b>Reflectance Range</b>	0-200%	0-200%	Not Listed	0 to 150 %	0~175%	0-170%
<b>Measuring Aperture</b>	MAV: Ø8mm/Ø10mm. SAV: Ø4mm/Ø5mm	MAV: Ø8mm/Ø14mm. SAV: Ø4mm/Ø6.5mm	LAV: Ø11mm/Ø15mm SAV: Ø6.5mm/Ø10mm. USAV: Ø2.5mm/Ø6.5mm	LAV 25.4 mm (1 in) illuminated/20.0 mm (0.8 in) measured	MAV: Ø6mm/Ø12mm. SAV: Ø3mm/Ø8mm	MAV: Ø8mm/Ø12mm
<b>Colour Space</b>	CIE Lab, XYZ, Yxy, LCh, CIE LUV, Hunter Lab	Lab, L*a*b*, Reflectance, L*C*h°, Munsell Notation, XYZ, Yxy, L*u*v*	CIE L*, a*, b*, C, h coordinates, Hunter L, a, b coordinates, Tristimulus X, Y, Z, x, y coordinates, CIE 2000	CIE L*a*b*, Hunter Lab, CIE L*C*h°, CIE Yxy, CIE XYZ	L*a*b*, L*C*h°, HunterLab, Yxy, XYZ, and Color Differences in these colour spaces, Munsell	CIE Lab/Ch, Lab(h), XYZ, Yxy
<b>Colour Difference Formula</b>	$\Delta E^*ab$ , $\Delta E^*uv$ , $\Delta E^*94$ , $\Delta E^*cmc$ (2:1), $\Delta E^*cmc$ (1:1), $\Delta E^*00$ , $\Delta E$ (Hunter)	[ $\sqrt{X}$ ], $\Delta ecmc$ , $\Delta lab$ , $\Delta E00$ , $\Delta reflectance$ , $\Delta E94$ , $\Delta XYZ$ , $\Delta L^*a^*b^*$ , $\Delta Yxy$ , $\Delta L^*C^*h^°$ , $\Delta L^*u^*v^*$ , Verbal Difference	[ $\sqrt{X}$ ], $\Delta ecmc$ , $\Delta lab$ , $\Delta E00$ , $\Delta reflectance$ , $\Delta E94$ , $\Delta XYZ$ , $\Delta L^*a^*b^*$ , $\Delta Yxy$ , $\Delta L^*C^*h^°$ , $\Delta L^*u^*v^*$ , Verbal Difference	$\Delta L^*a^*b^*$ , $\Delta Lab$ , $\Delta L^*C^*h^°$ , $\Delta Yxy$ , $\Delta XYZ$ Color Difference Indices: $\Delta E^*$ , $\Delta E$ , $\Delta C^*$ , $\Delta C$ and $\Delta Ecmc$	$\Delta E^*ab$ (CIE1976), $\Delta E94$ (CIE1994), $\Delta E00$ (CIE2000), $\Delta Ecmc$ (1:1), Hunter $\Delta E$ , $\Delta E99o$ (DIN6172)	Not Listed
<b>Other Colorimetric Index</b>	WI (ASTM E313, CIE/ISO, AATCC, Hunter) YI (ASTM D1925, ASTM E313), MI (Metamerism Index), Staining, Fastness, Colour Fastness, Colour Strength, Opacity	WI Taube, $\Delta WI73$ , WI98, $\Delta WI$ Berger, WI73, $\Delta WI$ Hunter, $\Delta WI$ Stensby, WI Hunter, $\Delta WI$ Taube, WI Stensby, $\Delta WI98$ , YI1925, $\Delta YI98$ , $\Delta YI73$ , $\Delta YI1925$ , YI73, MI, MI6172, Averaging, 555 Shade Sort	$DL^*$ , $Da^*$ , $Db^*$ , $DH^*$ , $Dh^*$ , $DE^*$ , CMC colour difference, FMC II colour differences, Hunter DL, $Da$ , $Db$ , $DE$ differences, YI1925, $\Delta YI98$ , $\Delta YI73$ , $\Delta YI1925$ , YI73, MI, MI6172, Averaging, 555 Shade Sort	E313 Whiteness and Tint (C/2° and D65/10°), E313 Yellowness (C/2° and D65/10°), D1925 Yellowness (C/2°), Y Brightness, Z%, 457 nm Brightness, MI, Opacity, Color Strength Average and Single Wavelength), Gray Change, Gray Stain, Shade Number	WI (ASTM E313), YI (ASTM E313, ASTM (1925), MI (Metamerism Index), Brightness (ISO2470), WI/Tint (CIE), DIN99o, Strength, Opacity, Greyscale	WIE313, CIE, Berger, YIE313, YID1925, Metamerism, Color Strength, Opacity, Greyscale



	Lovibond	X-Rite	Datacolor	Hunterlab	Konica-Minolta	BYK-Gardner
<b>Observer Angle</b>	2°/10°	2°/10°	2°/10°	2°/10°	2°/10°	2°/10°
<b>Illuminant</b>	D65, A, C, D50, D55, D75, F1, F2(CWF), F3, F4, F5, F6, F7(DLF), F8, F9, F10 (TPL5), F11(TL84), F12 (TL83/U30)	A, C, D50, D65, F2, F7, F11 & F12	D50, D55, D65, D75, A, C, U3000, Horizon, F2, F7, F11	A, C, D50, D55, D65, D75, F2, F7, F11	A, C, D50, D65, F2, F6, F7, F8, F10, F11, F12, ID50, ID65, User Illuminant	A, C, D50, D55, D65, D75, F2, F6, F7, F8, F10, F11, UL30
<b>Display Data</b>	Spectrogram/Values, Chromaticity Values, Colour Difference, Values/Graph, Pass/Fail Result, Colour Offset	Not Listed	Not Listed	Color Data, Color Difference Data, Tristimulus Color Plot, Spectral Data, Spectral Difference Data, Spectral Plot, Spectral Difference Plot, Pass/Fail, Average Multiple Readings, Search for Closest Standard	Spectral values/graph, Colorimetric values/graph, Color-difference values, Pass/Fail Judgement, Pseudocolor, Graphical Workflows (Job)	Not listed
<b>Measurement Time</b>	Approx. 2.6s	Approx. 2s	Not Listed	Approx 2 Secs	Approx. 2s	Not listed
<b>Repeatability</b>	MAV/SCI: $\Delta E^* \leq 0.03$	0.04 $\Delta E^*ab$ on white ceramic	<0.03 CIElab dE* max on white ceramic tile	Colorimetric Repeatability (20 Readings): $\Delta E^* < 0.05$ CIE L*a*b* on white tile	Standard deviation within $\Delta E^*ab$ 0.02	0.01 $\Delta E94$ (10 consecutive measurements on white)
<b>Inter-instrument Agreement</b>	Within $\Delta E^*ab$ 0.15 (Average for 12 BCRA Series II colour tiles)	0.13 $\Delta E^*ab$ avg. (8mm)	0.15 CIElab dE*avg of 12 BCRA tiles	$\Delta E^* < 0.15$ CIE L*a*b* (Avg) on BCRA II Tile Set	within $\Delta E^*ab$ 0.12 (MAV/SCI) Average for 12 BCRA Series II color tiles compared to values measured with the master body.	0.1 $\Delta E94$ (average of 12 BCRA II tiles)
<b>Size (L x W x H)</b>	184 x 77 x 105mm	213 mm x 91 mm x 109 mm	235mm x 90mm x 99mm	267mm x 109mm x 139mm	81.2mm x 93.3mm x 228.6mm	87 x 110 x 188 mm
<b>Weight</b>	Approx. 600g	1.06 kg	1.25 kg	1kg	Approx. 660g	Approx. 700g
<b>Power Source</b>	Li-ion battery. 5000 measurements within 8 hours	Li-ion, 1000 measurements (non-UV) @ 10 sec intervals	Rechargeable Li-ion Battery >2,000 measures/charge	Alkaline or Ni-Metal-Hydride (4000 measurements)	Rechargeable Lithium-ion battery, USB bus power (approx.1.000 measurement/charge)	Internal rechargeable battery
<b>LED Light Source Life Span</b>	3 million measurements	Approx. 500,000 measurements	Not Listed	> 1 million flashes	>1 million	Not listed
<b>Display</b>	3.5-inch TFT colour LCD, Capacitive Touch Screen	Backlit Color Graphic LCD	Colour display	5.8 cm x 5.8 cm (2.3 in. x 2.3 in.) backlit LCD, blue monochrome	2.7-inch TFT color LCD	3.5 " Color Touchscreen
<b>Interface</b>	USB, Bluetooth 4.0	USB 2.0, Bluetooth	USB, Bluetooth wireless	USB 2.0	USB2.0, Bluetooth™ (optional)	USB port
<b>Data Memory</b>	Standard 2000 Pcs, Sample 20000 Pcs	Standard 1000 Pcs, Sample 4000 Pcs	>2,000 standards with tolerance, max 500 batches per standard	Not Listed	Standard 1000 Pcs, Sample 5000 Pcs	Standard 4000 Pcs, Sample 10000 Pcs
<b>Language</b>	English, French, German, Spanish, Portuguese, Chinese	English, German, French, Spanish, Italian, Portuguese, Chinese Simplified, Chinese Traditional, Korean, and Japanese	English, French, German, Portuguese, Simplified Chinese, and Spanish	Chinese, English, French, German, Italian, Japanese, Spanish	English, German, French, Italian, Spanish, Portuguese, Russian, Turkish, Polish, Chinese (Simplified), Japanese	English, German, French, Italian, Spanish, Russian, Japanese, Chinese
<b>Gloss Measurement</b>	No	No	No	No	Yes	Yes

Summary Strengths TR 520 vs X-Rite CI64	Summary Strengths TR 520 vs Datacolor Check 3	Summary Strengths TR 520 vs MiniScan EZ 4000	Summary Strengths TR 520 vs CM-26dG	Summary Strengths TR 520 vs Spectro2guide
Lower price	Lower price	Lower price	Lower price	Lower price
Free OnShade software	Free OnShade software	Free OnShade software	Free OnShade software	Free OnShade software
Touchscreen	Touchscreen	Touchscreen	Touchscreen	More Colorimetric options
More Data Memory	More Colorimetric options	More Colorimetric options	More Colorimetric options	Faster measurement time
	More Data Memory	More Interface options	More Data Memory	More Interface options
		More Data Memory		More Data Memory



## Features and Benefits

Features	Benefits
State-of-the-Art technology at the right price.	<ul style="list-style-type: none"> <li>Minimise your cost for maximum performance.</li> </ul>
Compact and modern design.	<ul style="list-style-type: none"> <li>The TR Series takes up very little workspace as a handheld or benchtop unit while being used.</li> <li>The TR unit is supplied in a hard carry case enabling secure transportation for use anywhere.</li> <li>The TR unit and core accessories can be securely stored within its carry case when not in use.</li> </ul>
Long-Life white LED light source.	<ul style="list-style-type: none"> <li>Help avoid extra costs and disruption to work by avoiding the need to replace lamps regularly.</li> </ul>
Calibration Plate: Incorporating a White Tile and a "Black Trap"	<ul style="list-style-type: none"> <li>The TR Series needs to be calibrated every day before use, the calibration plate makes this quick, easy, and hassle-free.</li> </ul>
Rechargeable and removable Li-ion battery pack	<ul style="list-style-type: none"> <li>Maintain a clutter-free workspace as TR Series can be used free of any cabling.</li> <li>Due to low power consumption the TR unit can be powered and charged from an external battery pack making it extremely portable.</li> <li>Battery pack is easy to replace.</li> </ul>
Dual communication and charging port via USB	<ul style="list-style-type: none"> <li>No need to worry about the battery running low as the TR instrument can be used whilst charging via USB/DC Power Port.</li> </ul>
Onboard memory and data management	<ul style="list-style-type: none"> <li>The TR Series enables at least 1,000 standards and 20,000 samples to be stored ensuring the user has more than enough space for measurements.</li> <li>Easy-to-use record search functions allow quick retrieval of data.</li> </ul>
The TR Series measures absolute and difference measurements in various colorimetric systems	<ul style="list-style-type: none"> <li>Easy to match established internal and customer colour specifications.</li> </ul>
TFT LCD (Thin-film-transistor liquid-crystal display) colour touchscreen	<ul style="list-style-type: none"> <li>The touchscreen is easy to use and very responsive ensuring the instrument is simple and intuitive to navigate around the settings.</li> </ul>
Simple and elegant icon-based software	<ul style="list-style-type: none"> <li>The nature of the instrument ensures even inexperienced operators can be quickly and easily trained.</li> </ul>
PC OnShade Software included for FREE	<ul style="list-style-type: none"> <li>Each instrument ships with our Onshade PC software package with powerful extended functionality, allowing more detailed data analysis.</li> <li>Local Storage of Data is effectively unlimited.</li> <li>Reports can be easily exported (Excel) and printed.</li> <li>The software enables the data can be even more easily visualised.</li> </ul>
USB and Bluetooth connectivity	<ul style="list-style-type: none"> <li>Quick and flexible connection options.</li> </ul>
Supplied with all the required core accessories	<ul style="list-style-type: none"> <li>Instruments are sent out with all accessories required for the unit to be used straight out of the box.</li> </ul>

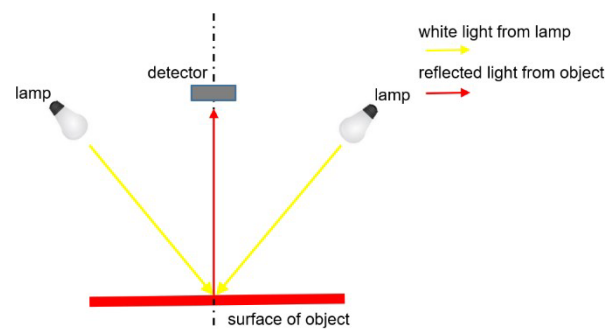
## Difference Between the TR Instruments

### The Difference Between a 45°/0° and a Sphere (aka diffuse/8°) Measurement

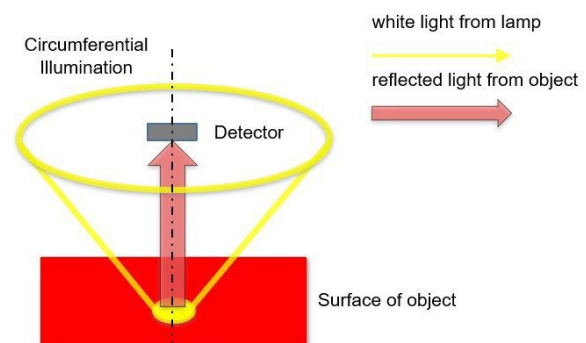
In the Reflectance market, two types of spectrophotometers are commonly used. Sphere (aka diffuse/8°) found in the TR 500 & TR 520 instruments and 45°/0° found in the TR 515. This is how the two devices measure colour, and how best to use them.

#### 45°/0°

In a “fixed geometry” or “single angle” device, the first number is the start point of the light, and the second is where the light ends up after reflecting off the sample. In a 45°/0°, the light source is set at 45° and the detectors are set directly above at 0°.



The TR 515 utilises **Circumferential Illumination**. When taking a reading a cone of light illuminates the sample evenly. Hence the orientation of the instrument will not cause variations in readings.



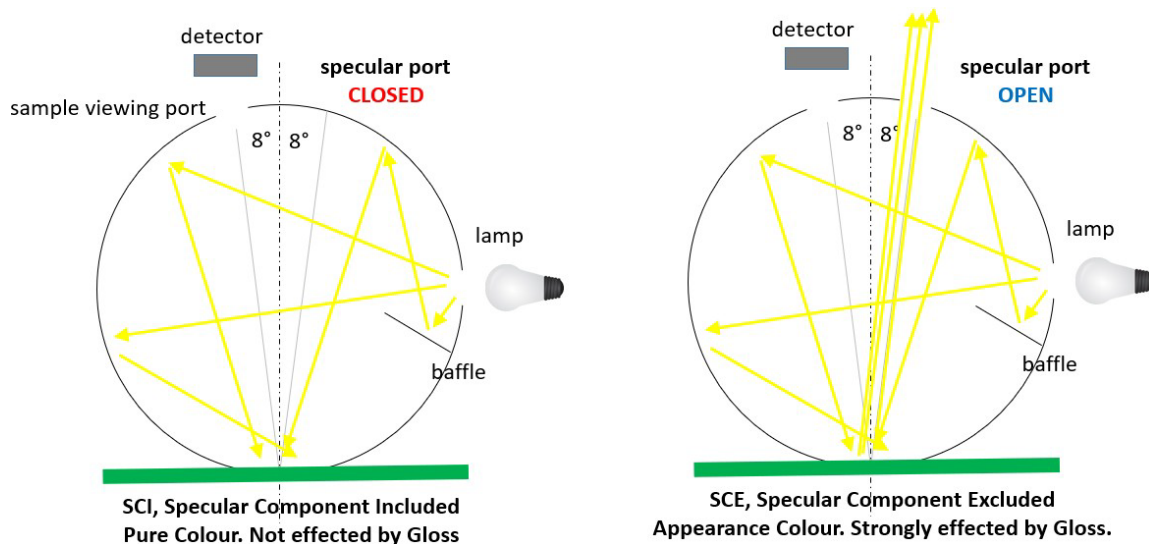
A 45°/0° is perfect for measuring colour on smooth and matte surfaces. This is because it captures the reflection from a sample just as the human eye would see it. They are sometimes used to measure smooth and glossy surfaces, but 45°/0° excludes surface appearance. The sample may measure as darker and more saturated than it is.

Looking at the image you can see one side is matte, and the other has a gloss coating. Although they are the same colour black, the readings will not match when measured using a 45°/0° geometry instrument. The glossy side will appear darker and more saturated, while the matte side will appear lighter. This is due to the difference in direct reflection (glossy side) vs. scattered reflection (matte side).



## Sphere (diffuse/8°)

The sphere has a white inner surface and a small circular aperture, against which the sample is placed to allow colour measurement. Baffles stop direct illumination of the sample; light reflects within the sphere and onto the sample. Additional apertures allow light to enter and leave the sphere at defined angles.



A key feature of the sphere instrument is the ability to measure in either specular included (SPIN, SCI) or specular excluded (SPEX, SCE) modes. Specular included eliminates the effect of specular reflection off the surface of a sample. Measuring pure colour, not appearance. Specular exclusion includes the surface appearance in the measurement.

As an example, let's look at our glossy and matte black sample again. If you measure both matte and gloss sides using the specular included, the resulting measurements should be similar. If you measure them both using specular excluded, the numbers will be farther apart, like a 45°/0°.

### Which one to use?

When it comes to spectrophotometers, one size does not fit all. To determine the best instrument for a customer, you must understand their requirements. Our "Discovery Questions" can help you gather this initial information. Our expert Support Team is very happy to provide further advice and assistance.

## Discovery Questions

### **Does the customer have any specific requirements for the instrument?**

*Performance tolerances, measuring area, measurement geometry (d/8°, 0°/45° etc.), specific illuminants (A, D65, F2, F11, etc.), internal memory, software, benchtop/portable, particular colour spaces/colour difference calculations etc.)*

### **What is the purpose of the colour measurement?**

*Internal QC, colour matching, reporting to customers, incoming inspections, outgoing inspections, colour formulation (which we do not provide!) etc.*

### **Where will the unit be used?**

*QC Lab, factory floor, office, outside etc.*

### **What is the nature of the samples being tested?**

*Are they flat or curved, matt or glossy, powders, pastes, gels, pellets etc? A photograph can be very useful – a picture tells a thousand words.*

### **Are the samples transparent liquids?**

*If YES, maybe a transmission option (PFXi, E Comparator, Model F, Comparators etc.) would be better. If NO, carry on.*

### **Is the measurement to be carried out in a standard colour scale e.g. Lovibond, ASTMD1500, Saybolt, AOCS-Tintometer, FAC etc.?**

*If YES, the customer will most likely need to melt/filter their samples to make them completely transparent and then measure them in a transmission instrument.*

### **What are the sizes of the samples?**

*For a range of sizes, please provide details.*

### **Does the customer also want to measure the gloss of their samples?**

### **Does the customer want to visually evaluate the overall appearance of the product under controlled lighting?**

### **What is the customer's budget?**

*We have reflectance instruments with prices ranging from £1,500 to £ 14,000, so we probably have something they can afford, but a small budget does restrict choice.*

### **Is the customer replacing or trying to match an existing instrument?**

*Please confirm the details of the other instrument, so our suggested option can agree as closely as possible with the existing measurements.*

### **Does the customer want multiple units for carrying out the same type of readings over several sites? If YES, how many?**

### **Are there any other requirements or information that you think might be relevant?**

## How to Demo the TR Series

### Opening the Box – What’s Inside It?

- TR Series Instrument
- What and Black Calibration Board
- Dust Cover
- USB Cable
- External Power Supply
- USB Stick with User Manual
- Adjustable Aperture if Applicable to Instrument



Figure 1: What's inside the TR Series case

### Turning the Unit On/Off

Setting the power switch to “1” will turn the power ON and setting the power switch to “0” will turn the power OFF. When switching the unit on the LED light on top of the unit will turn green and the Lovibond® logo will appear on the screen.

The instrument will automatically turn OFF after a long period of no operation (aka soft power OFF).

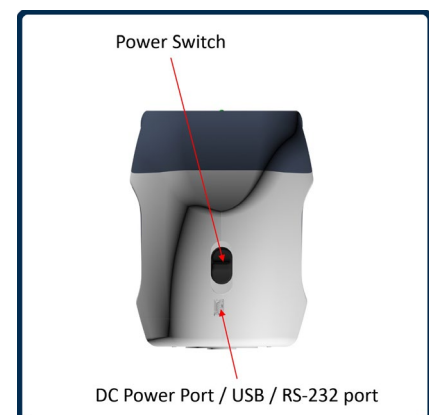


Figure 2: TR Series power switch

### Calibration

**It's important to show how easy the unit is to calibrate and how quickly it can be done.**

Select “Calibration” to enter the white and black calibration interface. Click “→” to continue and enter “White Calibration” then put the measuring aperture on the white plate and press the “Measurement” button for white calibration. After the white calibration, it will prompt you to carry out the black calibration. Per the warning, put the measuring aperture on the black plate and press the “Measurement” button for black calibration.

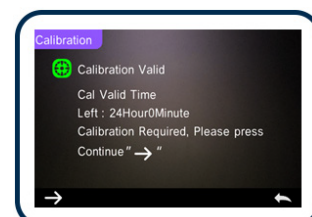


Figure 3: Calibration interface

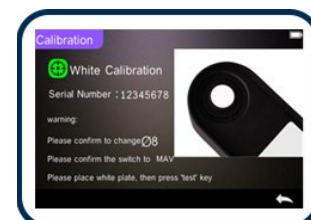


Figure 4: White calibration

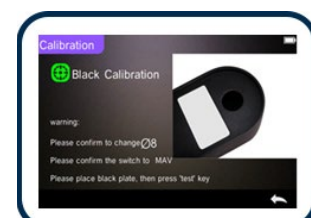


Figure 5: Black calibration



## Colour Scales and What They Do

Talk through the colour spaces that are used on the TR units and ensure the customer has a basic understanding of what they do and mean.

It's important that the customer has a basic understanding of how the colour is measured and why.

Please remember we have several tools available to help. You can use our visual reflectance tools, or the customer can be signed up for our online learning portal to gain a better understanding.

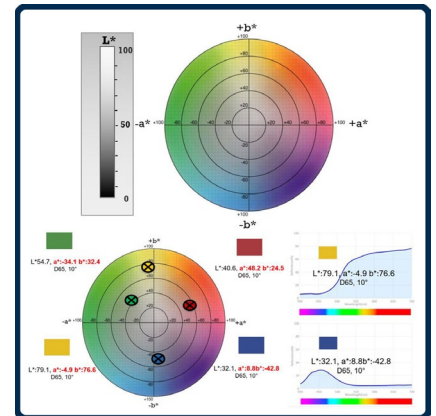


Figure 6: Example visual reflectance tool

## Take a Measurement

It's important to show how easy the unit is to use and how accurate it is. This will need to be done with the accessory stand as well as a handheld unit.

To carry this out you will require a couple of cards with two similar, but different, colours (local DIY and paint stores can be a useful source of these). To demo the Accessory, two liquids or powders of a similar, but different colour, can be used instead.



Figure 7: Example colour card

### Take a standard measurement


Enter the "Standard Measurement" menu to perform measurements.

Put the measuring aperture securely over the standard sample and press the "Measurement" button. The instrument will emit a **beep**, and the LED indicator light will turn green from red. The instrument will then display the measurement as per Figure 8 and Figure 9.



Figure 8: Display of standard measurement

### Take a sample measurement

After measuring the standard, click  to enter the Sample Measurement interface.

Position the measuring aperture over the sample to be measured and press the "Measurement" button. The instrument will emit a **beep**, and the LED indicator light will flash red to green. The results of the measurement will be displayed. Sample measurement is like Standard measurement, but it will display the colour difference between the current Standard and the measured Sample.

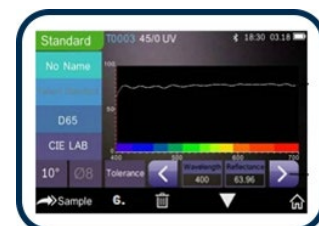


Figure 9: Display of standard measurement

## Show the results

As you are using different colour shades with the standard and sample measurements the unit will show a colour difference and **“Fail”**. **It's important for the customer to see that a different shade of the same colour will produce result of a failure.**

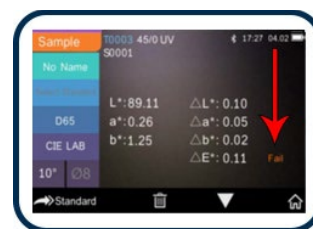


Figure 10: Fail

## Take a sample measurement

To show the unit's accuracy, take another sample measurement but use the original colour used for the standard measurement. **This will then show as a “Pass” on the screen and ensure the customer can see the accuracy of the unit.**

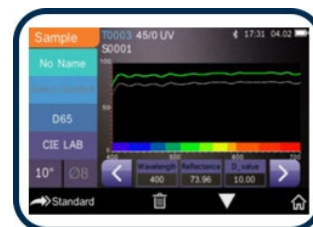


Figure 11: Colour difference

## Taking a measurement with the TR Accessory

If the customer's sample is going to be a material that would require the TR Accessory, please place the sample and standard in a Lovibond glass cell provided with the accessory and place the unit in the stand to take a measurement. **Follow the about steps to ensure the customer can see the accuracy of the unit.**

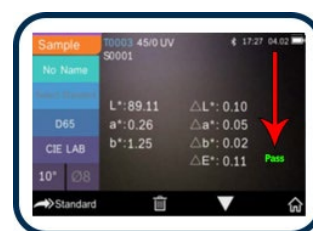


Figure 12: Pass

## FREE OnShade Software

Our OnShade software is a powerful selling point for the TR Series. **It's important for the customer to see the software in action and know that it comes FREE when purchasing any TR unit.**

### Setting up OnShade software

Before carrying out a demonstration please ensure the software has been installed on your laptop. Many of the functions will be disabled until you have connected the unit to the software.

### Connecting the instrument

Before using the software, you must connect the unit to a PC and then calibrate the black and white plate. The instrument can be connected via a USB cable or Bluetooth.

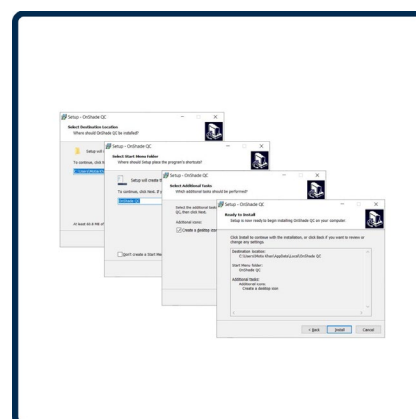


Figure 13: Installing OnShade Software

## USB cable connection

If the software is already open, the instrument will automatically be detected and connected; otherwise, it will automatically connect to the instrument when the software is loaded. The status on the bottom right hand of the system should show as "Connected." If the status says "Disconnected," you can manually click "Connect" under the "Instrument" menu.

## Bluetooth connection

You can connect via Bluetooth by following these steps:

- Make sure that the PC's Bluetooth device is turned on.
- Turn on the Bluetooth in the System Setting of the instrument (refer to the instrument's user manual for instructions).
- From the OnShade system menu select "Instrument">"Connection Way">"Connect by Bluetooth". If this has already been selected, then click "Connect" (Figure 15).

From the pop-up menu select the device i.e., the Lovibond instrument to connect and then click "OK." The Bluetooth device of the instrument is usually in the form of "Lovibond" plus the serial number of the instrument. If the serial number of the instrument is "960900", then the Bluetooth name will be "Lovibond-SN960900".

## Operation Instructions

### Main interface introduction

When you open the OnShade software, the main user interface is displayed in Figure 16, this includes the following:

1. Menu
2. Toolbar
3. Sample Tree
4. Data Sheet
5. Charts
6. Status Bar

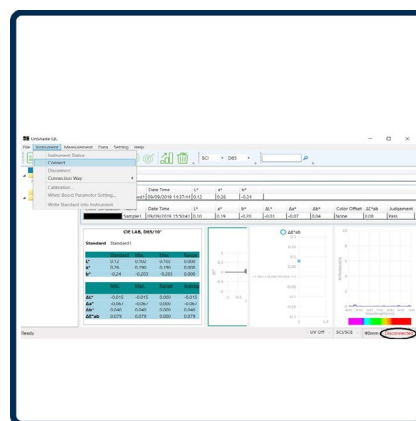


Figure 14: Connect instrument via USB

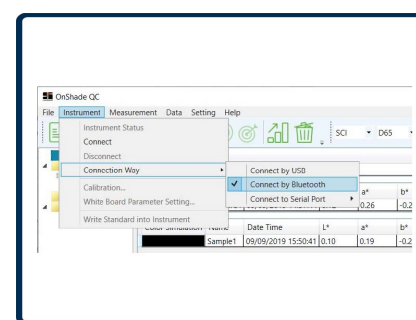


Figure 15: Connect instrument via Bluetooth

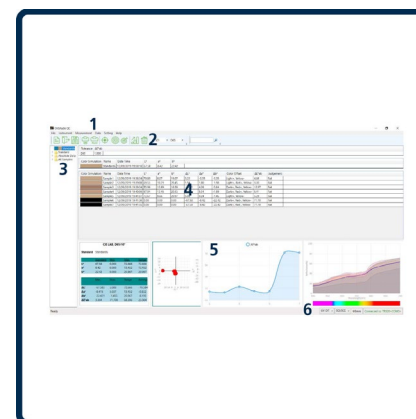


Figure 16: Main interface

## Calibration

**It is recommended that the instrument is re-calibrated when connecting to OnShade.**

To do this follow the steps below.

1. From the menu select "Instrument" and then "Calibration" or click the Calibration icon from the toolbar see Figure 17.
2. Confirm the current measurement aperture and whiteboard number and then click "OK" to proceed to whiteboard.
3. You will see a prompt to align the measuring aperture with the whiteboard of the calibration box. Ensure alignment and click "OK" to continue. White calibration will be repeated three times
4. Once the white calibration is successful, a dialogue box will appear. Align the measuring aperture with the blackboard and click "OK" to continue. The black calibration is also repeated three times.
5. On the successful calibration of the black, the calibration cycle is completed, and you will see a confirmation on the screen. Click "OK" to continue.

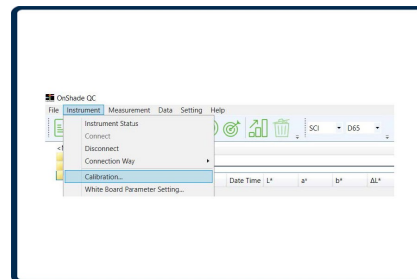


Figure 17: Calibration

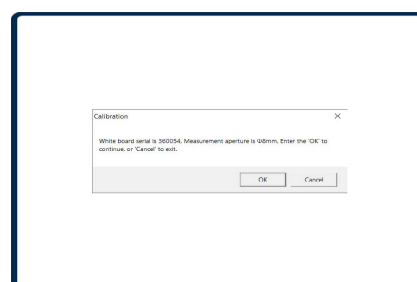



Figure 18: Whiteboard calibration

## Take a standard measurement

1. Align the measuring aperture tightly with the standard sample and keep the instrument stable during measurements.
2. From the menu select "Measurement">"Measure Standard" (Figure 19) or click the Standard Measure icon  from the toolbar or use the shortcut key F5.

The results of the measurements are stored in the Standard section.

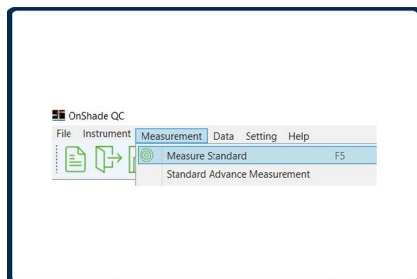



Figure 19: Standard measurement

## Take a sample measurement

1. Align the measuring aperture with the sample to be measured and keep the instrument stable.
2. From the menu select "Measurement">"Measure Sample" (Figure 20) or click the Sample Measurement icon  from the toolbar or use the shortcut key Space.

The results of the sample measurements are stored under the current standard.

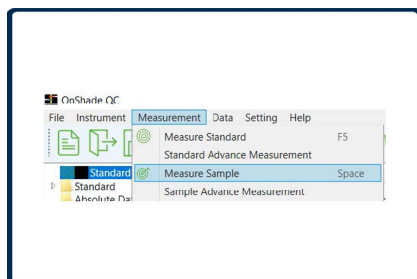


Figure 20: Sample measurement

## Extra Support

**We have many tools to help and support you through the sales process.**

### Discovery Questions

We have a list of questions to ask the customer to help you understand what TR Series instrument would best suit their needs. These questions can be found in our “TR Series Play Book”.

### Product Videos

We have produced a video that offers a general overview of the TR Series, this video can be shown to your customer to give a better understanding of how the unit works. We also have a video showing how to use the TR Series accessory.

### Online Learning

We have online learning on general colour measurement and TR Series-specific training. This training is available to both you and the end user. Please contact [support@lovibond.uk](mailto:support@lovibond.uk) for more information on the training.

### Reflectance Glossary

Understanding all the terminology of reflectance colour measurement can be difficult, so we have put together a glossary of all the most used terms to help both you and your customer understand the TR Series and colour measurement in general. This can be found in your TR Series marketing/sales pack.

### Colour Visual Tools

Sometimes it can be difficult to explain how colour measurement works, so we have made some visual tools that will help you explain colour measurement to your customer during the demonstration. These tools can be found in your TR Series marketing/sales pack.



Figure 21: Lovibond video

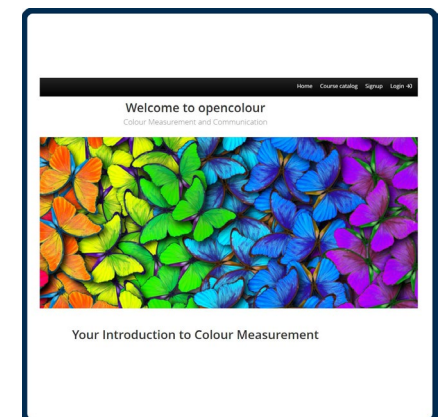


Figure 22: Lovibond online learning

# TR Series Testimonial



## How important is colour management in food and drink?

*New Food finds out how food producer anona ensures colour consistency in its products and why measuring and managing colour is so crucial for food and beverages.*

**C**LOUR MANAGEMENT plays an essential role in the food industry. With the documentation of the colour conditions from the raw material to the end product, raw material and product-specific properties can be recorded. This allows differences in the respective production batches to be localised and, if needed, action to be taken.

In addition, raw materials and products undergo an ageing process (including oxidation) during storage depending on the prevailing environmental conditions (temperature, humidity, packaging type and packaging material). This can manifest in a variety of ways, such as a reduction in colour intensity (eg, carotenoids) and can also influence smell and taste.

An significant factor in reducing the progressive ageing process of products is compliance with the specified storage conditions.

### Meeting expectations

Storage tests to determine the stability of raw materials and products are carried

out continuously so that a colour change in the product over time is documented in the respective product specifications. If the actual colour does not correspond to the stored product specifications, the product purchased by the end user will be checked internally and, if necessary, externally, and a statement will be made. If the specified storage conditions are correctly observed, the consumer will be reimbursed for their financial outlay. If a product is to be recalled entirely due to a lack of appearance, internal review mechanisms are initiated, such as reviewing the raw materials, packaging materials and the packing records.

### Measuring colour

In our case, the measurement and documentation of a product's colour happens in the first stage of product development within the R&D department. The long-term colour stability of the product during storage is checked at the same time.

Conducting colour measurement during the development phase affords the benefit of advance information around colour

stability. Moreover, it is also possible to adapt the product in accordance with a customer's wishes, for example by exchanging raw materials or adjusting their quantity.

Following the production and packaging process, reference samples are handed over to the quality assurance and R&D departments, where they are again subjected to a long-term stability test, including recording the colour change over time. This is useful as it can be used for customer enquiries or complaints.

### The right tools

Before using the Lovibond® TRA 500 and integrating colour management, it was not possible to accurately determine how the colour of our products would change over time. Evaluations were conducted but these were subject to error.

We chose the mobile device so that we could use the same equipment across different departments. This allows us to spot differences in colour from raw materials to packaging materials more quickly. Another important consideration for us was the operation of the colour



Measuring colour with the Lovibond® TRA 500

measuring device, which had to be simple and clear so that even inexperienced employees could quickly learn how to use it. By integrating the TRA 500 into day-to-day business, we were able to increase our quality standard and improve customer satisfaction.

The device enables us to precisely identify colour deficiencies in our products during the storage test.

Through preliminary analysis, any raw materials that cause an accelerated colour change in the product could be identified and substituted by other raw materials. As a result, the consistency of our products has greatly improved.

### Trending colours

Due to consumers' increasing environmental awareness, the trend

is towards natural colours such as leaf green or sand. These give the impression that the product contains health-promoting substances both in terms of physical and mental wellbeing for oneself as well as planetary health.

This trend is being further driven by the move away from animal-based ingredients, with more natural colours reflecting plant origin – hence its use within the plant-based category.

Colours that reflect nature can have a positive impact on the consumer's state of mind too.

We foresee the use of natural colours gaining more momentum in the future, as consumers become hyperaware of their economic footprint. □



**Thomas Papert**

Thomas is the Product and Process Engineer within the Research and Development (R&D) department at Anona GmbH. He has a Master's degree in Science Biotechnology

and represents the intersection between the R&D department and production. Thus, he is responsible for the smooth running of the production chain as well as the optimisation of the underlying process.

## EXPERT VIEW



**Matthew Russell**  
Product Manager, Tintometer



For further information, visit [www.Lovibond.com](http://www.Lovibond.com)

## It needs more 'zing'

Defining the colour of a product accurately and consistently is of vital importance in any industry; Matthew Russell explains.

Direct visual assessment is subjective. Humans suffer from retinal fatigue, very poor colour memory and colour blindness (one in 12 men and one in 200 women). Background effects (eg, colour viewed over black looks different to over white) and lighting (eg, daylight vs. a dimly lit office) will hugely hinder accurate colour assessment.

Furthermore, colour communication entails imprecise verbal descriptions. Phrases such as 'it's too pinkish', 'lighter', 'darker', 'needs more zing', or 'it's off colour by five percent' are not uncommon.

Fortunately, the food industry has a long history of measuring the colour of products using instrumentation. Early in the 20th century, our founder, Joseph Lovibond, was providing colour

measurement instruments, known as Tintometers, to the brewers of Southern England.

The early adoption of colorimeters and spectrophotometers provided precise, objective and absolute data.

The logic for implementing colour measurement is as valid today as it was over a century ago. A clear and precise description of colour standards and tolerances is critical when:

- Specifying a material when sourcing it
- Communicating colour within the wider supply chain
- Inspecting incoming materials
- Conducting continual production quality control
- Inspecting final/outgoing products

- Guaranteeing compliance with national and international standards.

For example, in the global edible oil and fat industry, the colour of transparent samples is most commonly expressed in terms of Lovibond® RYBN colour (red, yellow, blue and neutral) using Lovibond instruments. This ensures consistent and controlled communication across the supply chain.

Reliable and repeatable colour test results are of course key. In addition, speed of analysis can be vital for efficient process control. Simplicity of operation also helps to reduce errors and increase productivity. All these qualities can be achieved using 21st century colour measurement techniques and technology.

# Lovibond® Colour Measurement

Tintometer® Group



## TR Series of Spectrophotometers



The best of both worlds with the TR Series of handheld and benchtop spectrophotometers



[www.lovibond.com](http://www.lovibond.com)

## The TR Series



Colour measurement plays a vital role in quality control across many industries, helping to ensure accuracy, efficiency, cost-effectiveness, consistency in product, brand image and compliance with regulations and industry standards. The Lovibond® TR Series offers accurate and reliable colour management that fits in the palm of your hand. The ergonomic design makes the series convenient for use on the plant floor, production line and warehouse or in a laboratory. The TR Series is perfect for the whole manufacturing process.

### How can the TR Series Help you?

**Consistency:** Colour is often a critical factor in determining the quality of a product. Manufacturers need to ensure that the colours of their products are consistent to meet customers' expectations. By using the TR Series, you can ensure your products meet these standards.

**Accuracy:** The TR Series can identify any variations in colour, enabling manufacturers to take corrective measures and ensure that the products meet the required standards.

**Efficiency:** Manufacturing processes often involve the use of colourants or dyes. By measuring the colour of these materials, manufacturers can ensure that they are using the correct amount of colourant and avoid waste. The TR Series can help reduce costs and improve efficiency in the manufacturing process.

**Cost-effectiveness:** Accurate colour measurement helps in reducing waste, rework, and the need for multiple iterations, leading to cost savings for the manufacturers.

**Branding:** The colour of a product is often a key part of its branding and marketing. Customers may associate a particular colour with a brand, and manufacturers need to ensure that their products are consistent. By using the TR Series, you can ensure products match the desired brand colour and help maintain a strong brand image.

**Compliance:** Some industries, such as food and pharmaceuticals, have strict regulations regarding the colour of their products. By using the TR Series, you can ensure that products comply with these regulations and avoid potential legal issues.



- 1 Measurement trigger for convenient and quick measurement
- 2 TFT LCD colour touch screen with on-board camera based locator
- 3 Aperture switch offering convenient adjustment from large (10mm/8mm) to small (5mm/4mm)
- 4 Measurement aperture providing greater flexibility
- 5 Battery pack suitable for 5000 measurements
- 6 Power switch
- 7 DC power port / USB / RS-232 port
- 8 Quick and easy to use calibration board
- 9 White calibration plate
- 10 Black calibration trap



**Automotive:** With colour and visual appearance playing such an important role in the finished product throughout the industry, having a comprehensive colour measurement and quality control process is essential. The TR Series enables an exact colour match to be achieved across the manufacturing process, from the lab to the supplier to the paint shop to the assembly line.



**Food & Beverage:** Controlling the colour of materials enables the food producer to reject any that is substandard before offloading, during processing and prior to shipment. This guarantees that the final colour satisfies the consumers' expectations. So, whether you produce finished food products, drinks, powders, cereals, pastes, granules, or gels our TR Series will have a solution for you.





**Pharmaceutical & Cosmetics:** In the pharmaceutical and cosmetics industries it's crucial every component is chosen carefully, and the colour is an important part of that decision. With a variety of textures and wet surfaces, such as powders, creams, and liquids it can be a challenge for manufacturers to ensure colour consistency. The TR Series and software provide you with the peace of mind of a colour match through the manufacturing process.



**Paint & Coatings:** The communication and quality control of the colour of coatings is fundamental in the aesthetic design of so many products. Whether paint, powder coatings or varnishes; factors such as the type of substrate, viewer, light source, and batch variation can make colour control a challenge. The TR Series can provide you with the tools to manage the subjective visual elements of your design and quality processes.



**Plastics:** From raw material through to the finished product the TR Series can monitor the colour variables during the manufacturing process, while our FREE OnShade software can help share colour data among the supply chain.

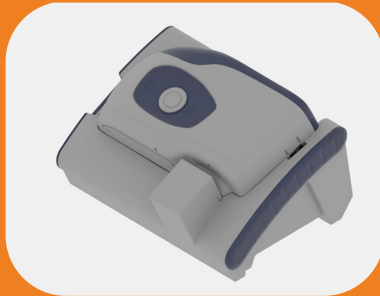
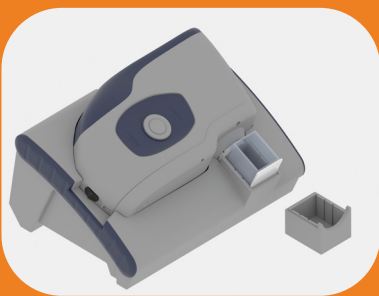


**Textiles:** Whether you are checking dye baths for consistent strength or correcting for metameric effects of different weaves in your supply chain, the TR Series can help you communicate and control colour from the design and manufacturing process through to retail.

## TRA Stand

The TRA portable instrument stand is supplied with both the TRA 500 & TRA 520 converting your handheld device into a benchtop unit. The TR stand provides you with the opportunity to measure problematic samples using our optical cells and white background plate to ensure a consistent measurement within a controlled environment.

- Perfect solution for colour measurement of liquids, gels and powders
- Designed for easy touch screen operation and on-board camera locator viewing
- Supports a wide variety of samples with optical glass cell sizes of 10, 20 and 30mm
- Designed to ensure no ambient light can influence the reading
- Light-weight and portable

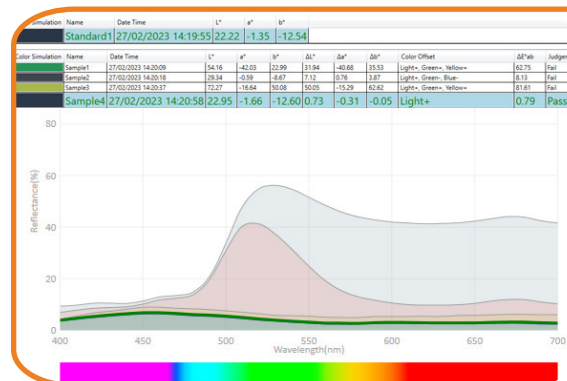


## Quality Control Software

Colour quality control software is used to ensure that products are produced with consistent and accurate colour throughout the manufacturing process. This software provides manufacturers with a way to measure, monitor, and control the colour of their products, which is essential in many industries.

The OnShade software makes a substantial expansion of the instruments functionality to support various colour systems, illuminants, more complicated data management, colour detection and report generation.

At Lovibond® we understand how important quality control is so we ensure that our OnShade software is included with the purchase of every TR Series instrument.



# TR Series Specifications

## TR Series Specifications

<b>Spectral Device</b>	Concave Grating	<b>Display Data</b>	Spectrogram/Values, Samples Chromaticity Values, Colour Difference Values/Graph, Pass/Fail Result, Colour Offset
<b>Detector</b>	256 Image Element Double Array CMOS Image Sensor	<b>Measurement Mode</b>	Single Measurement, Average Measurement
<b>Wavelength Range</b>	400-700nm	<b>Size (L x W x H)</b>	184 x 77 x 105mm
<b>Wavelength Resolution</b>	10nm	<b>Weight</b>	Approx. 600g
<b>Half Bandwidth</b>	10nm	<b>Power Source</b>	Li-ion battery. 5000 measurements within 8 hours
<b>Reflectance Range</b>	0-200%	<b>LED Light source Life Span</b>	3 million measurements
<b>Colour Space</b>	CIE Lab, XYZ, Yxy, LCh, CIE LUV, Hunter LAB	<b>Display</b>	3.5-inch TFT colour LCD, Capacitive Touch Screen
<b>Colour Difference Formula</b>	$\Delta E^*_{ab}$ , $\Delta E^*_{uv}$ , $\Delta E^*_{94}$ , $\Delta E^*_{cmc}$ (2:1), $\Delta E^*_{cmc}$ (1:1), $\Delta E^*_{00v}$ , $\Delta E$ (Hunter)	<b>Working Environment</b>	Altitude: less than 2000 m
<b>Observer Angle</b>	2° / 10°	<b>Storage Environment</b>	Temperature: 0~40°C; Humidity: 0~85% (No Condensation)
<b>Interface</b>	USB, Bluetooth 4.0		

	TR 520 / TRA 520 Specification	TR 515 Specification	TR 500 / TRA 500 Specification
<b>Optical Geometry</b>	Reflect: di:8°, de:8° (diffused illumination, 8-degree viewing angle)	45°/0° (45° ring-shaped illumination, vertical viewing);	Reflect: di:8°, de:8° (diffused illumination, 8-degree viewing angle)
<b>Light Source</b>	Combined LED Light, UV Light	Combined LED Light, UV Light	Combined LED Light
<b>Measuring Aperture</b>	Dual Aperture: 10mm / 8mm & 5mm / 4mm	MAV: Ø8mm / Ø10mm; SAV: Ø4mm / Ø5mm	Customized Aperture: 8mm / 4mm / 1×3mm
<b>Other Colorimetric Index</b>	WI (ASTM E313, CIE/ISO, AATCC, Hunter) YI (ASTM D1925, ASTM E313) TI (ASTM E313, CIE/ISO) Metamerism Index MI, Staining Fastness, Colour Fastness, Colour Strength, Opacity	WI (ASTM E313, CIE/ISO, AATCC, Hunter) YI (ASTM D1925, ASTM E313) MI (Metamerism Index) Staining Fastness, Colour Fastness, Colour Strength, Opacity	WI (ASTM E313, CIE/ISO, AATCC, Hunter) YI (ASTM D1925, ASTM E313) TI (ASTM E313, CIE/ISO) Metamerism Index MI, Staining Fastness, Colour Fastness, Colour Strength, Opacity
<b>Illuminant</b>	D65, A, C, D50, D55, D75, F1, F2 (CWF), F3, F4, F5, F6, F7 (DLF), F8, F9, F10 (TPL5), F11 (TL84), F12 (TL83/U30)	D65, A, C, D50, D55, D75, F1, F2 (CWF), F3, F4, F5, F6, F7 (DLF), F8, F9, F10 (TPL5), F11 (TL84), F12 (TL83/U30)	D65, A, C, D50, D55, D75, F2 (CWF), F7 (DLF), F11 (TL84)
<b>Measuring Time</b>	2.6 Seconds	1.5 Seconds	2.6 Seconds
<b>Repeatability</b>	MAV/SCI: $\Delta E^* \leq 0.03$	Spectral reflectance: MAV, Standard deviation within 0.08% (400 nm to 700 nm: within 0.18%) Chromaticity value: within $\Delta E^*_{ab}$ 0.05 (When a white calibration plate is measured 30 times at 5 second intervals after white calibration)	MAV/SCI: $\Delta E^* \leq 0.05$
<b>Inter-instrument Agreement</b>	MAV/SCI: $\Delta E^* \leq 0.15$	Within $\Delta E^*_{ab}$ 0.15 (Average for 12 BCRA Series II colour tiles)	MAV/SCI: $\Delta E^* \leq 0.2$
<b>Data Memory</b>	Standard 2,000 Pcs, Sample 20,000 Pcs	Standard 1,000 Pcs, Sample 30,000 Pcs	Standard 2,000 Pcs, Sample 20,000 Pcs
<b>Language</b>	English, French, German, Spanish, Portuguese, Chinese	English, Chinese	English, French, German, Spanish, Portuguese, Chinese
<b>Accessories Provided</b>	Power Adapter, USB Cable, Built-in Li-ion battery, User Manual, PC Software, White and Black Calibration Board, Protective Case *TRA Instrument supplied with TR Series stand	Power Adapter, USB Cable, Built-in Li-ion battery, User Manual, PC Software, White and Black Calibration Board, Protective Case	Power Adapter, USB Cable, Built-in Li-ion battery, User Manual, PC Software, White and Black Calibration Board, Protective Case *TRA Instrument supplied with TR Series stand

**Tintometer GmbH**  
Tel.: +49 (0)231/94510-0  
sales@lovibond.com  
Germany

**The Tintometer Ltd**  
Tel.: +44 (0)1980 664800  
support@lovibond.uk  
UK

**Tintometer Inc.**  
Tel.: +1 941 756 6410  
sales@lovibond.us  
USA

**Tintometer India Pvt. Ltd**  
Tel.: +91 (0) 40 23883300  
indiaoffice@lovibond.in  
India

**Tintometer China**  
Tel.: +86 10 85251111 App. 330  
chinaoffice@tintometer.com  
China

**Tintometer South East Asia**  
Tel.: +60 (0)3 3325 2285/6  
lovibond.asia@lovibond.com  
Malaysia

[www.lovibond.com](http://www.lovibond.com)

Lovibond® and Tintometer® are Registered Trade Marks of The Tintometer® Group. All translations and transliterations of LOVIBOND® & TINTOMETER® are asserted as Trade Marks of The Tintometer® Group. Registered Office: Lovibond House, UK. Registered in England No. 45024.  
Errors and Omissions Excepted - Content Subject to alterations without notice.

# Lovibond® Colour Measurement

Tintometer® Group



## Reflectance Glossary



## Reflectance

### Spectrophotometer

A spectrophotometer is a scientific instrument used to measure the intensity of light absorbed or transmitted by a sample as a function of the wavelength of light.

### Colour Space

A colour space is a specific way of representing colours, where each colour is defined by a set of numerical values that represent its properties, such as hue, saturation, and brightness.

### Hue

Hue refers to the dominant wavelength of light that the human eye perceives when looking at a colour. In other words, hue is what allows us to distinguish one colour from another, such as red, blue, or green.

### Saturation

Saturation is a property of color that refers to the intensity or purity of a color. It describes how much of the color is present in a particular shade, relative to grey or white.

### Brightness

Brightness, also known as value or lightness, is a property of color that describes how light or dark a color appears.

### CIE Lab

Used to describe all colours visible to the human eye. It is a device-independent colour model, meaning that it is not tied to any device, such as a computer monitor or printer, but instead describes colours in terms of their perception by the human eye.

### XYZ

It is a device-independent colour space, meaning that it is not tied to any specific display technology or printing process, and it is based on the human visual system's response to light.

### Yxy

Designed to represent colours in a way that corresponds more closely to human colour perception.

## **LCh**

LCH is a colour space that is based on the Lab colour space and is designed to make it easier to understand and work with colour. LCH stands for Lightness, Chroma, and Hue, which are the three main components used to define a colour in this colour space.

## **CIE LUV**

LUV is designed to be a device-independent colour space that represents colors based on human colour perception.

## **Hunter LAB**

Is a way to measure and analyze colour in a way that more closely aligns with human perception. The Hunter Lab colour space is based on the CIE Lab\* colour space, but it has a slightly different formula for calculating the L, a, and b values.

## **Colour Difference Formula**

The colour difference formula is a mathematical equation used to quantify the difference between two colours. The colour difference formula is used in various applications, such as colour matching, colour reproduction, and colour correction.

## **Observer Angle**

The observer angle refers to the angle at which an observer views a color sample. In colour science, the observer angle is an important consideration because the appearance of a colour can change depending on the angle at which it is viewed.

The most used observer angles in colour science are 2° and 10°. The 2° observer angle is based on the average angle at which light enters the human eye, and it is often used in applications where precise colour matching is required, such as in printing and colour calibration. The 10° observer angle is used in applications where colour appearance is more important than precise colour matching, such as in the evaluation of colour samples and visual colour assessments.

## **Optical Geometry**

Optical geometry refers to the arrangement of light sources, colour samples, and observers in a colour measurement system. Optical geometry is important in colour measurement because it affects the way that light is reflected from a colour sample and enters the instrument.

## **Measuring Aperture**

The measuring aperture in a colour measurement system refers to the size of the area from which light is collected by the instrument. The measuring aperture is important in colour measurement because it affects the amount of light that is collected, and the size of the area being measured.

## **Colorimetric Index**

A colorimetric index is a numerical value that describes a specific colour characteristic of an object or substance. Colorimetric indices are used in colour measurement and analysis to provide a quantitative measure of a colour property, which can be used for quality control, process control, and colour matching.

## **Whiteness Index (WI)**

The whiteness index is a colorimetric index that measures the whiteness or brightness of a material compared to a standard white reference material. It is often used in industries such as paper, textiles, and coatings, where brightness is an important factor in product quality.

## **Yellowness index (YI)**

The yellowness index is a colorimetric index that measures the degree of yellow colour in a material. It is often used in industries such as plastics, coatings, and textiles, where yellowing can be a sign of product degradation or ageing.

## **Titanium Index (TI)**

The titanium Index is a measure of the colour and opacity of a paint film and is commonly used in the paint industry to evaluate the performance of titanium dioxide pigment in paints and coatings.

## **Metamerism Index (MI)**

Metamerism Index (MI) is a colorimetric index that measures the degree of color difference between two samples when they are viewed under different lighting conditions.

Metamerism is a phenomenon in which two samples that match under one light source may appear different when viewed under another light source. This is because different light sources have different spectral distributions, which can cause colour differences to become pronounced.

## **Staining Fastness**

Staining fastness is a measure of a material's ability to resist the transfer of colourants or other substances to other materials when they are in contact with each other. It is an important property for materials that meet other materials, such as textiles, leather, and paper, as staining can negatively impact their appearance and functionality.

## **Colour Fastness**

Colour fastness is a term used to describe a material's ability to retain its original colour under various conditions such as exposure to light, washing, rubbing, and other environmental factors. Colour fastness is an important property for materials such as textiles, paints, and plastics, as it can affect their appearance, durability, and functionality.

## **Colour Strength**

Colour strength is a measure of the concentration or saturation of a colourant in a material or solution. It is commonly used in the printing, textile, and paint industries to describe the intensity or vibrancy of color.

## **Opacity**

Opacity refers to how much light can pass through colour, or how much it obscures what is behind it. Colours can range from completely transparent (allowing all light to pass through) to completely opaque (blocking all light).

## **Illuminant**

Illuminant refers to the source of light that illuminates a scene or an object. It can be natural light from the sun, artificial light from a lamp, a computer screen, or any other light source. The illuminant plays an important role in colour perception, as it affects the way colours are perceived by the human eye.

# Lovibond® Colour Measurement

Tintometer® Group



## Visual Tools – Reflectance

- 0°/45° (or 45°/0°) Geometry
- Sphere Geometry
- CIE LAB Colour Space
- CIE L\*a\*b\* Colour Space: a\* & b\*
- CIE L\*a\*b\* Colour Space: L\*
- Colour Sensing Process

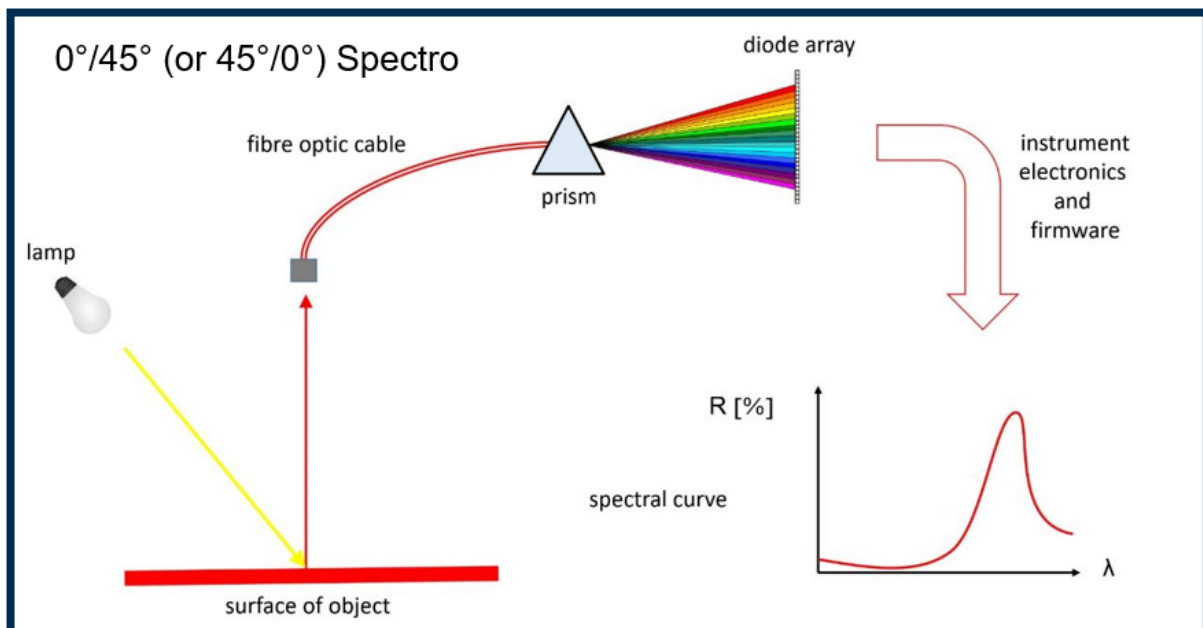
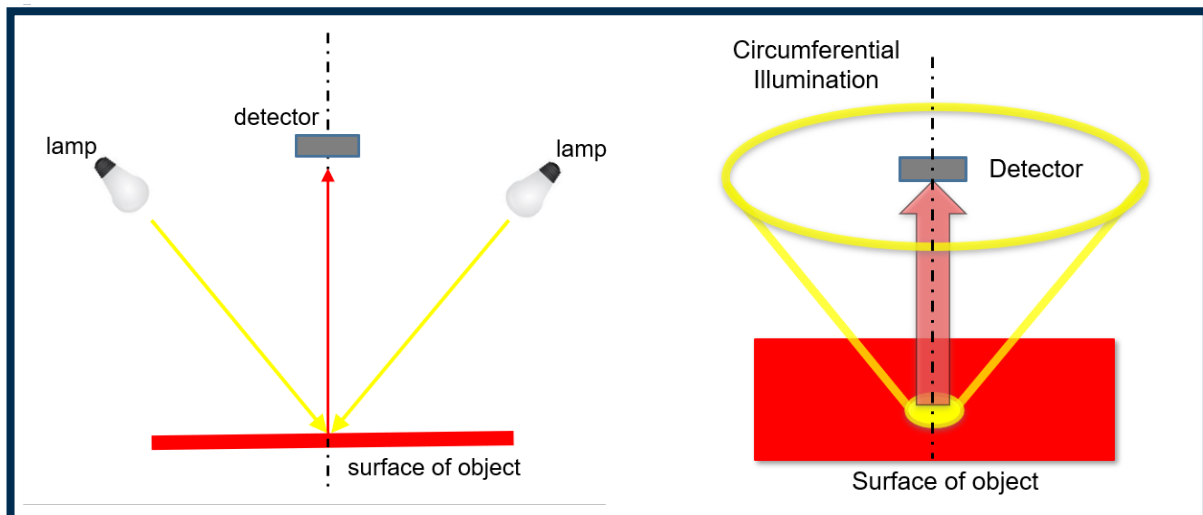


## 0°/45° (or 45°/0°) Geometry

White light from lamp



Reflected light from object

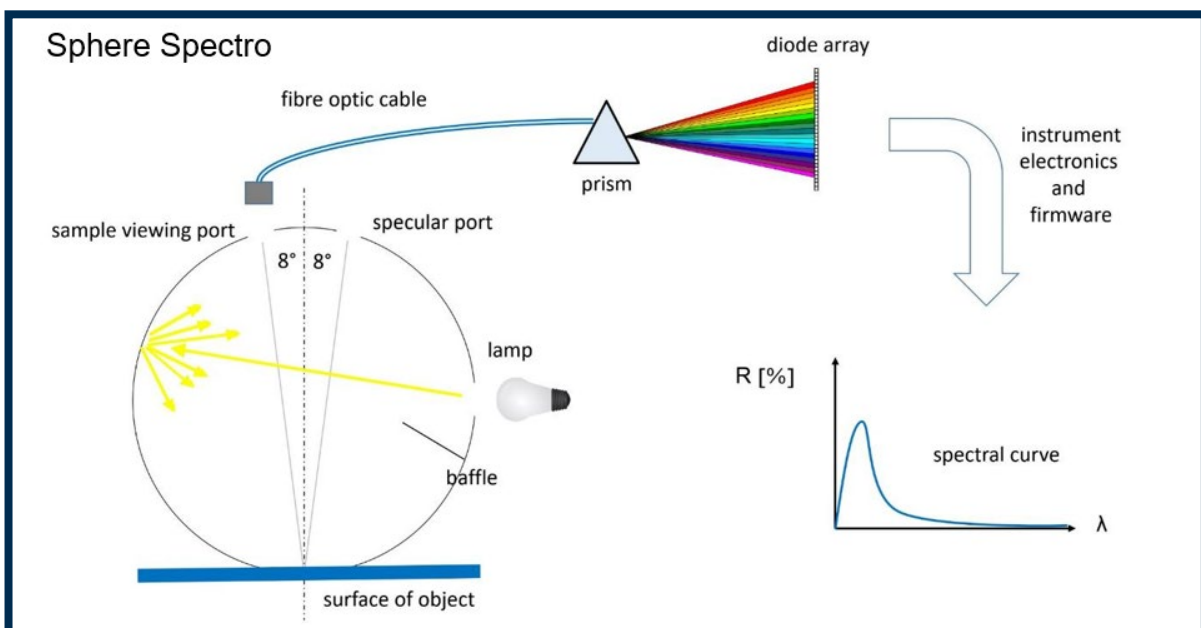
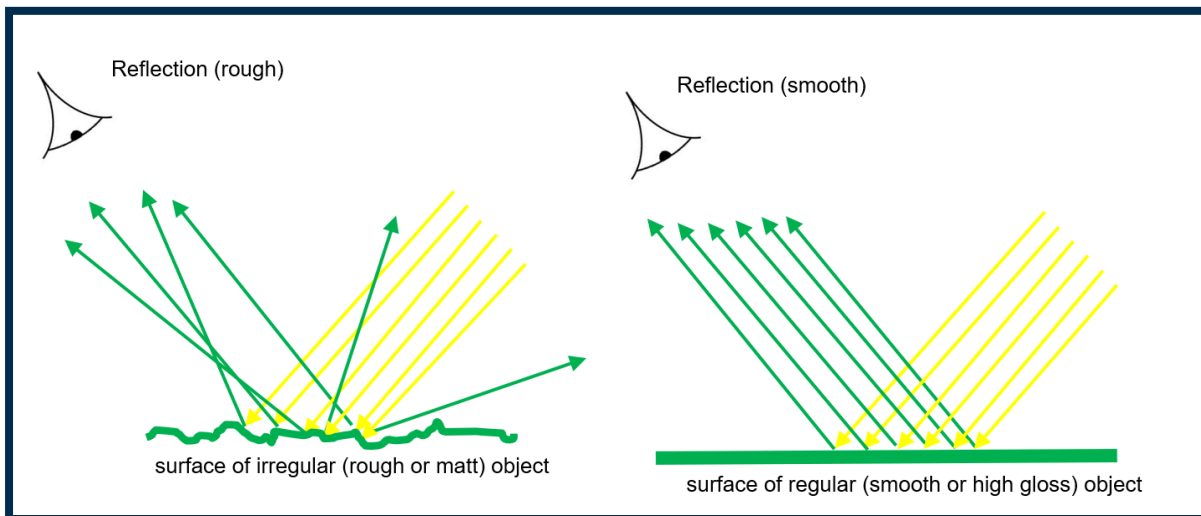


## Sphere Geometry

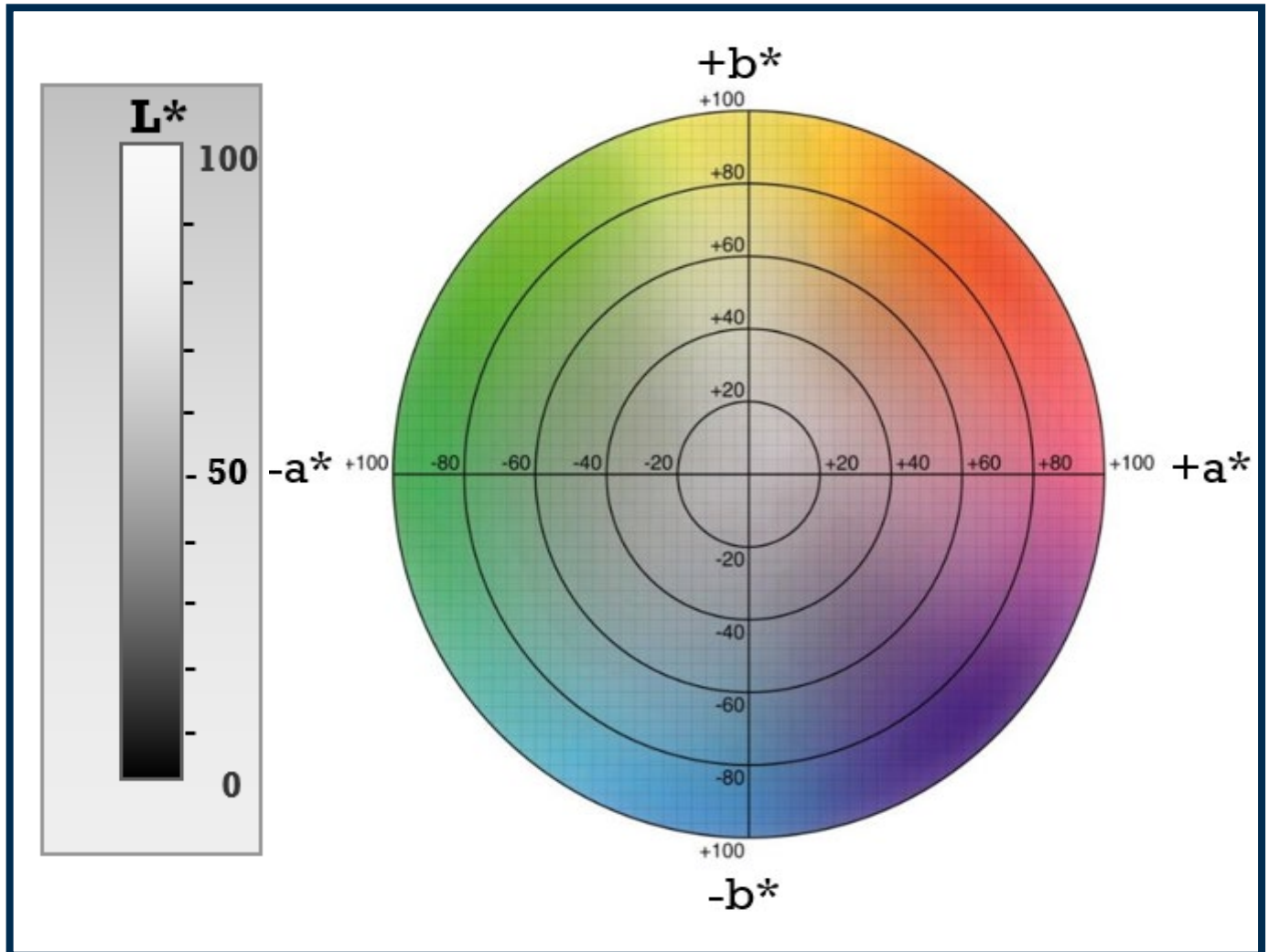
White light



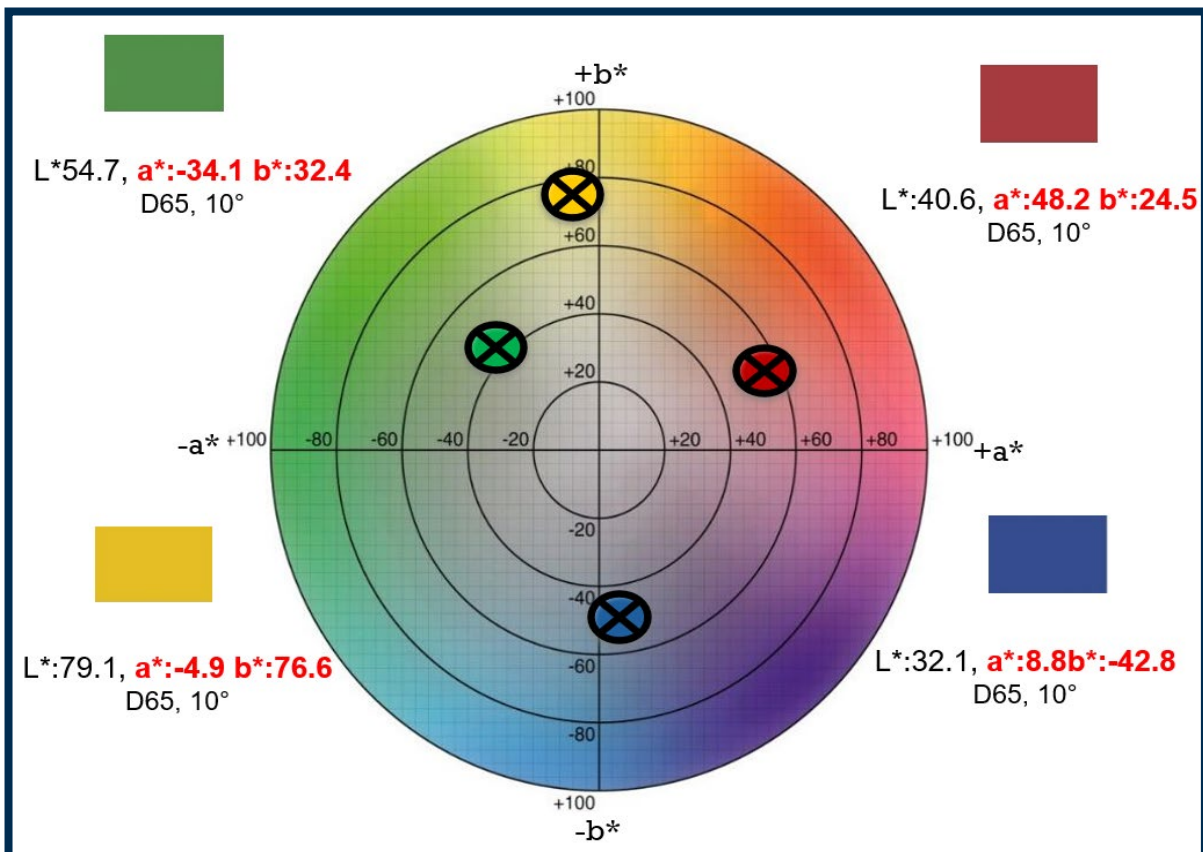
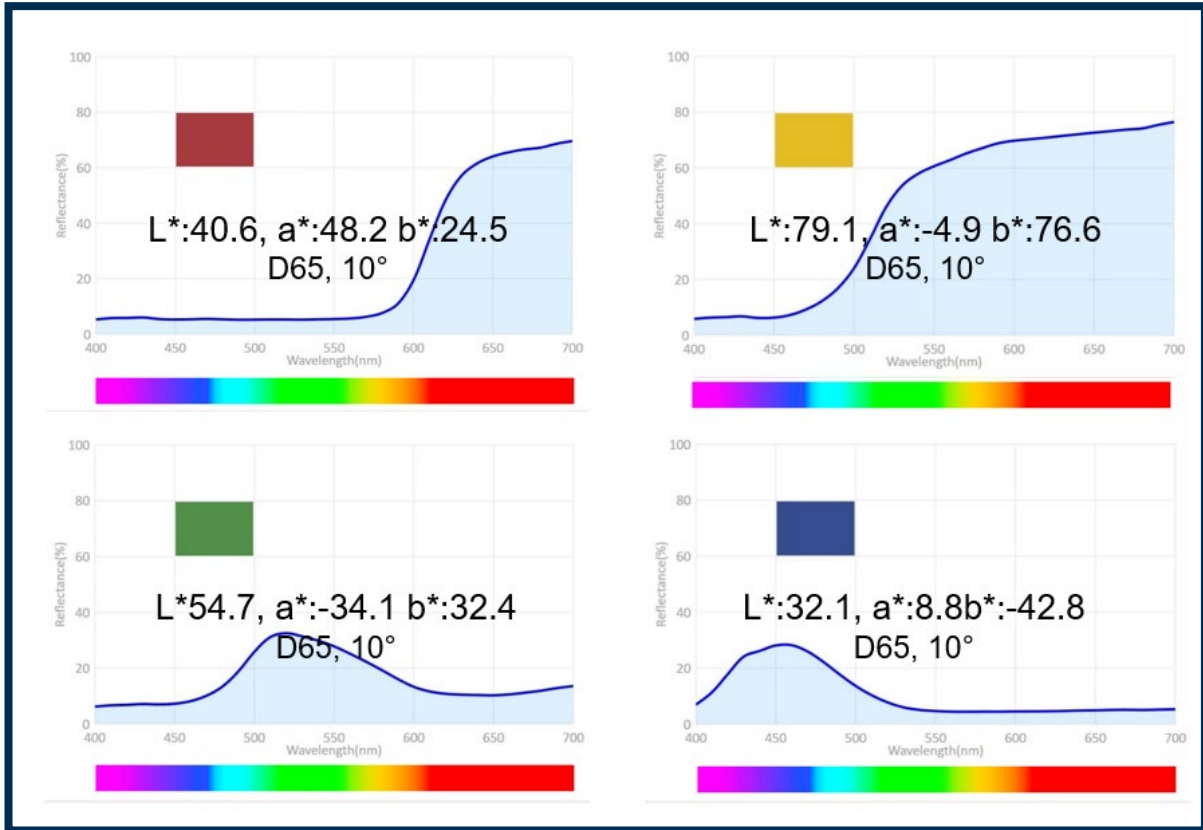
Reflected light



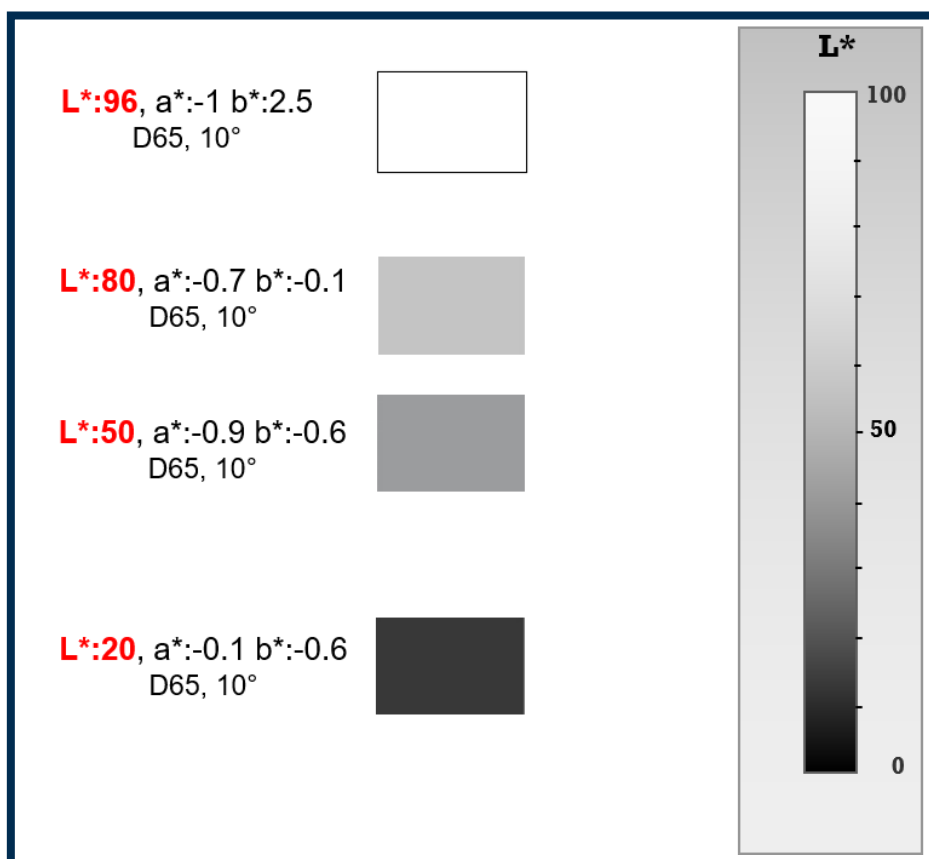
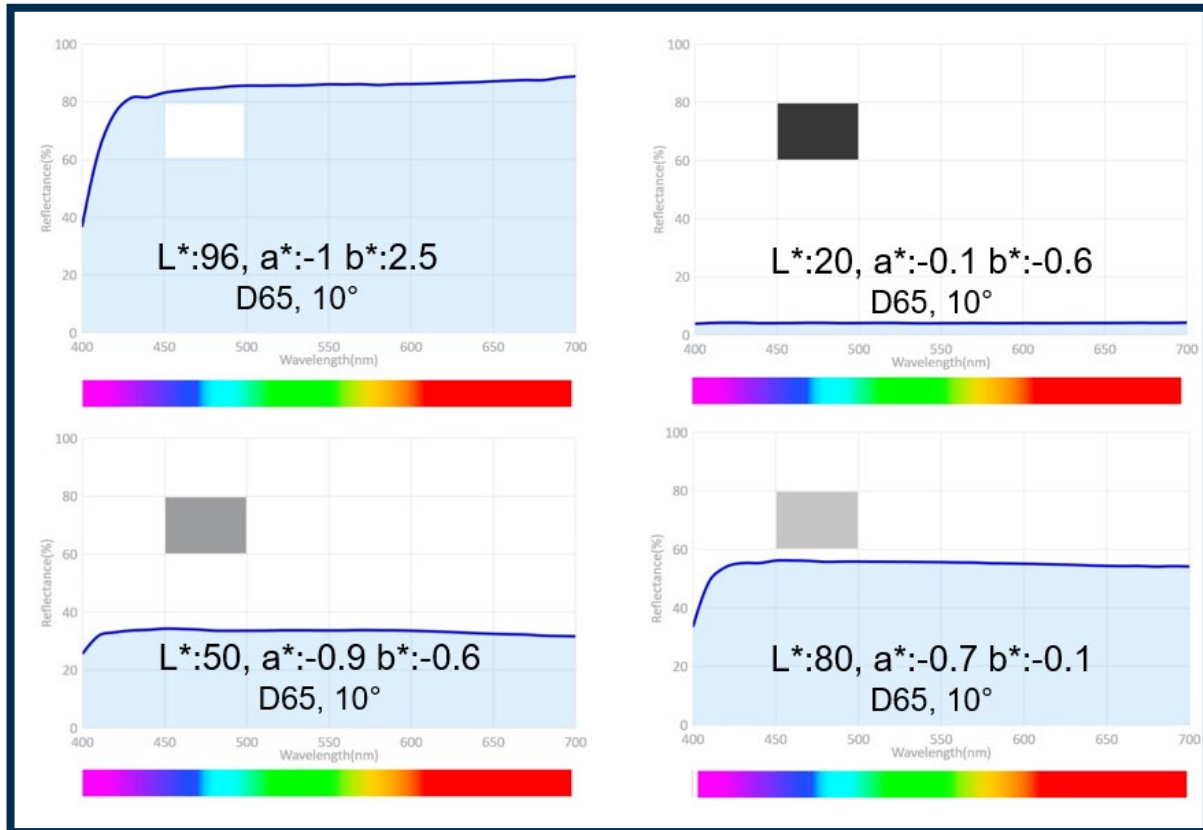
## CIE LAB Colour Space



# CIE L\*a\*b\* Colour Space: a\* & b\*



# CIE L\*a\*b\* Colour Space: L\*



# Colour Sensing Process

Light Source



Observer



Object



X



X



=

Numbers

Light Source

Object

Observer

