



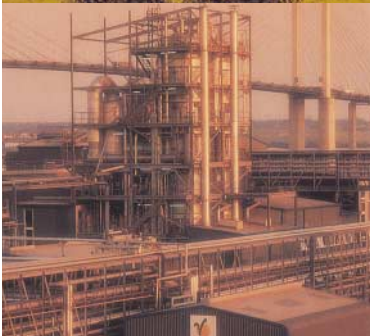
Colour Measurement

Edible Oils & Fats
Oleochemicals & Surfactants
Industrial Oils & Resins
Liquid Chemicals
Transparent Liquids

AOCS-Tintometer Colour
beta Carotene
Chlorophyll A & B
Dichromate Colour Index
FAC Colour
Gardner Colour
Hess-Ives Colour Units
Iodine Colour
Klett Colour
Kreis Value
Lovibond RYBN
Pt-Co/Hazen/APHA Colour
Rosin, US Naval Stores
Yellowness Index
CIE Values
Spectral Data

The Tintometer Limited





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Tintometer

Over a Century of Excellence in Colour Measurement



In the 1800s, Joseph Lovibond, the founder of The Tintometer Ltd, developed the original Lovibond Colour Scale, which was based on a calibrated series of red, yellow and blue glasses.

Today companies throughout the world use Lovibond colorimeters in the analysis of products such as edible and industrial oils, oil derivatives, liquid chemicals, paint vehicles and coatings. Over the years the Lovibond brand has become the hallmark for colour measurement in processing

industries, recognised by major international standardising bodies, including the AOCS, ISO and ASTM, who quote our equipment in their specifications for colour measurement. Tintometer's unparalleled knowledge is embodied into the Lovibond range of instruments, from the visual comparators for single-scale colour grading through to flexible, full-scale spectrophotometric instruments for objective measurement and data analysis. And it is this unique experience that ensures excellent correlation between automatic and visual grading instruments.

Visual Measurement with Lovibond Glass Colour Standards

After more than a century, Tintometer still manufactures and accurately grades the glass standards used for visual colour measurement in terms of Lovibond units as well as many other established colour scales. Each Lovibond colour standard is made from stable-coloured glass that is guaranteed not to fade during normal usage. They form an integral part of Lovibond visual colorimeters, which enable operators to make a quick comparison between the sample and a suitable range of colour standards under specified conditions. For specific colour control requirements, Tintometer can also manufacture customised glass filters, which are matched to samples provided, usually representing the 'ideal' colour and acceptable colour limits or a series of product related colours.

Automatic Measurement offering Advanced Features

Lovibond spectrophotometric colorimeters respond to the growing demand for consistent and reliable colour data, from R&D through to processing and production. They remove all subjectivity involved in colour measurement, supplying unbiased readings which are unaffected by operator or environment. Each instrument expresses colour data in terms of industry scales, spectral data and CIE values. They offer facilities for automated data logging and analysis, they will interface with standard printers and they also include diagnostic tests for periodic checks on performance. For regular conformance testing each automatic colorimeter is supplied with a certified glass filter of specified colour value. Conformance filter sets for the principal colour scales are also available.

Quality Assured

All Lovibond equipment can be issued with a Certificate of Conformity, which confirms that the product has been manufactured, inspected and tested under the control of our ISO 9001 Quality Management System and conform in all respects with the stated standard or test method. In addition, Tintometer has been awarded UKAS (United Kingdom Accreditation Service) accreditation as one of an elite group of calibration laboratories for spectral response and CIE measurements. As a result, we are now able to supply glass filters and reference materials for Lovibond instruments with colour measurements that are directly traceable to national standards.



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Why Measure Colour?

Many circumstances exist where some form of colour measurement is necessary to quantify and assess a product's colour or where colour is an indirect measure of product quality or processing performance:



To Ensure Uniformity of Colour in Production

If the colour of a product varies from one batch to another, it may be perceived as being an inferior product.

To Achieve Aesthetic Quality

Presentation of an acceptable and consistent colour is of tremendous importance to consumers.

As a Performance Indicator

For example, to assess the performance of decolorising materials or to determine a product's suitability for a particular purpose.

To Indicate Product Condition

For example, as an indication of the level of purity, the degree of deterioration over time, adverse growing conditions experienced by natural raw materials or the condition of used product.

To Indicate the Level of Refining/Processing Undergone

In oil refining processes, the colour provides a good indication of the degree of refinement and allows optimisation of the refining process.

As a Content Indicator

There is often a correlation between colour and chemical/physical content (for example, the amount of fat in milk). In these cases, colour measurement may offer a simple alternative to more complex means of testing.

The Colour Scales

Grading techniques are widely used to assess product colour by comparison with a representative series of fixed colour standards. For many product types, a characteristic set of standards was agreed and adopted long ago to aid colour control and the communication of colour specifications; the result is a selection of traditional colour grading scales that have been adopted as industry standards and are still in common use today. Colour measurement involves absolute determination in terms of its individual components. In particular, the Lovibond Colour scale and its variant AOCS-Tintometer Colour have gained international acceptance for oils and oil derivatives.

Colour Scale	References	Scope	Range
AOCS-Tintometer Colour	AOCS Cc 13b-45 the Wesson Method, AOCS Cc 8d-55, AOCS Cc 13j-97	Modified red and yellow version of the Lovibond RYBN scale used for oils, fats and derivatives.	0.1 - 20 Red 1.0 - 70 Yellow
APHA Colour, see Platinum-Cobalt			
beta Carotene	BS684 Section 2.20	Direct measurement of beta carotene content.	Parts per million
Chlorophyll A & B	AOCS Cc 13d-55	Direct measurement of chlorophyll content.	Parts per million
Dichromate Colour Index	DGF C-IV 4d (discontinued)	Oils and fats where colours are similar to potassium dichromate solutions.	0 - 10
FAC Colour	AOCS Cc 13a-43	Approved by the Fats Analysis Committee of the American Oil Chemists Society for grading dark coloured oils, fats and tallows.	1 - 45 (odd numbers)
Gardner Colour	ASTM D 1544, ASTM D 6166, AOCS Td 1a	Oils & chemicals ranging from pale yellow to red, including lecithins, resins, drying oils & fatty acids.	1 - 18 units
Hazen Colour, see Platinum-Cobalt			
Hess-Ives Colour Units		Chemicals and surfactant liquids.	
Iodine Colour	DIN 6162	Oils and chemicals ranging from yellow to brown. For colours registering 1 or less on the Iodine scale, the Pt-Co Colour scale is applicable.	1 - 500 units
Klett Colour (blue filter KS-42)	AOCS Dd 5-92	Detergents and surfactants.	0 - 1000 units
Kreis Value		Colorimetric test for quality control of fats and oils for oxidative rancidity which uses Lovibond Red units.	Depends on concentration & pathlength
Lovibond RYBN	ISO 15305, BS 684, AOCS Cc 13e-92, AOCS Cc 13j-97	Based on calibrated series of coloured glasses in each of the colours red, yellow and blue, going from very pale to dark. It is widely used for oils, fats, chemicals, resins and other transparent liquids products; it is also used for some light-reflecting products such as fats and waxes.	0.1 - 70 Red, Yellow; 0.1 - 40 Blue; 0.1 - 3.0 Neutral
Platinum-Cobalt/APHA Colour	ASTM D 1209, AOCS Ea 9-65, AOCS Td 1b-64	Clear oils, chemicals and petrochemicals such as glycerine, solvents, carbon tetrachloride, and petroleum spirits.	0 - 500 mg Pt/l
Rosin, US Naval Stores	ASTM D 509	Rosins varying in colour from yellow to reddish orange.	XC - D + FF
Yellowness Index	ASTM D 1925, ASTM E 313	Determination of the degree of yellowness under daylight illumination. Calculated from XY Z tristimulus values.	

Spectrophotometric Colorimeters Visual Colorimeters Visual Comparators



COLOUR SCALES ¹⁾

COLOUR VALUES

	PFX995	PFX950	PFX880/L	PFX880/AT	PFX195/1	PFX195/3	PFX195/6	Tintometer Model F	Tintometer AF710-3	Comparator 3000 Series	Comparator 2000+	Nessleriser 2150/2250/1209
AOCS-Tintometer	• ²⁾	•	o	•					•			
beta Carotene	•	o	o	o								
Chlorophyll A & B	•	o	o	o								
Dichromate Index											•	
FAC	•	o	o	o		•				•		
Gardner Colour	•	•	o	o	•	•	o			•	• ⁵⁾	
Hess-Ives Colour Units	•				o	o	•					
Iodine	•	o	o	o	•						•	
Klett Colour (blue filter KS-42)	•	o	o	o	o	o	•					
Kreis Value	•							•				
Lovibond RYBN	• ³⁾	•	•					•				
Pt-Co/Hazen/APHA	•	o	o	o	•	o	•				•	•
Rosin, US Naval Stores ⁴⁾					o	o	o			•		
Yellowness Index					o	o	o					
XY Z tristimulus values	•	•	•	•	•	•	•					
x yY chromaticity co-ordinates	•	•	•	•	•	•	•					
CIE L*a*b* colour space	•	•	•	•	•	•	•					
L*C*h colour space	•				o	o	o					
Hunter L a b colour space	•											
ΔE colour difference	•	•	•	•	•	•	•					
Transmittance	•	•	•	•	•	•	•					
Optical density	•				•	•	•					
Path length	Up to 6" (153mm)	Up to 6" (153mm)	Up to 6" (153mm)	Up to 6" (153mm)	Up to 50 mm	Up to 50 mm	Up to 50 mm	Up to 6" (153mm)	Up to 5 1/4" (134mm)	10 mm, 7/8" (Rosin)	Up to 40 mm	Up to 288mm
Windows software	•	o	o	o	•	•						
Integrated heater unit	o	o	o	o								

• included as standard

o available as an optional upgrade

¹⁾ Colour scale upgrade kits for Saybolt and ASTM Colour are available for spectrophotometric colorimeters ²⁾ Includes AF960 AOCS ³⁾ Includes AF960 Lovibond ⁴⁾ Rosin standards as cubes are also available

⁵⁾ The current Gardner scale was specified in 1963; Lovibond glass filters are also available for earlier 1953 and 1933 versions.

Lovibond PFX995, PFX950, PFX880

The Lovibond Colour and AOCs-Tintometer Colour scales are popular quantitative methods of colour measurement that have gained widespread international acceptance, particularly with processors of oils and oil derivatives. In addition, certain product sectors have adopted one-dimensional scales such as Gardner and FAC Colour to simplify colour control when the range of sample colours involves varying intensities of a single hue. To satisfy the diverse requirements for colour data, the Lovibond PFX995/950/880 series of high-precision, spectrophotometric colorimeters offers a choice of more than 20 colour scales. The standard versions vary from focussed instruments for Lovibond Colour or AOCs-Tintometer Colour through to a flexible, full-scale package. Additional scales can be added as optional upgrades, either at the time of purchase or at a later date.



PFX995: Comprehensive Colour Data Requirements

The Lovibond PFX995 provides objective, unbiased colour data according to a comprehensive range of established industry scales, spectral data and CIE values. It is ideal for companies that process a broad selection of product types with varied colour specifications, particularly in central test facilities or in independent testing laboratories. The instrument is easily customised to display only those scales of interest to the user.

PFX950: Core Colour Scales for Oils and Oil Derivatives

The Lovibond PFX950 is an economical version of the PFX995 incorporating the popular scales that meet the colour analysis requirements of many oil processors. It includes both Lovibond Colour and AOCs-Tintometer Colour - scales that are accepted internationally for oil analysis - as well as Gardner Colour for industrial oils, derivatives and specific products such as sunflower oil.

PFX880/L & PFX880/AT: Automated Lovibond Colour or AOCs-Tintometer Colour

The Lovibond PFX880/L and PFX880/AT are automatic versions of visual Tintometer instruments, which are designed to meet a growing demand for consistent and objective colour data. They are limited scale colorimeters: the PFX880/L expresses colour in terms of the Red, Yellow, Blue and Neutral units that make up the Lovibond Colour scale; the PFX880/AT gives colour data according to the AOCs-Tintometer Colour scale, a modified red and yellow version of the Lovibond scale. On both instruments, results can also be displayed in terms of CIE values and spectral data.

J/L & PFX880/AT Tintometers

Colour Scale ¹⁾	Range	Path length	PFX995	PFX950	PFX880/L	PFX880/AT
Lovibond RYBN	0 - 70 Red, Yellow; 0 - 40 Blue; 0 - 3.9 Neutral	1/16" - 6"	• ²⁾	•	•	
AOCS-Tintometer Colour	0 - 20 Red, 0 - 70 Yellow	1", 5/16"	• ²⁾	•	o	•
Gardner Colour	1 - 18 units	10 mm	•	•	o	o
Pt-Co/Hazen/APHA Colour	0 - 500 mg Pt/l	100 mm	•	o	o	o
FAC Colour	1 - 45 (odd numbers)	10 mm	•	o	o	o
Chlorophyll A & B	0 - 100 ppm	10 mm	•	o	o	o
beta Carotene	0 - 1000 ppm	10 mm	•	o	o	o
Iodine Colour	1 - 500 units	10 mm	•	o	o	o
Hess-Ives Colour Units		10, 25, 50 mm	•			
Klett Colour (blue filter KS-42)	0 - 1000 units	40 mm	•	o	o	o
Kreis Value	Depends on concentration and pathlength	1/16" - 6"	•			
CIE Values	Defined by spectrum locus	Depends on saturation of sample colour				
- X Y Z tristimulus values			•	•	•	•
- x y Y chromaticity co-ordinates			•	•	•	•
- CIE L*a*b* colour space			•	•	•	•
- L*C*h colour space			•			
- Hunter L a b colour space			•			
- ΔE colour difference			•	•	•	•
Spectral Data - transmittance	0 - 100% (full spectrum and specified wavelength)		•	•	•	•
- optical density	0 - 2.5 (full spectrum and specified wavelength)		•			
Optional Items for Individual Applications						
Integrated heater unit	A factory fitted option for maintaining samples such as fats and waxes in a liquid state.		o	o	o	o
Windows software for data capture on PC	Allows data sets to be automatically downloaded to a PC computer where they can be processed or stored. It also permits remote control of the instrument.		•	o	o	o
Conformance filter sets	Sets of graded glass filters, representing a spread of colours from the main scales for quick and simple calibration checks (page 11)		o	o	o	o
Certified colour reference standards	Ideal for routine calibration and verification of test data (see page 11.		o	o	o	o

• included as standard o available as an optional upgrade

¹⁾ Colour scale upgrades are also available for Saybolt and ASTM Colour ²⁾ The Lovibond PFX995 also includes: the AF960 Lovibond Scale, an abridged red and yellow scale which was introduced on the AF960, an early electronic colorimeter; the AF960 AOCS scale, which is similar to AOCS-Tintometer Colour but modified for use on the AF960.

Precision Colour Analysis made Simple

These four colorimeters are all easy to use, automatic instruments, which overcome the subjectivity of visual methods. The menu system guides operators through the selection of operating parameters. Thereafter, measurements are initiated by just a single key press and take less than 25 seconds to complete. Use of sample cells up to 6" path length ensures precise colour measurement, without multiplying errors, even with unsaturated samples. The accuracy, repeatability and reproducibility of data provided by the instruments allow for tighter colour specifications and greater consistency in colour measurement, giving users the confidence needed to make important decisions regarding raw materials and processing operations.

Confidence in Instrument Performance

The Lovibond PFX995, PFX950 and PFX880 series are rugged colorimeters with a fabricated steel housing; they are designed to function equally as a QC instrument within the laboratory or on 24 hour operation in a production environment. A diagnostic test routine allows users to conduct periodic checks on the instrument or identify faults.



The precision filament lamp is easily accessed and changed from outside the instrument.



For regular conformance testing the colorimeters are also supplied with a certified glass filter of specified colour value.

TECHNICAL SPECIFICATION

Measuring principle	16 interference filters
Spectral response	420 - 710 nm
Bandwidth	20 nm
Repeatability	
- chromaticity (x y)	± 0.0002
- transmittance	± 0.25 %
- Lovibond values	± 0.1
Measurement time	Less than 25 seconds
Calibration	Single key press; fully automated
Light source	5 Volt, 10 Watt tungsten halogen lamp (lens ended)
Illuminant	CIE Illuminant C (A, C, D65 on PFX995)
Observer	2° (2°, 10° on PFX995)
Path length	0.004" - 6" (0.1 - 153 mm)
Interface	Parallel printer port, RS 232 port
Input voltage	Universal, via external power supply
Approvals	CE
Display	2 x 40-character, back-lit LCD
Keypad	21 key membrane keypad; washable polyester with audible feedback
Instructions	7 languages - English, French, German, Spanish, Italian, Portuguese, Dutch
Heater unit	Factory fitted option, 95°C max
Instrument housing	Fabricated sheet steel with tough, textured paint finish
Dimensions	Width 515 mm, depth 195 mm, height 170 mm
Weight	7.75 kg

Each instrument is supplied complete with optical glass cells of the relevant path lengths for each of the colour scales included, a calibrated glass conformance filter, a spare lamp and instructions.

Lovibond PFX195 Automatic Colorimeter



Automatic Grading of One Dimensional Colour Scales

The Lovibond PFX195 is a low-cost spectrophotometric colorimeter, which automatically measures the colour of transparent samples according to the one-dimensional colour scales that have been adopted as industry standards in oils and chemicals processing. Results can also be displayed in terms of spectral data and CIE values. Each version of the PFX195 includes a selection of standard colour scales that are used in a specific industry sector: the PFX195/1 for chemicals, industrial oils and fatty acids, the PFX195/3 for dark oils and fats and the PFX195/6 for industrial oils and surfactants. Colour scale upgrade kits enable additional colour scales to be added to standard instrument versions. The PFX195 also allows users to obtain a closest match to stored references or to build up a customised scale from a series of reference samples. It includes a calculation and description of off-hue factor for many scales.

Colour Scale	Range	Path length	PFX195/1	PFX195/3	PFX195/6
Pt-Co/Hazen/APHA Colour	0 - 500 mg Pt/l	50 mm	•	o	•
Gardner Colour	1 - 18 units	10 mm	•	•	o
FAC Colour	1 - 45 (odd numbers)	10 mm	o	•	
Iodine Colour	1 - 500 units	10 mm	•	o	
Hess-Ives Colour Units		10, 25, 50 mm	o	o	•
Klett Colour (blue filter KS-42)		40 mm	o	o	•
Rosin, US Naval Stores	XC - D + FF	7/8"	o	o	o
Yellowness Index		10, 25, 50 mm	o	o	o
CIE Values	Defined by spectrum locus	Depends on saturation of sample colour	•	•	•
- X Y Z tristimulus values			•	•	•
- x y Y chromaticity co-ordinates			•	•	•
- CIE L*a*b* colour space			•	•	•
- ΔE colour difference			•	•	•
- CIE L C h			o	o	o
Spectral data - transmittance,	0 - 100% (full spectrum and specified wavelength)		•	•	•
- optical density	0 - 2.5 (full spectrum and specified wavelength)		•	•	•
Optional Items for Individual Applications					
Conformance filter sets	Sets of graded glass filters, representing a spread of colour from each of the main scales, are available for quick and simple calibration checks (see page 11)		o	o	o
Certified colour reference standards	Idea for routine calibration of and verification of test data (see page 11)		o	o	o
Adaptor for 10.65 mm (Gardner) tubes	For Gardner colour of hot samples in tubes (eg testing the colour stability of fatty acids and drying oils after heating).		o	o	o
Spectrophotometer cell holder	Allows use of standard width (12.5 mm) spectrophotometer cells		o	o	o

• included as standard o available as an optional upgrade

Confidence in Colour Measurement

The Lovibond PFX195 responds to the demand for consistent and reliable colour data, from R&D through to processing and production. It removes all subjectivity involved in colour measurement, supplying unbiased readings that are unaffected by operator or environment. The proven optical system ensures excellent repeatability of measurements giving confidence in communication and control of colour. For regular conformance testing the PFX195 is supplied with a certified glass filter of specified colour value (filter sets are available).

Colour Testing and Analysis Made Simple

The Lovibond PFX195 is an easy to use, automatic instrument requiring no special skills to operate. The built-in menu guides users through the selection of operating parameters such as colour scale. Thereafter, readings are made with a single key press, taking less than 25 seconds to complete. Data sets can be saved in the instrument, printed out or automatically down loaded to a PC computer where they can be processed and stored for future analysis, traceability and monitoring trends. ΔE colour difference measurements can be used to ensure samples fall within acceptable colour limits. A Windows software program enables the generation of spectral and CIE diagrams as well as analysis of spectral data.

Ideally Suited to Laboratory or Production Environments

Comprehensive facilities for colour measurement and data analysis make the Lovibond PFX195 an ideal choice for the laboratory. However, with excellent calibration stability, password protection for tamper proof control and simple operation, the Lovibond PFX195 also supports the migration of quality control to the manufacturing area, making it a cost-effective option for dedicated production testing. For easy maintenance, the Lovibond PFX195 includes a robust steel sample chamber, which is easily removed and cleaned if a spillage occurs, and the precision filament lamp is easily assessed and changed from outside the instrument.

TECHNICAL SPECIFICATION

Measuring principle	9 interference filters
Spectral response	420 - 710 nm
Bandwidth	20 nm
Repeatability	
- chromaticity (x,y)	± 0.0004
- transmittance	± 0.5 %
Measurement time	Less than 25 seconds
Calibration	Single key press, fully automated
Light source	5 Volt, 10 Watt tungsten halogen lamp (lens ended)
Illuminants	CIE Illuminant A, B, C, D65
Observers	2°, 10°
Path length	0.1 - 50 mm
Interface	Parallel printer port, RS 232 port
Data storage	Up to 32 data sets
Input voltage	Universal, via external power supply
Approvals	CE
Display	2 x 40-character, back-lit LCD
Keypad	21-key membrane keypad: washable polyester with audible feedback
Instructions	7 languages - English, French, German, Spanish, Italian, Portuguese & Dutch
Instrument housing	Fabricated sheet steel with tough, textured paint finish
Dimensions	Width 290 mm, depth 360 mm, height 120 mm
Weight	6.8 kg

The Lovibond PFX195 is supplied complete with Windows software, accessories and spares, optical glass cells of the relevant path lengths for each of the colour scales included, a calibrated glass conformance filter and instructions.

Lovibond Tintometer Model F

Operating Principle

The Lovibond Tintometer is a visual colorimeter that allows matching of samples against Lovibond Colour standards - a series of accurately calibrated coloured glasses in each of the colours red, yellow and blue, going from very pale to dark. It is arranged with two adjacent fields of view, seen through the viewing tube, so that the product in the sample field and a white reflective surface in the comparison field are observed side by side, suitably illuminated. The Lovibond colour standards are introduced into the comparison field by a simple system of sliding racks, allowing the user to compare the colour of the sample with the standards. A series of neutral glasses in racks is also supplied; these can be introduced into the sample field to dull the colour of products which are too bright to obtain a good colour match using Lovibond Red, Yellow or Blue glasses. The racks are adjusted until a visual colour match is found for the sample and its colour can then be expressed in Lovibond units.

A Major Advance in Visual Colorimetry

The Model F is the latest in a distinguished series of Lovibond Tintometers, which has been widely used for colour measurement in terms of Lovibond units for more than a century. The advance stems from the introduction of modern technology to enhance a traditional visual colorimeter:

- Individual housing of colour standards affords excellent protection of the glass filters, allows easy distinction between adjacent standards, simplifies cleaning and allows replacement of single glasses if required.
- Prismatic optical system for accurate and repeatable colour matching.
- Standardised and diffused tungsten-halogen light source.
- A removable sample chamber insert simplifies cleaning if a spillage takes place; it can be replaced at intervals to maintain the whiteness of the interior, an essential feature for accurate colour matching.

Versatile Applications

The Model F is a versatile instrument for colour measurement of products that transmit light as well as opaque solids, powders and pastes (an optional 'solid' sample accessory pack may be required for measuring light-reflecting products). Fats are measured for colour either by transmitted light when in a molten condition or by reflected light when solid. The Model F is available in two formats to meet the requirements of different applications and the national and international standardising bodies which specify the instrument in their official methods for colour measurement:



TECHNICAL SPECIFICATION

Measuring principle	Visual, in terms of Lovibond units
Modes	Transmittance, reflectance
Range	0.1 - 70 Red, Yellow; 0.1 - 40 Blue; 0.1 - 3.0 Neutral
Resolution	0.1 Lovibond unit
Optical system	11 glass-filled nylon racks containing a graduated range of Lovibond colour standards
Viewing system	Fully adjustable, prismatic with integral blue filter for light standardisation.
Light source	2 x 12 Volt, 10 Watt tungsten halogen lamp
Illuminant	Approximates to daylight
Path length	0.1 - 153 mm (0.004" - 6")
Power pack	12 Volt ac, switchable to suit 220/110 Volt supply
Approvals	CE
Instrument housing	Fabricated sheet steel with a tough, textured paint finish
Dimensions	Width 330 mm, depth 410 mm, height 230 mm
Weight	8.3 kg

Each format of the Model F is supplied with a complete set of 11 racks containing colour stable glass standards for the Lovibond colour scale (Red 0.1 - 0.9, 1.0 - 9.0, 10.0 - 70; Yellow 0.1 - 0.9, 1.0 - 9.0, 10.0 - 70; Blue 0.1 - 0.9, 1.0 - 9.0, 10.0 - 40; Neutral 0.1 - 0.9, 1.0 - 3.0), a sample chamber liner with a white PVC reference, a spare white reference, a pair of spare bulbs, rectangular fused glass cells (one each of 1" and 5/8" for the Model F and one each of 1/8", 1/4", 1/2", 1", 5/8" for the Model F (BS 684)), a colour analysis records book and instructions.

Tintometer	Scope
Model F	Standard model for applications including fats and fatty oils, bleached lac, liquid chemicals and pharmaceuticals.
Model F (BS 684)	Version for grading animal and vegetable fats and oils according to BS 684 Section 1.14, ISO 15305 and AOCS Method Cc 13e-92. Racks are fitted with colourless glass compensating slides in the sample field. The instrument also includes a black sheath to prevent light entering the sides of the sample cell.
Optional Items for Individual Applications	
Replacement sample chamber insert	Available as single units or in a pack of 3.
'Solid' sample accessory pack	A selection of sample holders for various types of light reflecting products: a short optical cell (W560/OG/10mm), holders for powders and opaque liquids, solid sample clamp and detachable magnetic white reference. Individual holders can be ordered separately if required.
Conformance filter sets	Sets of graded glass filters, representing a spread of colours from the Lovibond Colour scale are available for quick and simple calibration checks.



Lovibond Tintometer AF 710 - 3

Colour Measurement according to the AOCS-Tintometer Colour Scale

The Tintometer AF 710-3 is a visual colorimeter approved by the American Oil Chemists Society (AOCS) for colour measurement of oils and fats according to AOCS Official Method Cc 13b-45, the Wesson Method. Colour is determined by obtaining a visual colour match for the light transmitted through a column of the sample with that transmitted through a series of red and yellow colour standards calibrated in accordance with the AOCS-Tintometer Colour Scale. The glasses are varied until a colour match is found for the light passing through the sample and this colour is then expressed in AOCS-Tintometer Colour units.

The Lovibond Tintometer AF 710-3 is supplied complete with a set of AOCS-Tintometer Colour glasses (Red 0.1 - 0.9; 1.0 - 7.0; 7.6, 8.0, 9.0, 10.0, 11.0, 12.0, 16.0, 20.0; Yellow 1.0 - 9.0; 10.0, 15.0, 20.0, 35.0, 50.0, 70.0) and two flat-bottomed, glass sample tubes, which are marked to indicate an oil column of 1/2", 1" and 5/8".

Lovibond Comparator 3000 Series

Visual Grading of Gardner or FAC Colour Scales

Single scale, 3-field instruments for visual colour grading by direct comparison between the sample and Lovibond glass colour standards housed in a pair of discs. The advantage of a 3-section field of view is that the sample and two consecutive glasses on the colour scale are viewed simultaneously, making it easier to achieve the optimum colour match. For rapid colour grading within predetermined colour limits, the glass standards can be set to the two limiting colours so that it is easy to check that the sample is within tolerance. Versions of the Comparator 3000 are available for the Gardner, FAC and US Naval Stores Rosin Colour scales, each supplied with the appropriate range of coloured glass filters. In each instrument the tungsten halogen light source is colour corrected to CIE standard illuminant C, which guarantees constant lighting conditions for colour grading. Samples are measured in clear glass tubes or Rosin cells as appropriate.



Colour Scale	Range	Path length	AF 228	AF 229	AF 670
Gardner Colour	1 - 18	10 mm	•		
FAC Colour	1 - 45 (odd numbers)	10 mm		•	
Rosin, US Naval Stores	XC - D	7/8"			•



Lovibond Comparator System 2000

A Flexible, Modular System for Visual Colour Grading

Using a suitable Comparator instrument, the sample is visually matched against calibrated, colour stable glass standards in test discs. The Comparator 2000+ is a short path length instrument (up to 40 mm) for visually matching samples with relatively dark colours. Nessleriser systems are longer path length instruments for matching a column of sample in a Nessler cylinder with Lovibond glass filters; they are designed for measuring unsaturated samples that are below the sensitivity of the Comparator 2000+. A selection of Lovibond colour grading discs for use with the Comparator System 2000 is shown below.

Colour Scale	Disc	Range Covered	Instrument	Accessories Required
Gardner Colour	4/30AS	1, 2, 3, 4, 5, 6, 7, 8, 9 units	Comparator 2000+	10 mm cell W680/OG/10
	4/30BS	10, 11, 12, 13, 14, 15, 16, 17, 18 units	Comparator 2000+	10 mm cell W680/OG/10
Pt-Co/Hazen/APHA Colour	4/28	50, 75, 100, 150, 200, 250, 300, 400, 500 mg Pt/l	Comparator 2000+	40 mm cell W680/OG/40
	NSH	10, 20, 30, 40, 50, 60, 70, 80, 90 mg Pt/l	Nessleriser 2150	Nessler cylinders AF 306/P
	NSB	70, 85, 100, 125, 150, 175, 200, 225, 250 mg Pt/l	Nessleriser 2150	Nessler cylinders AF 306/P
	NSX	50, 60, 70, 80, 100, 150, 200, 250, 300 mg Pt/l	Nessleriser 2150	Nessler cylinders AF 306/P
	CAA	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30 mg Pt/l	Nessleriser 2250	250 mm cylinders DB 420
	CBB	30, 35, 40, 45, 50, 55, 60, 65, 70 mg Pt/l	Nessleriser 2250	250 mm cylinders DB 420
	1209/1	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30 mg Pt/l	Nessleriser 1209 ¹⁾	100 ml cylinders DB 423
Iodine Colour	1209/2	30, 35, 40, 45, 50, 55, 60, 65, 70 mg Pt/l	Nessleriser 1209 ¹⁾	100 ml cylinders DB 423
	4/57	1, 2, 3, 4, 5, 6, 7, 8, 9 mg/100 ml	Comparator 2000+	25 mm cell W680/OG/25
Dichromate Colour Index	4/58	10, 15, 20, 25, 30, 35, 40, 45, 50 mg/100ml	Comparator 2000+	10 mm cell W680/OG/10
	4/59	60, 70, 80, 100, 125, 150, 200, 250, 300 mg/100ml	Comparator 2000+	10 mm cell W680/OG/10
	4/60	400, 500, 600, 700, 800, 900, 1000 mg/100 ml	Comparator 2000+	2.5 mm cell W680/OG/2.5
Dichromate Colour Index	4/62	0.5, 0.75, 1.15, 2, 2.5, 3, 3.5, 4	Comparator 2000+	25 mm cell W680/OG/25
	4/63	4.5, 5, 5.5, 6, 7, 8, 9, 10	Comparator 2000+	25 mm cell W680/OG/25
Optional Items for Individual Applications				
Daylight 2000 Lighting Unit	A standardised benchtop light source to guarantee constant lighting conditions for accurate colour grading, particularly when the sample is very pale in colour.			

¹⁾ Conforms to the path length requirements specified in ASTM D 1209

Test Kits based on the Comparator System 2000

Available for the most commonly used colour scales and colorimetric tests, these kits are a convenient means of ordering the complete range of equipment required.

Type	Colour Scale	Range	Apparatus included
AF 334	Gardner Colour	1 - 18 units	Lovibond Comparator 2000+ with Daylight 2000 Lighting Unit, Gardner discs 4/30 AS, 4/30 BS, W680/OG/10 mm path length fused cell.
AF 329	Pt-Co/Hazen/APHA Colour	0 - 250 mg Pt/l	Nessleriser 2150 with Daylight 2000 Lighting Unit and Nessler cylinders, Nessleriser 2250 upgrade with Nessler cylinders, Pt-Co/Hazen discs CAA, CAB & NSB, stand for using Nessleriser with natural lighting.
AF 325	Pt-Co/Hazen/APHA Colour	10 - 250 mg Pt/l	Nessleriser 2150 with Daylight 2000 Lighting Unit and Nessler cylinders, Pt-Co/Hazen discs NSH & NSB, stand for using Nessleriser with natural lighting.
AF 328	Pt-Co/Hazen/APHA Colour, Low Range	0 - 70 mg Pt/l	Nessleriser 2250 with Daylight 2000 Lighting Unit and Nessler cylinders, Pt-Co/Hazen discs CAA & CAB, stand for using Nessleriser with natural lighting.
AF 327	Pt-Co/Hazen/APHA Colour, Low Range, according to ASTM D 1209	0 - 70 mg Pt/l	Nessleriser 1209 with Daylight 2000 Lighting Unit and 100 ml (288 mm) Nessler cylinders, Pt-Co/Hazen discs 1209/1 & 1209/2, deionised water.

Accessories

Colorimetry Cells

We supply precision fused cells in a range of dimensions and path lengths, made from optical glass to the highest standards at our own factory. For instruments equipped with a heater unit and whenever cells are subjected to thermal shock, it is recommended that borosilicate cells be used.



Series	W600 Optical		W600 Borosilicate		W680 Optical	
Use	PFX995/950/880/195 Series, Tintometer Model F				Comparator 2000/3000	
Path Length	Order Code	Type	Order Code	Type	Order Code	Type
10 mm	60 59 60	W600/OG/10	65 59 60	W600/B/10	60 68 10	W680/OG/10
25 mm	60 59 90	W600/OG/25	65 59 90	W600/B/25	60 68 60	W680/OG/25
40 mm	60 60 20	W600/OG/40	65 60 20	W600/B/40	60 68 90	W680/OG/40
50 mm	60 62 00	W600/OG/50	65 62 00	W100/B/50	60 69 30	W680/OG/50
100 mm	60 60 30	W600/OG/100	65 60 30	W600/B/100		
1/16"	60 60 40	W600/OG/1/16"	65 60 40	W600/B/1/16"		
1/4"	60 60 60	W600/OG/1/4"	65 60 60	W600/B/1/4"		
1/2"	60 60 70	W600/OG/1/2"	65 60 70	W600/B/1/2"		
1"	60 60 80	W600/OG/1"	65 60 80	W600/B/1"		
2"	60 60 90	W600/OG/2"	65 60 90	W600/B/2"		
5/4"	60 61 30	W600/OG/5/4"	65 61 30	W600/B/5/4"		

Conformance Filter Sets

Order Code	Colour Scale	No Filters	Nominal Values
PFX995, PFX950, PFX880/L, PFX880/AT & PFX195			
13 69 00	AOCS-Tintometer Colour	3	0.5R 1.0Y, 3.7R 13.0Y, 6.6R 50Y
13 95 20	beta carotene	1	45 ppm (at 10mm path length)
13 95 30	Chlorophyll A	1	0.19 ppm (at 10mm path length)
13 97 00	FAC Colour	5	7, 13, 15, 29, 39
13 95 60	Gardner Colour	4	2, 8, 12, 17
13 95 90	Lovibond Red Yellow Neutral	10	0.1R 0.5Y - 7.1R 51.0Y 0.5N
13 96 10	Lovibond Red Yellow Neutral	5	0.1R 0.5Y - 5.0R 34.0Y 0.1N
13 96 20	Lovibond Red Yellow Blue	5	1.0R 0.5B, 1.3R 0.8B, 1.2R 4.3Y 1.2B, 2.6R 11.5Y 2.1B, 3.4R 15.9Y 2.9B
13 95 70	Platinum-Cobalt/Hazen/APHA	5	5, 20, 50, 100, 300
10 99 70	Single Filter (Certificated)	1	Select scale and nominal value from above
10 99 80	User Specified Filter	1	Specify scale and value when ordering
Iodine Colour is also available under the category 'User Specified Filter (Certificated)'			
Tintometer Model F			
18 40 00	Lovibond Red Yellow	10	0.1R 0.5Y - 6.5R 51.0Y
18 50 00	Lovibond Red Yellow	5	0.1R 0.5Y - 5.0R 34.0Y
18 60 00	Lovibond Red Yellow Blue	5	1.2R 0.9B, 1.1R 4.3Y 1.4B, 2.6R 11.5Y 2.1B, 3.2R 15.5Y 2.9B, 1.0Y 0.5B
Tintometer Model F (BS 684)			
18 70 00	Lovibond Red Yellow Blue	10	0.6R 1.0Y 0.6B - 7.3R 51.0Y 1.0B
Comparator 3000 Series			
34 30 00	FAC Colour	4	7, 13, 29, 39
34 20 00	Gardner Colour	2	3, 17

Conformance filter sets allow quick and simple conformance checks on Lovibond instruments. Each filter set consists of coloured glasses representing a spread of colours from the scale of interest, which are mounted in suitable holders. They are supplied in a presentation box with a Certificate of Conformity that states the actual values for each filter and confirms that they have been manufactured and inspected under the control of our ISO 9001 Quality Management System. In addition, Tintometer's UKAS accredited calibration laboratory can supply glass filters for Lovibond instruments with colour measurements that are directly traceable to national standards.



Certified Colour Reference Standards

- Ideal for routine calibration & verification of test data
- Ensure good inter-laboratory and inter-instrument correlation
- Supplied in a 500 mL bottle with a 12-month shelf life
- Full traceability to internationally recognised standards (Gardner Colour standards certified under UKAS to ISO 17025; AOCS-Tintometer, Lovibond RYBN & Pt-Co Colour certified under ISO9001 quality system)
- All classified as non-hazardous according to EU directives
- Each bottle supplied with full certification including MSDS



Colour Scale	Nominal Certified Value	Order Code	Accreditation
AOCS-Tintometer Colour	0.3R 2.0Y (5 1/4")	134240	ISO 9001
	1.0R 9.0Y (5 1/4")	134250	ISO 9001
	1.2R 12.0Y (5 1/4")	134260	ISO 9001
	2.2R 22.0Y (5 1/4")	134270	ISO 9001
	3.4R 28.0Y (5 1/4")	134280	ISO 9001
Gardner Colour	2	134200	UKAS
	5	134210	UKAS
	8	134220	UKAS
Lovibond RYBN Colour	0.4R 1.9Y 0.1N (5 1/4")	134080	ISO 9001
	1.0R 4.3Y 0.1N (5 1/4")	134090	ISO 9001
	1.4R 7.3Y 0.2N (5 1/4")	134100	ISO 9001
	1.6R 11.0Y 0.1N (5 1/4")	134110	ISO 9001
	1.8R 14.0Y 0.3N (5 1/4")	134120	ISO 9001
	2.5R 24.0Y 0.5N (5 1/4")	134130	ISO 9001
	3.3R 33.0Y 0.3N (5 1/4")	134230	ISO 9001
Pt-Co/Hazen/APHA Colour	5	134140	ISO 9001
	10	134150	ISO 9001
	15	134160	ISO 9001
	30	134170	ISO 9001
	50	134180	ISO 9001
	100	134190	ISO 9001



www.tintometer.com

The Tintometer Ltd · Waterloo Road · Salisbury · SP1 2JY · UK
Tel: +44 1722 327242 · Fax: +44 1722 412322 · Email: sales@tintometer.com

Offices in Switzerland, Far East & Australia

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