Lovibond® Colour Measurement

Tintometer® Group

Colour Management for Industry

Lovibond® PFX*i*-880/950/995 Series

Dark Oils & Fats • Liquid Chemicals & Industrial Oils
Petroleum Oils & Fuels • Beers, Malts & Caramels • Pharmaceutical Solutions
Industrial Oil & Surfactants • Sugar Solutions, Syrups & Honey
Optically Clear Samples • Water & Waste Waters

Accurate, efficient spectrophotometric colorimeters

www.lovibondcolour.com

Lovibond® PFX*i*-880/950/995 Series

- RCMSi Remote Calibration & Maintenance Service via internet
- USB & LAN Interface
- Large clear LCD screen for ease of use and ability to display graphs and data in a wide variety of languages
- Extensive yet flexible choice of standard colour scales
- Optional heated sample chamber for maintaining samples at high temperatures
- Accommodates a range of sample cells and tubes: includes a unique long path length sample chamber which can accommodate cells of up to 6" (153 mm) in length
- Remote upgrade facility for adding scales once in service
- Allows calculation and description of off-hue status
- Gives closest match to stored references
- Generates a customised colour scale from reference samples
- Robust steel construction with excellent chemical resistance
- Easy maintenance with removable sample chamber
- Supplied with colour control software for data analysis
- Output conforming to GLP including date, time, sample & user ID

Objective Colour Data for Process Control

The Lovibond® PFX*i*-880, PFX*i*-950 and PFX*i*-995 instruments are accurate, highly efficient spectrophotometers for optically clear samples that meet the demand for consistent and reliable colour data for a wide range of samples. The long path-length cell chamber also allows the measurement of extremely unsaturated, light samples and also colour scales which are defined with long path lengths including the Lovibond® RYBN and AOCS Tintometer® colour. The instruments remove all subjectivity involved in colour grading, supplying unbiased readings that are unaffected by operator or environment.

Comprehensive Selection of Standard Colour Values

The PFX*i*-880/950/995 series of colorimeters automatically measure colour and display the results directly, either according to the traditional grading scales that have been widely adopted as industry standards for colour assessment and control, or in terms of internationally recognised CIE values and spectral data:

Colour Scale	References	Scope	Range
ADMI (full spectrum and tristimulus filter)	American Standard Methods 2120 E	Coloured waters and tinted liquids	1 – 500
Acid Wash Color	ASTM D848	Quality testing of industrial aromatic hydrocarbons	1 – 14
AOCS-Tintometer®	AOCS Cc 13b-45 AOCS Cc 8d-55 AOCS Cc 13j-97	Special red and yellow version of the Lovibond® RYBN scale used for oils, fats and derivatives	0 – 20 Red, 0 – 70 Yellow
ASBC		American standard for colour grading of beers; derived from EBC Colour	1.2 – 10.6 (extended range by dilution and reduction in path length)
ASTM Color	ASTM D1500, D6045, ISO 2049	A wide range of petroleum products including lubricating oils, heating oils and diesel fuel oils	0.5 – 8 units
Beta Carotene	BS684 Section 2.20	Direct measurement of content in parts per million	0 – 1000 ppm
Chinese Pharmacopoeia Colour Series[1)]	CP Appendix IX A	Pharmaceutical solutions	YG1 – 10; Y1 – 10; OY – 10; OR1 – 10; BR1 – 10
Chlorophyll A	AOCS Cc 13d-55	Direct measurement of content in parts per million	0 – 100 ppm
EBC Colour	Analytica	Beers, malts and caramels and similarly coloured liquids. Based either on absorption at 430 nm or CIE x y chromaticity co-ordinates	2 – 27 units (extended range by dilution and reduction in path length)
European Pharmacopoeia Colour Series	Ph. Eur. Method 2.2.2	Pharmaceutical solutions	R1 – 7; Y1 – 7; B1 – 9; BY1 – 7; GY1 – 7
FAC Color	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 Color	ASTM D1544, D6166, AOCS Td 1a,	Chemicals and oils ranging from pale yellow to red, such as resins, varnishes, drying oils, lecithins and fatty acids	1 – 18 units
Honey Colour (Pfund Equivalents)		Commercial honeys, ranging from pale yellow through amber to deep red	0 – 115 mm Pfund
ICUMSA Colour	ICUMSA GS1-7, ICUMSA GS2/3-9	Sugar solutions & syrups	
IP Units	IP 17 Method B	Light coloured products such as refined undyed motor fuel, white spirit or kerosene	Water White (0.25) to Standard White (4.0)
Iodine Colour	DIN 6162	Solvents, plasticisers, resins, oils and fatty acids ranging from yellow to brown	1 – 500 units
Kreis Value	BS 684 : 2.32 (1991)	Quality testing of fats and oils for oxidative rancidity	Depends on concentrations and path length
Lovibond® RYBN	ISO 15305 AOCS Cc 13e-92 AOCS 13j-97 IP 17 Method A	Oils, fats, chemicals, resins and other transparent liquids in terms of Lovibond® Red, Yellow, Blue and Neutral units	0 – 70 Red, Yellow; 0 – 40 Blue; 0 – 3.9 Neutral
AF960 Lovibond®		Abridged red and yellow scale that was introduced on the AF960, an early electronic colorimeter	0 – 20 Red, 0 – 70 Yellow
Pt-Co/Hazen/APHA Scale	ASTM D1209, D5386	Water and other clear liquids such as plasticisers, solvents and petroleum spirits	0 – 500 mg Pt/l
Rosin, US Naval Stores[1)]	ASTM D509	Rosins varying in colour from yellow to reddish orange	XC – D + FF
Saybolt Color	ASTM D156, D6045, JIS K 2580	Light coloured petroleum products including aviation fuels, kerosene, white mineral oils, hydrocarbon solvents and petroleum waxes	–16 (darkest) to +30 (lightest)
Series 52 (Brown)		Beers, whiskies and sugar solutions	1– 38 units
Yellowness Index[1)]	ASTM D1925, E 313	Determination of the degree of yellowness under daylight illumination. Calculated from X Y Z tristimulus values	
US Pharmacopoeia Color	USP (631) Color and Achromicity	Pharmaceutical solutions	A – T
CIE Values	ASTM E308	X Y Z tristimulus values; x y Y chromaticity co-ordinates; CIE L*a*b* colourspace; ΔE colour difference; L*C*h colour space[2)], Hunter L a b colour space[2)]	Defined by spectrum locus
Spectral data (420 – 710 nm)		Transmittance (full spectrum and at specified wavelengths) Optical density (full spectrum and at specified wavelengths)	0 – 100% 0 – 2.5

[1)] These scales are not included on standard instrument versions but are available as a colour scale upgrade

[2)] included as standard on PFX*i*-995 and 995/P only

A number of industry-specific instrumental options are available which contain different combinations of colour scales. These are available with heated or non-heated sample chambers and are supplied with appropriate path length cells.

Colour scale upgrades give the flexibility to meet individual requirements, enabling additional colour scales to be added to standard instrument versions either at the time of order or remotely once the instrument is in service. For product types that are incompatible with standard colour scales, the PFX*i* range allows users to build up a customised scale from a series of reference samples and then to obtain a closest match to the stored references.

RCMSi Technology (Remote Calibration & Maintenance Service via internet)

The PFX*i* range includes new RCMSi technology (Remote Calibration & Maintenance Service via internet). This unique feature allows a calibrated measurement to be taken using an ISO 17025 certified liquid standard. The spectral response is transmitted to the Lovibond® secure calibration server. On completion of this procedure, a traceable calibration certificate is made electronically available to the user. The RCMSi system not only gives the user added confidence that the instrument is working within tight ISO standards but also reduces the need for expensive on-site servicing and preventative maintenance of the unit.

Colour Testing Made Simple

The PFX*i* Series provides easy-to-use, automatic instruments that require 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 30 seconds to complete. Built-in help files are available.

Easily Customised to User Specifications

Adaptable software and design allow users to configure the PFX*i* Series to their requirements. Operators can set the language for display, program the PFX*i* to show only those scales of interest or restrict access to the menu system. As well as standard colorimetry cells, the PFX*i* can be used with a range of tubes and standard, flow-through and disposable spectrophotometer cells.

Calculation and Description of Off-Hue Status

The off-hue status of the PFX*i* range is a useful facility that reveals whether the sample colour is characteristic of the selected scale. Where appropriate, it includes a description of hue difference (eg. redder, greener), relative saturation (stronger or weaker) and an off-hue factor (a relative measure of the distance away in colour space of the sample colour from the 'true' colour scale).

Suited to Laboratory or Production Environments

Comprehensive capabilities for colour management make the PFX*i* Series an ideal choice for the laboratory. However, with excellent calibration stability, password protection for tamper proof control and simple operation, the PFX*i* range 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® PFX*i* Series includes a robust steel sample chamber, which is simply removed and cleaned if a spillage occurs, and a precision filament lamp, which is easily accessed and changed from outside the instrument.

Optimised Use of Colour Data

Data sets can be saved in the instrument, printed out or automatically downloaded to a PC where they can be processed and stored for future analysis, traceability and trend monitoring. The colour control software supplied with the PFX*i* enables the generation of spectral and CIE diagrams as well as analysis of spectral data. It also permits direct control of the instrument from the computer.

Confidence in Colour Measurement

For regular conformance checking, certified colour reference standards are also available for routine calibration and verification of test data. Conformance filters are supplied with a Certificate of Conformity stating their colour values and confirming that they have been manufactured and inspected under the control of The Tintometer Ltd's ISO 9001 quality system. Certified colour reference standards are supplied with full traceability to internationally recognised standards, either ISO/IEC 17025 (ASTM Color, Saybolt and Gardner Color) or the ISO 9001quality system (Pt-Co Units, the Lovibond® RYBN and the AOCS Tintometer® colour).

PFX*i*–880/950/995 Technical Specification

Measuring principle	16 interference filters
Spectral response	420 – 710 nm
Bandwidth	10 nm
Repeatability	On measurements of de-ionised water
Chromaticity (x y)	+/– 0.0002
ΔE	0.2
Measurement time	Less than 30 seconds
Baseline calibration	Single key press; fully automated
Light source	5 Volt, 10 Watt Tungsten Halogen
Illuminants	CIE Illuminant A, B, C, D65
Observer	2°, 10°
Path length	0.1 – 153 mm (0.004" – 6")
Interfaces	USB, LAN, RS232
Data storage	100,000+ Measurements
Input voltage	Universal (90 – 240 Vac), via external power supply
Compliance	CE, RoHS, WEEE
Display	240 x 128, back-lit graphic display, (white on blue)
Keypad	23 key tactile membrane keypad; washable polyester with audible feedback
Languages	English, French, German, Italian, Portuguese, Russian, Spanish, Chinese and Japanese
Instrument housing	Fabricated steel with tough, textured paint finish
Dimensions	Width 515, depth 196, height 170 (mm)
Weight	7.7 kg

Each PFX*i*-880/950/995 is supplied with Windows® compatible software, Lovibond® optical glass cells for the included colour scales, a spare lamp, instructions and an RCMSi Starter Pack.

Version	Application	Standard Colour Scales
PFX*i*-880/L	Oils and Fats	Lovibond® RYBN colour, CIE values, spectral data
PFX*i*-880/AT	Oils and Fats	AOCS-Tintometer®, CIE values, spectral data
PFX*i*-880/P	Fuels and Waxes	Saybolt, ASTM Color, CIE values, spectral data
PFX*i*-880/IP17	Fuels and Waxes	IP Units, Lovibond® RYBN, CIE values, spectral data
PFX*i*-880/S	Sugar Solutions, Syrups and Honey	ICUMSA Colour Index, Lovibond® RYBN, CIE values, spectral data
PFX*i*-880/CIE	Transparent Samples	Acid Wash Test (ASTM D848), CIE values, spectral data
PFX*i*-950	Chemicals, Oils and Fats	AOCS-Tintometer®, Gardner, Lovibond® RYBN, CIE values, spectral data
PFX*i*-950/P	Fuels and Waxes	Saybolt, ASTM Color, Pt-Co/Hazen/APHA, CIE values, spectral data
PFX*i*-995	Transparent Samples	AOCS-Tintometer®, Gardner, Kreis, Hunter Lab, Iodine colour, Pt-Co/Hazen/APHA, CIE values, spectral data, Lovibond®, FAC, Chlor A, beta Carotene
PFX*i*-995/P	Fuels and Waxes	Saybolt, IP Units, ASTM Color, Pt-Co/Hazen/APHA, CIE values, spectral data, Lovibond®, Gardner

Please note: All of these instruments are available with optional electronically controlled heated sample chambers.

Lovibond® PFX*i*-880/950/995 Series

Ordering Information

PFX*i*-880/950/995 Instruments		Order Code
PFX*i*-995	Lovibond® RYBN, AOCS-Tintometer, Gardner, Pt-Co, FAC, Chlorophyll A, beta Carotene, Iodine, Klett (blue filter KS-42), Kreis, CIE values, Spectral data	1379951
PFX*i*-995 (heated)	Lovibond® RYBN, AOCS-Tintometer, Gardner, Pt-Co, FAC, Chlorophyll A, beta Carotene, Iodine, Klett (blue filter KS-42), Kreis, CIE values, Spectral data	1379951H
PFX*i*-995/P	Saybolt, ASTM, Pt-Co, Gardner, Lovibond® RYBN, IP Units, CIE values, Spectral data	1379952
PFX*i*-995/P (heated)	Saybolt, ASTM, Pt-Co, Gardner, Lovibond® RYBN, IP Units, CIE values, Spectral data	1379952H
PFX*i*-950	Lovibond® RYBN, AOCS-Tintometer®, Gardner, CIE values, Spectral data	1379501
PFX*i*-950 (heated)	Lovibond® RYBN, AOCS-Tintometer®, Gardner, CIE values, Spectral data	1379501H
PFX*i*-950/P	Saybolt, ASTM, Pt-Co, CIE values, Spectral data	1379502
PFX*i*-950/P (heated)	Saybolt, ASTM, Pt-Co, CIE values, Spectral data	1379502H
PFX*i*-880/L	Lovibond® RYBN, CIE values, Spectral data	1378801
PFX*i*-880/L (heated)	Lovibond® RYBN, CIE values, Spectral data	1378801H
PFX*i*-880/AT	AOCS-Tintometer®, CIE values, Spectral data	1378802
PFX*i*-880/AT (heated)	AOCS-Tintometer®, CIE values, Spectral data	1378802H
PFX*i*-880/P	Saybolt, ASTM, CIE values, Spectral data	1378803
PFX*i*-880/P (heated)	Saybolt, ASTM, CIE values, Spectral data	1378803H
PFX*i*-880/IP17	IP Units, Lovibond® RYBN, CIE values, Spectral data	1378804
PFX*i*-880/IP17 (heated)	IP Units, Lovibond® RYBN, CIE values, Spectral data	1378804H
PFX*i*-880/S	ICUMSA (420 & 560 nm), Lovibond® RYBN, CIE values, Spectral data	1378805
PFX*i*-880/S (heated)	ICUMSA (420 & 560 nm), Lovibond® RYBN, CIE values, Spectral data	1378805H
PFX*i*- 880/CIE	CIE values, Spectral data	1378806
PFX*i*-880/CIE (heated)	CIE values, Spectral data	1378806H

Accessories

Version	Glass Cells (optical glass for standard, borosilicate for heated instruments)
PFX*i*-995	1 x 10mm, 1 x 100mm, 1 x 1", 1 x 5¼
PFX*i*-995/P	1 x 10mm, 1 x 33mm, 1 x 100mm, 1x 1", 1 x 6"
PFX*i*-950	1 x 10mm, 1 x 1", 1 x 5¼
PFX*i*-950/P	1 x 33mm, 1 x 100mm
PFX*i*-880/L	1 x 1", 1 x 5 ¼"
PFX*i*-880/P	1 x 33mm, 1 x 100mm
PFX*i*-880/AT	1 x 1", 1 x 5 ¼"
PFX*i*-880/IP17	1 x 1", 1 x 6"
PFX*i*-880/S	1 x 100mm
PFX*i*-880/CIE	1 x 10mm

* Whenever cells are subjected to thermal shock, only borosilicate glass cells should be used.

Colour Scale Upgrades (include required cell)	Order Code
AOCS-Tintometer®	132000
Gardner	132010
FAC	132020
Pt-Co	132030
Iodine colour	132040
Klett (blue filter KS-42)	132050
ASTM	132060
Saybolt	132070
European Pharmacopoeia	132080
US Pharmacopoeia	132090
Lovibond® RYBN	132100
Acid Wash	132110
ICUMSA (420 & 560nm)	132120
Yellowness Index	132130
IP units	132140
Chlorophyll + beta Carotene	138900
AF960 scale extension	139090

for all other scales, please enquire

Spares & Optional Accessories	
PFX*i* lamp 5V	138180
Replacement sample chamber (PFXi-880/950/995)	133840
Holder for 12.5mm wide cells	137530
Acid Wash tube base (PFX*i*-880/950/995)	137510
Acid Wash shaking tube	352220
Acid Wash tube	131840
PFX*i* IQ/OQ documentation	137680
PFX*i* flow through software	137690
Flow through cell 10mm (needs holder 658030)	658020
Flow through cell 50mm (needs holder 658030)	658010
Plastic disposable cells 10mm, pack of 100 (needs holder 658030)	132770
Plastic disposable cells 33mm, pack of 50 (needs holder 658030)	352091
Dark sample cell 1mm path length (10mm with 9mm spacer)	132820
PFX*i* Instruction CD including Windows® Software	137460
RCMSi Certified Calibration Pack- Full	134410
RCMSi Certified Calibration Pack- Conformance	134420
RCMSi Certified Calibration Pack - Starter	134430
Heater upgrade for PFX*i*	137880
PFX*i* Thermal Printer	137890
PFX*i* external power supply pack	131219

Conformance Filters (nominal values quoted)	
AOCS-Tintometer Filter Set - (3 filters: 0.5R 1.0Y, 3.7R 13.0Y, 6.6R 50Y)	136900
ASTM Color Filter Set - (3 filters: 0.5, 3.5, 5.0)	139510
Beta carotene - (1 filter: 45 ppm at 10 mm path length)	139520
Chlorophyll A - (1 filter: 0.19 ppm at 10 mm path length)	139530
FAC Colour Filter Set - (5 filters: 7, 13, 15, 29, 39)	139700
Gardner Colour Filter Set - (4 filters: 2, 8, 12, 17)	139560
IP Units Filter Set - (4 filters: 0.75, 1.25, 2.0, 3.5)	137660
Klett (blue filter KS-42) Filter Set - (5 filters: 21, 66, 162, 318, 616)	139710
Lovibond® Red, Yellow, Neutral Filter Set - (5 filters) - Set 1	139630
Lovibond® Red, Yellow, Neutral Filter Set - (5 filters) - Set 2	139610
Lovibond® Red, Yellow, Neutral Filter Set - (10 filters) - Sets 1 & 2	139590
Lovibond® Red, Yellow, Blue Filter Set - (5 filters)	139620
Pt-Co/Hazen/APHA Filter Set - (5 filters: 5, 20, 50, 100, 300)	139570
Saybolt Colour Filter Set - (5 filters: -8, 0, +10, +18, +25)	139580
Single Filter (Certificated) - (specify instrument, scale and nominal value from above)	109970
User Specified Filter - (specify instrument, scale and value when ordering)	109980

Certified Reference Materials, 500 ml (nominal values quoted)	
AOCS-Tintometer® Colour 0.3R 2.0Y (5¼")	134240
AOCS-Tintometer® Colour 1.0R 9.0Y (5¼")	134250
AOCS-Tintometer® Colour 1.2R 12Y (5¼")	134260
AOCS-Tintometer® Colour 2.2R 22Y (5¼")	134270
ASTM Color < 0.5 500 ml	134290
ASTM Color 1 500 ml	134000
ASTM Color 3 500 ml	134010
ASTM Color 5 500 ml	134020
ASTM Color 7 500 ml	134030
Gardner Colour 2	134200
Gardner Colour 5	134210
Gardner Colour 8	134220
Lovibond® RYBN Colour 0.4R 1.9Y 0.1N (5¼")	134080
Lovibond® RYBN Colour 1.0R 4.3Y 0.1N (5¼")	134090
Lovibond® RYBN Colour 1.4R 7.3Y 0.2N (5¼")	134100
Lovibond® RYBN Colour 1.6R 11.0Y 0.1N (5¼")	134110
Lovibond® RYBN Colour 1.8R 14.0Y 0.3N (5¼")	134120
Lovibond® RYBN Colour 2.5R 24.0Y 0.5N (5¼")	134130
Platinum Cobalt Colour 0 (no certificate)	133991
Platinum-Cobalt Colour 5	134140
Platinum-Cobalt Colour 10	134150
Platinum-Cobalt Colour 15	134160
Platinum-Cobalt Colour 30	134170
Platinum-Cobalt Colour 50	134180
Platinum-Cobalt Colour 100	134190
Platinum-Cobalt Colour 500	462803
Saybolt Colour -10 500 ml	134040
Saybolt Colour 0 500 ml	134050
Saybolt Colour +12 500 ml	134060
Saybolt Colour +25 500 ml	134070

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