



Chroma[™]

Optical Spectral Analysis
and Color Measurement



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ChromaTM

Powerful software package for optical spectral analysis and color measurement



Color is an important design and product recognition feature, one that can mean the difference between market success and failure. Particularly when using natural or recycled raw materials with varying compositions, continuous, objective monitoring of the effect of color is a key prerequisite for uniform quality.

With the Chroma software package and a PC-controlled spectrophotometer, you can now determine the transmission and reflection properties of solids and liquids precisely, and on the basis of these calculate and graphically display color values according to both the Helmholtz and the CIELAB method.

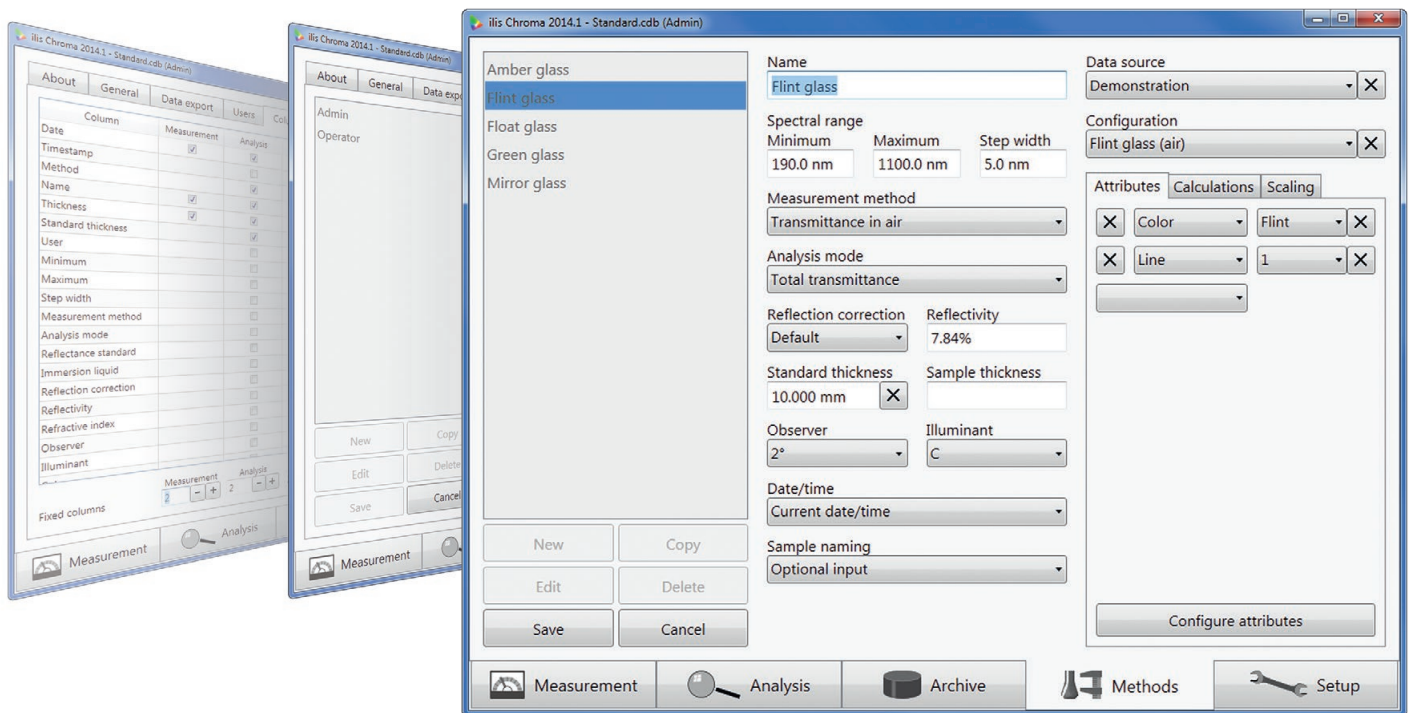
Chroma links measurement and evaluation with a powerful database in which all results are stored in an optimized structure. The Chroma software ensures the traceability and complete documentation of all measurements to actively support you in implementing your quality standards.

Chroma meets all the needs of routine analysis and quality control by means of measurement requirements, automated series measurement, data export and report generation. At the same time, Chroma also fulfills the most stringent requirements for research and development thanks to its flexible evaluation options and statistical functions. And its clearly structured user interface means that Chroma is always, intuitive, simple and dependable to use.

FEATURES

- > Directly controls spectrophotometers from a variety of manufacturers
- > Integrated color determination according to ISO 11664/CIE 15
- > Graphic, interactive display of measurement results
- > Wide range of evaluation options
- > Integrated database with trend analysis
- > Special functions for measuring glass and plastic
- > Clear, intuitive user interface structured according to work processes



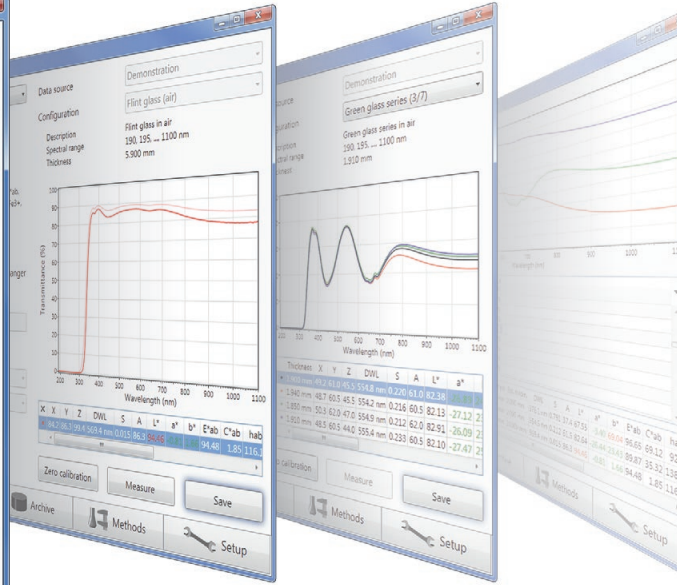
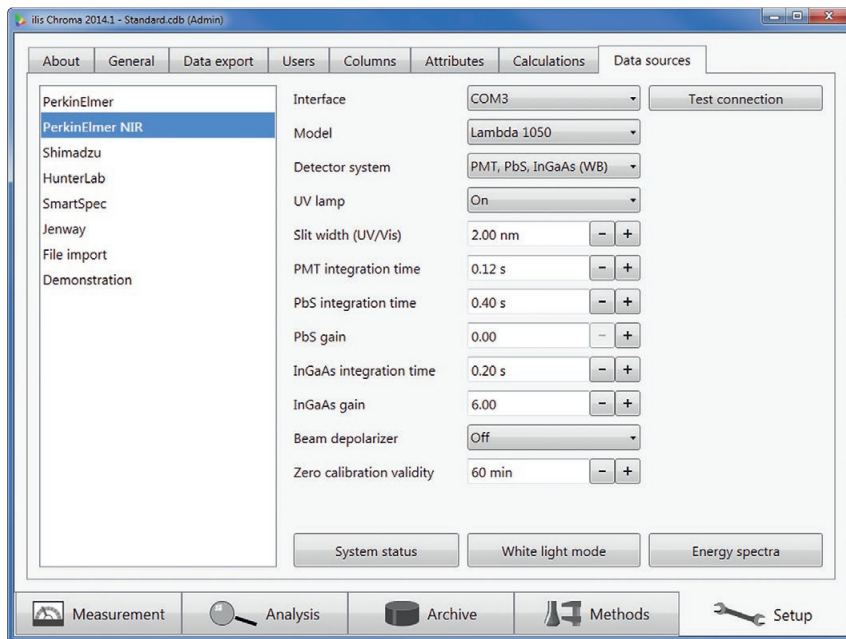
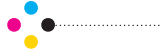


Manage your parameters easily using methods and attributes



All parameters necessary for measuring and evaluation are compiled in methods, to ensure that measurements are always conducted using the same settings and under identical conditions. Users can create any number of methods, either from scratch or based on existing methods. In addition to the required settings such as the wavelength range and measurement method, Chroma offers an array of parameters for correcting and converting the measured spectrum. For example, Chroma lets you translate transmission measurements of samples of varying thicknesses to a defined layer thickness to make your measurements comparable. When measuring in immersion, you

can take the effect of the immersion fluid used into account to correct your measurement. Chroma also lets you link methods with user-defined attributes to facilitate subsequent retrieval of measurements from the archive. For example, you can store a list of color numbers in Chroma and assign these to a method. Then, when performing a measurement, users must select the proper number from a drop-down list. This ensures correct attribution of all measurements at all times.

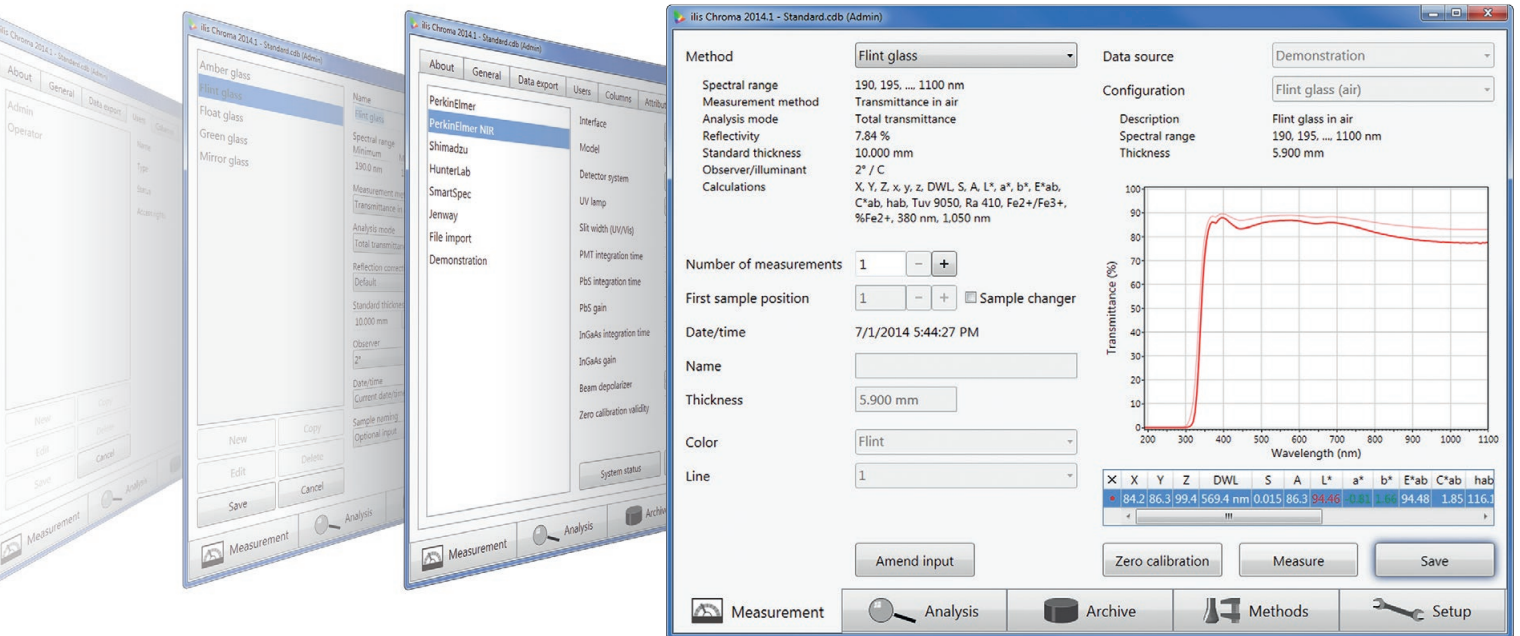


Direct control of spectrophotometers and flexible data import

Chroma can directly control a continually growing number of spectrometers from various manufacturers. You can access the instrument settings directly in Chroma via device-specific configuration pages, independent from the measurement method itself. You can thus use the same method with different instruments. The configuration remains clearly organized even for complex instruments with multiple detectors, because Chroma automatically selects the optimum values for a wide range of instrument settings. You see only the parameters that you truly need to set – Chroma does the rest.

Spectra from instruments for which Chroma does not yet have drivers can be imported from text files. The necessary settings such as column and decimal separators or the usable data range are already predefined for a wide range of common file formats, and are also user-configurable as needed.



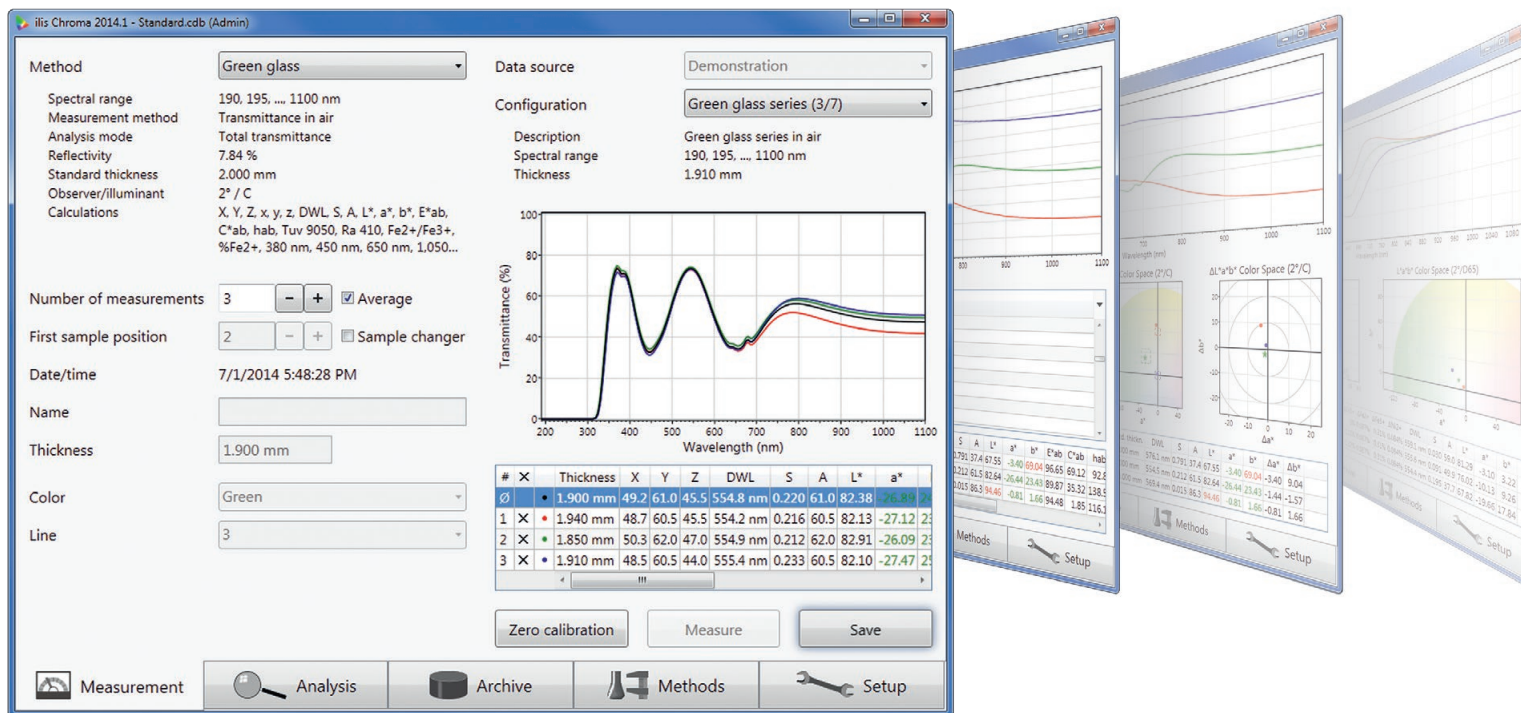


Rapid spectral transmission and reflection measurement

Prior to measuring, simply select the desired measurement and enter the parameters still required, such as sample thickness and attribute values. Chroma makes sure you don't overlook anything, and informs you of each next step. Chroma also takes care of zero calibration and automatically detects when this needs to be repeated due to altered settings or following expiration of a set period.

Once the measurement is started, the measured spectrum is continually updated on the screen. The corrections defined in the method, such as conversion to a fixed reference thickness, are taken into account, and the corrected spectrum is displayed along with the raw values. This means that you obtain a first impression of the measurement results during the measurement, allowing you to e.g. reject faulty measurements without having to wait until measurement is finished.





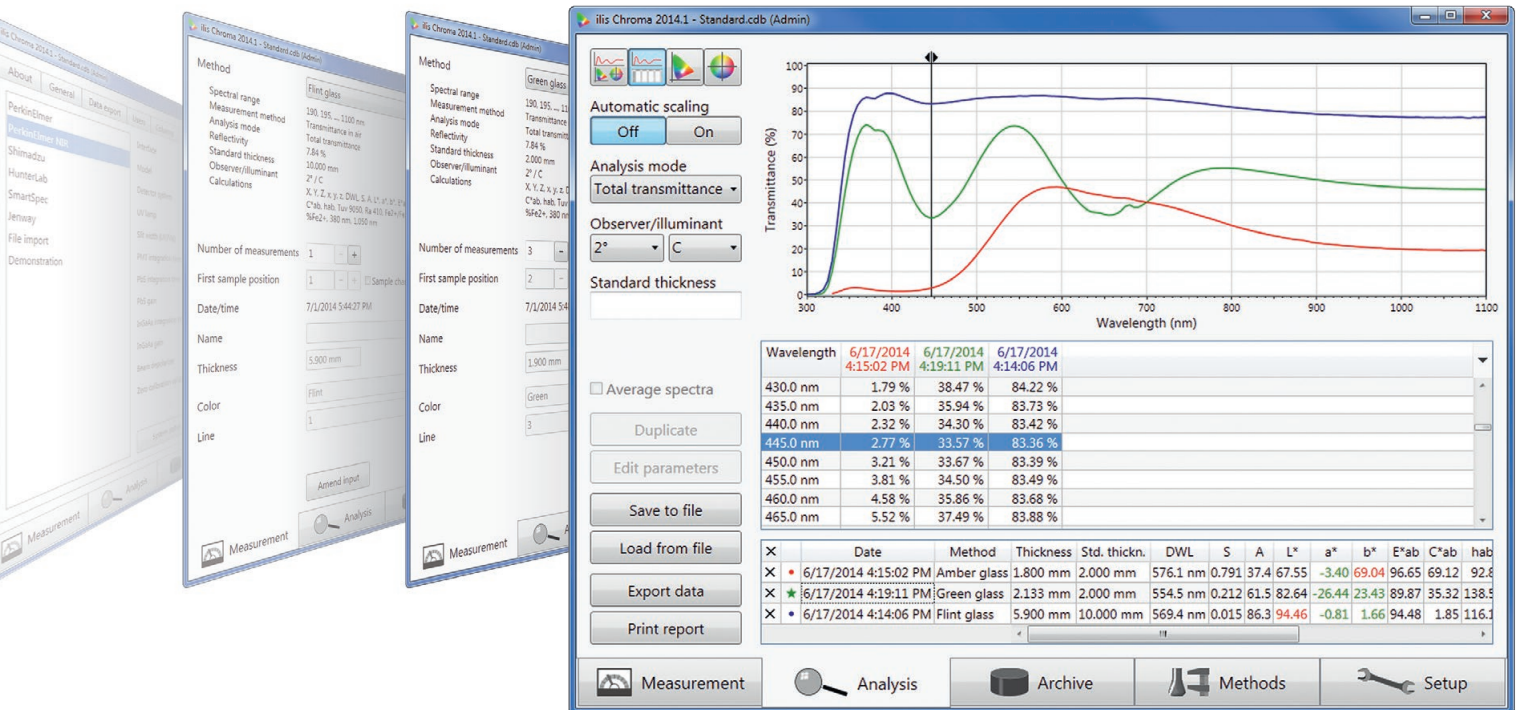
Automating workflows through series measurement

The Series Measurement module enables you to automate recurring workflows easily. If the measuring instrument is equipped with a sample changer, Chroma can even change the samples in the beam path – freeing you for other work while the measurement is running.

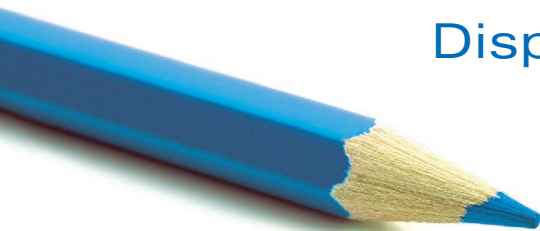
You can automatically average multiple measurements to obtain more accurate results. Simply specify the number of measurements to be performed – Chroma handles the rest. After measuring, the averaged spectrum is displayed along with the corrected individual measurements.

This enables you to identify outliers rapidly and eliminate them with just a click. The individual measurements are stored in the archive along with the averaged measurement and can be retrieved and evaluated at any time. The entire process remains transparent, and no data is lost.





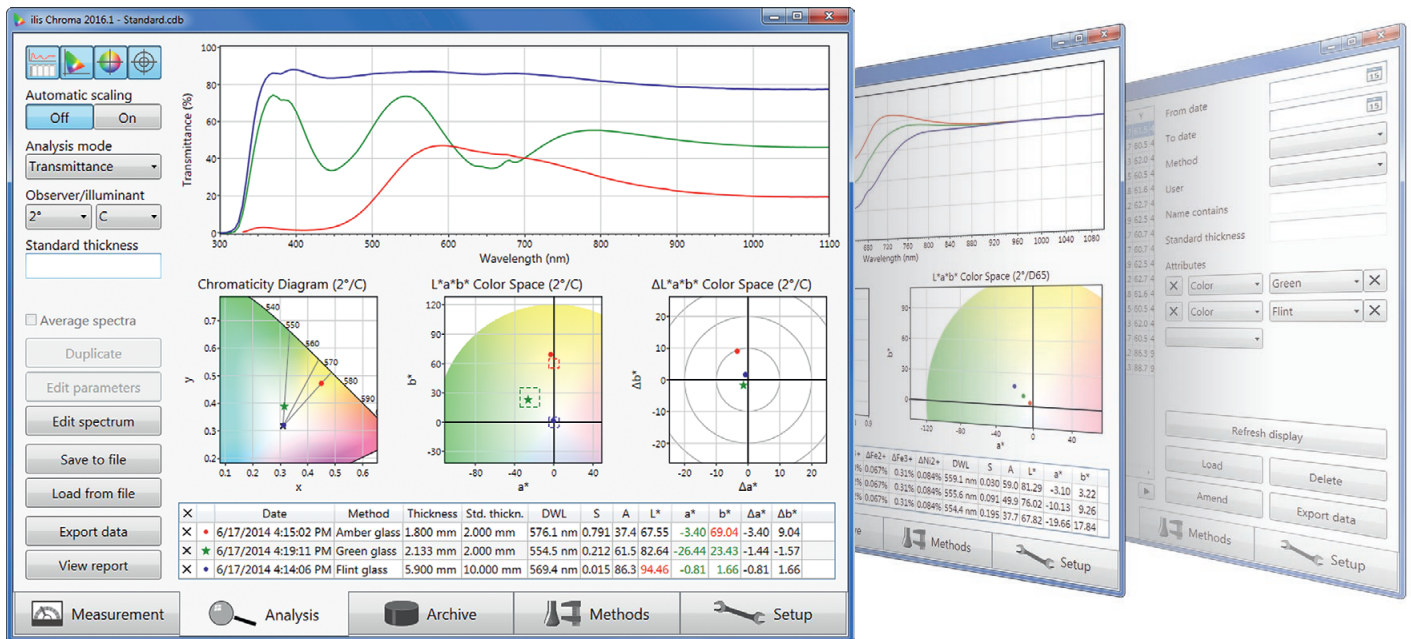
Displaying and evaluating transmission and reflection spectra



When you save a measurement or load one from the archive, Chroma automatically opens the Analysis module, in which all results are displayed in the form of tables and diagrams. In Analysis mode, you can print out results or export them for further processing in other programs.

You can also subsequently modify certain parameters without in any way altering the results stored in the database.

Chroma lets you compare up to ten spectra directly in transmission and reflection diagrams. Transmission spectra can also be displayed in absorbance mode (optical density). You can additionally open a table with all spectral values beneath the diagram.

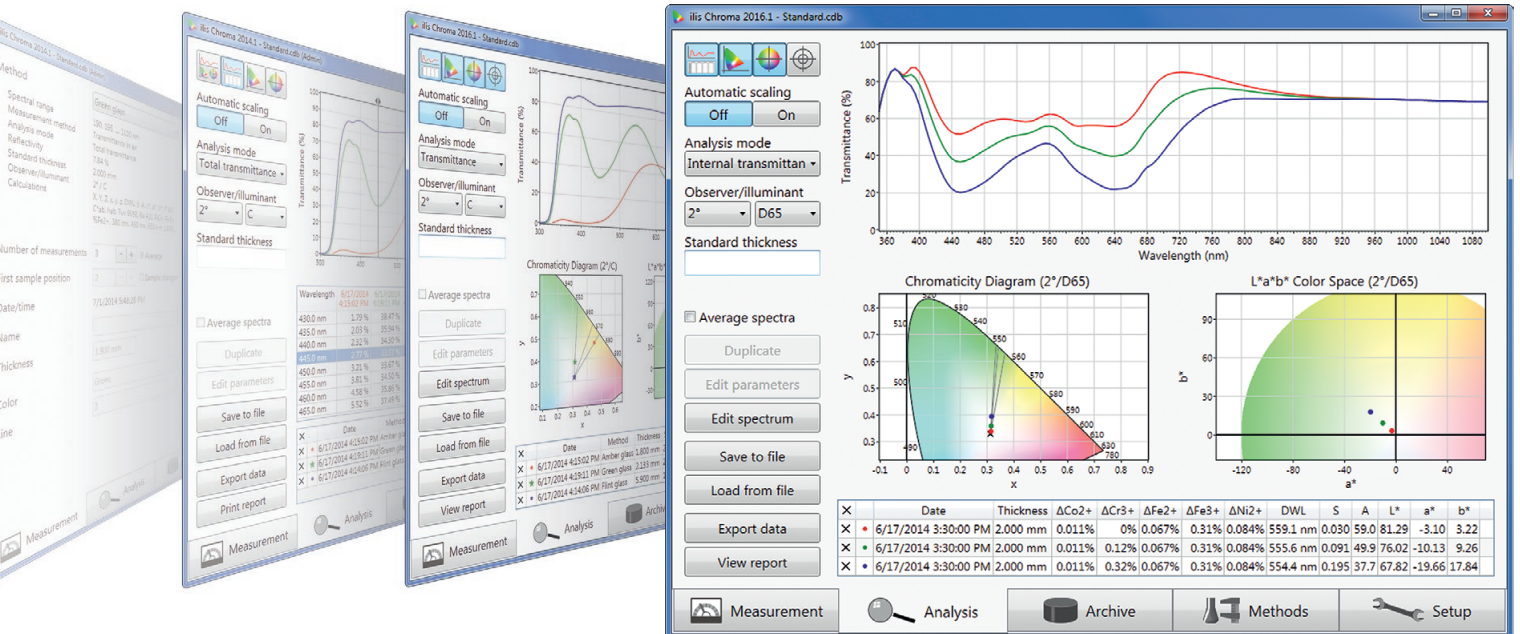


Standard-compliant color determination using the Helmholtz and CIELAB methods

Using the Color Analysis module, you can determine color values according to the Helmholtz and CIE-LAB methods from the spectrum and display these graphically in the chromaticity diagram and in L*a*b* color space. All values can be calculated in the 2° or 10° chromaticity system or using standard illuminants A, C or D65. Both parameters can also be varied retroactively to test the effect of different illumination and observation situations.

Limit values stored in the methods are verified automatically. Table values are color-coded to indicate non-compliance with tolerances. The tolerance ranges are additionally displayed in the L*a*b* diagram as a rectangle, enabling you to see at a glance how close the measurement point lies to the limits.





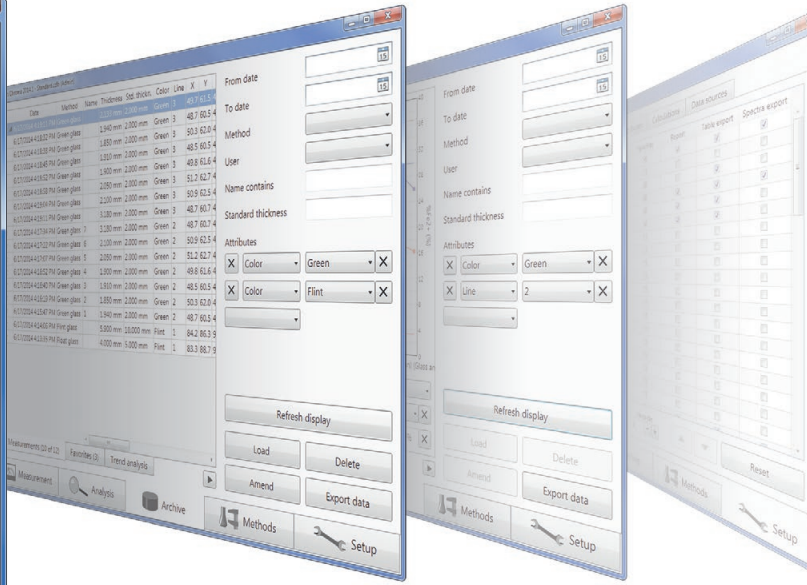
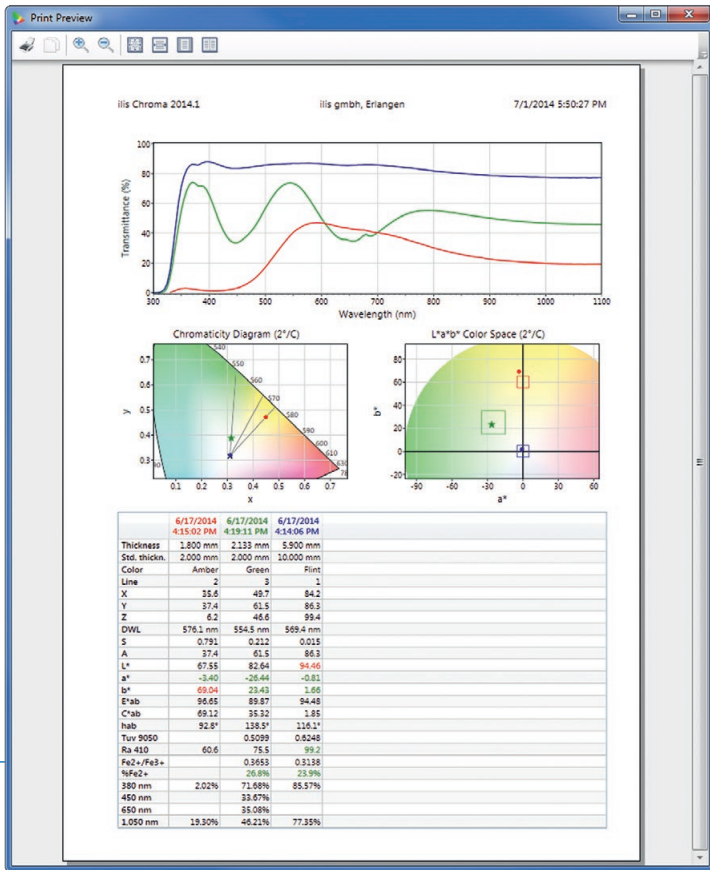
Special calculations for the glass industry

The Chroma Glass Analysis module is designed to meet the special requirements of the glass industry, and comprises glass-specific calculations.

A wide range of glass assessment methods are offered, including light transmittance, direct solar transmittance, UV transmittance as well as the color rendering index according to ISO 9050 and EN 410. If desired, the conversion of layer thickness can even consider the wavelength-dependent multiple reflection.

The redox state is of key importance in manufacturing packaging and flat glass. This can be determined on the

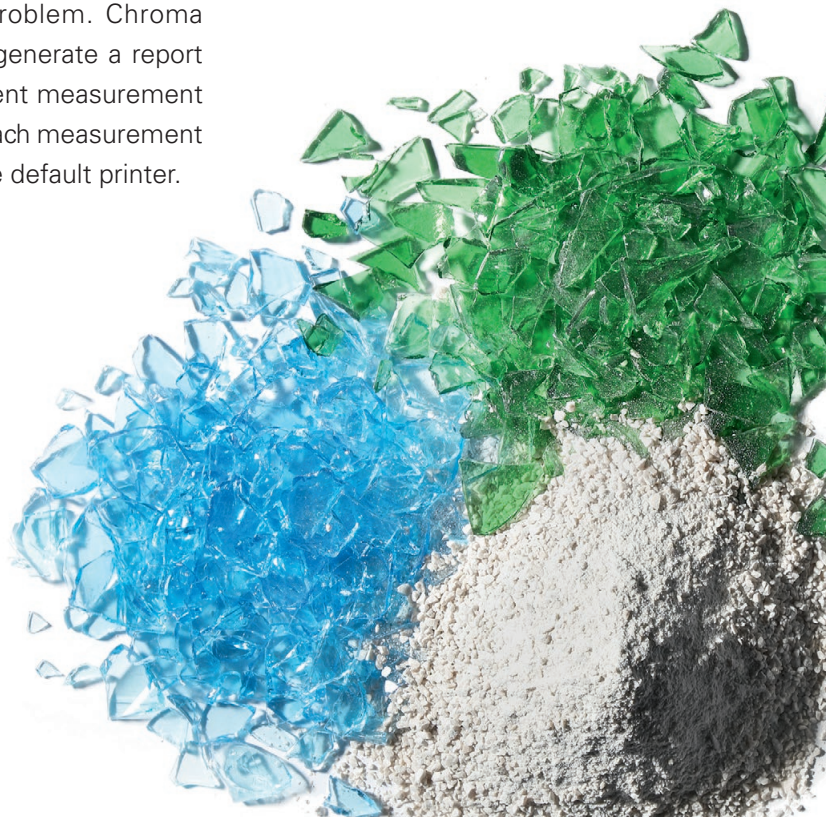
basis of the transmission spectrum using the Bamford/Hudson formula and specified as the Fe^{2+}/Fe^{3+} ratio or the relative Fe^{2+} or Fe^{3+} proportion. For soda lime glasses, the influence of common coloring oxides (iron, chromium, cobalt, etc.) on the transmission spectrum and the color effect can be simulated.

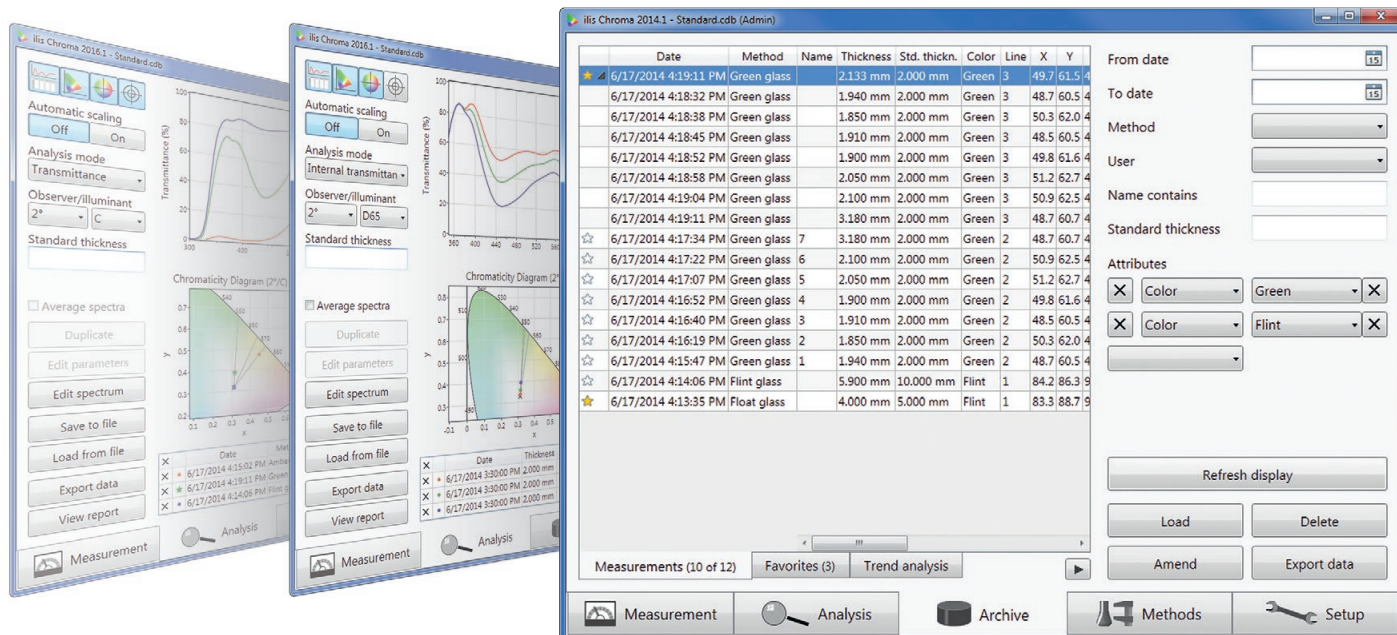


Generate meaningful reports

Chroma lets you generate and print out meaningful reports or store them as PDF files, to enable you to document and distribute your results. Instead of weighing you down with clunky report generators, Chroma empowers you with the proven what-you-see-is-what-you-get principle. So the content and structure of your reports always correspond to the way they look on screen. And of course you can adapt the report to meet your own personal needs, for example by adding a header or permanently defining the axis scales in the diagrams via the method.

Do you want to automate report generation? No problem. Chroma can automatically generate a report with the most recent measurement results following each measurement and output it to the default printer.



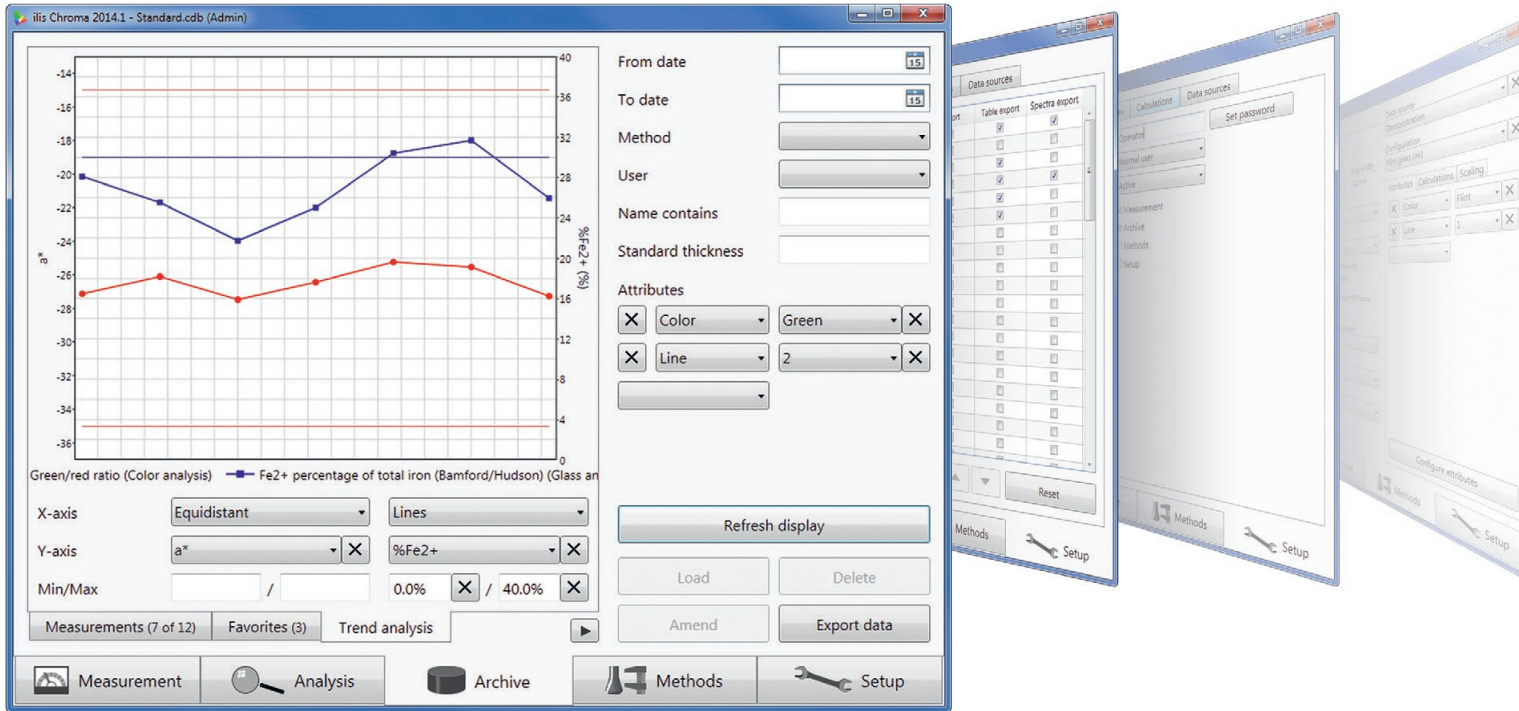


Archive and manage measurement results reliably

What good is the best measurement if you cannot find it again? Particularly in quality assurance, thousands of measurements can easily accumulate over the course of a year. With its Archive module, Chroma offers a user-friendly solution. All measurements are stored in a central database. The instantly comprehensible table view provides a constant overview of past measurements with all calculation results. You can rapidly filter the table according to criteria such as date, name or linked attributes.

Do you want to repeatedly compare specific measurements with current measurements? In the Archive, you can bookmark any measurements with just a click, which are then conveniently listed on an extra tab.



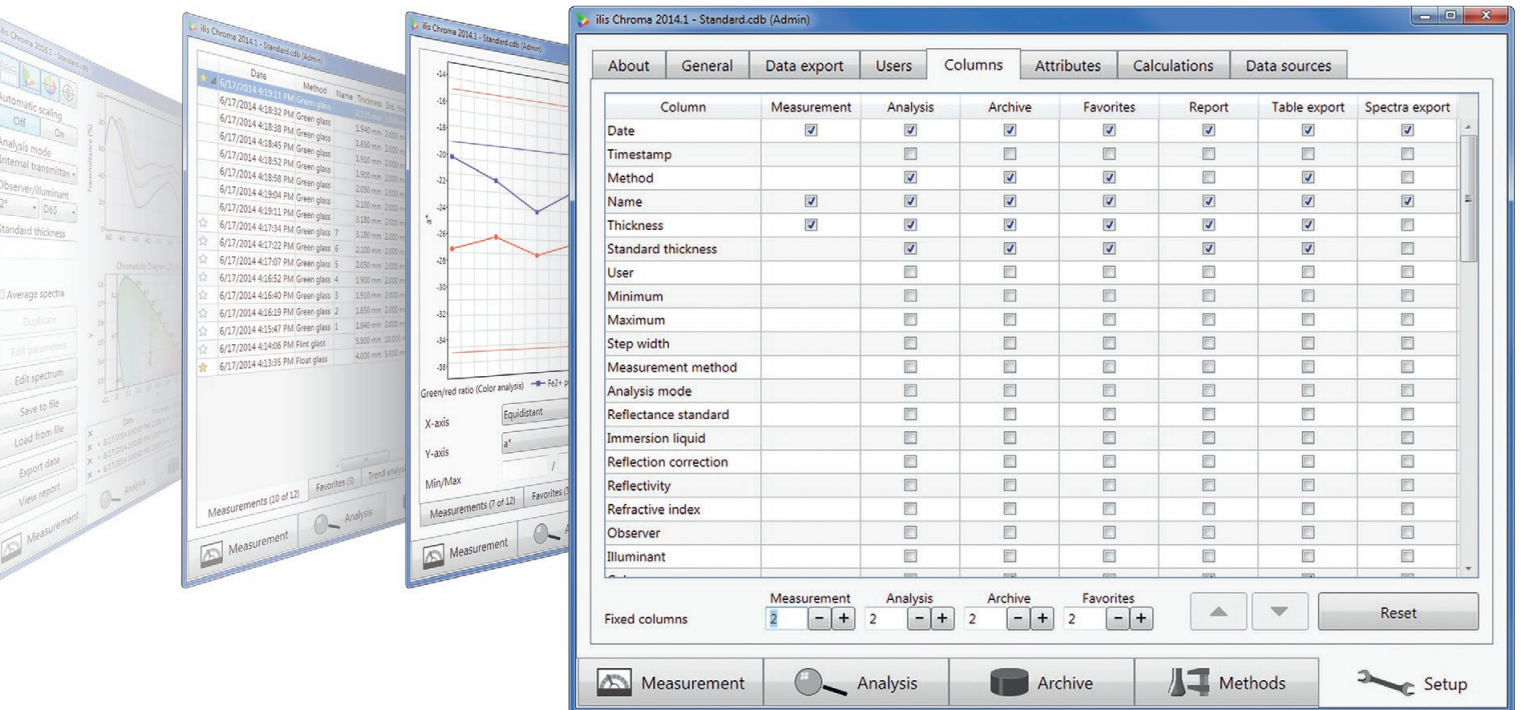


Tracking trends and monitoring limit values

As an alternative to the table view, you can also visualize the stored measured values in Chroma directly in the form of meaningful trend diagrams.

To make dependencies visible, you can display two values in a diagram concurrently to compare them directly. Limit values stored in the methods are displayed here as lines, to immediately reveal when a measured value is on the verge of going out of tolerance.



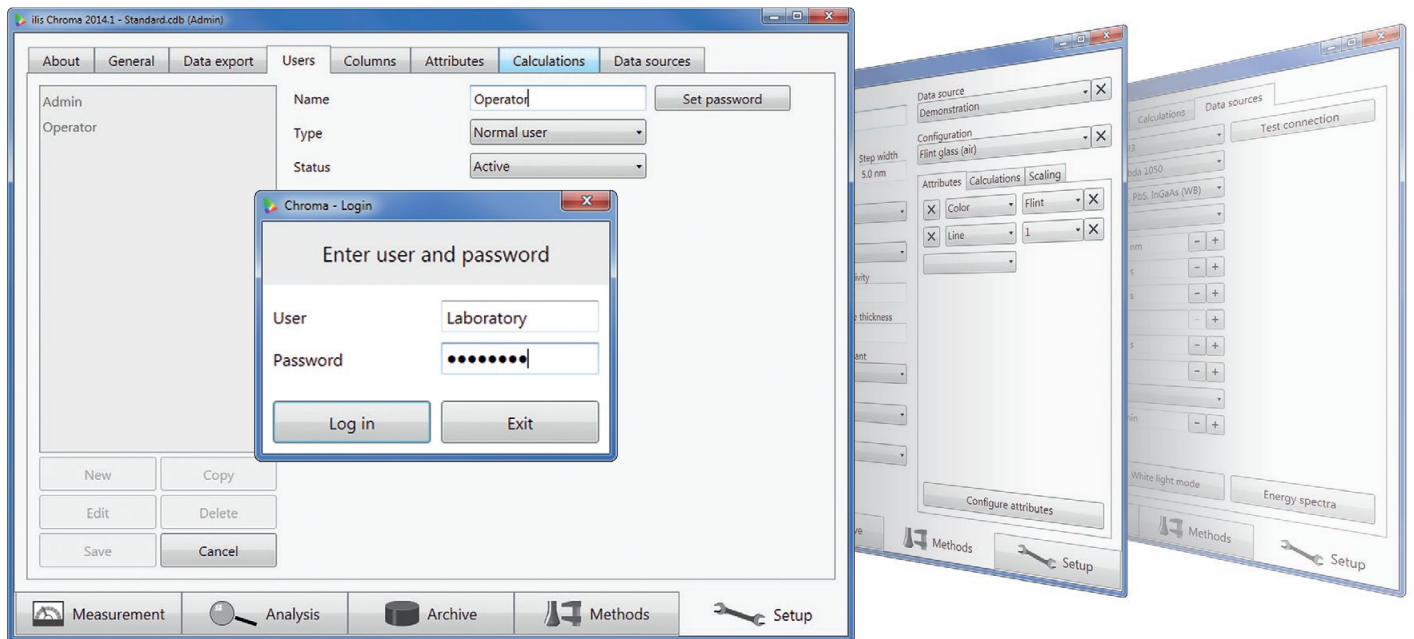


User-friendly data export

If ever Chroma's evaluation functions are not enough, you can export all data – from result values to entire spectra – in CSV format for processing in other programs, such as Microsoft Excel. This is possible in both the Analysis and Archive module. You can define in detail the data to be exported in the setup. In addition to the result and spectrum values, you can also select any method parameters and attributes for export. Do you want to transfer results automatically to your laboratory information system (LIMS)?

Simply activate automatic data export, and the results are exported automatically after the measurement. To ensure that no problems occur in further processing, Chroma lets you define precisely what language is to be used for column headers and configure decimal and column separators.





Limiting access and preventing manipulation

Not everyone who works with Chroma should also be able to change all settings. Access control lets you define as many users as you want and assign them rights to different parts of Chroma. Each user must then log in with username and password when Chroma starts.

Once stored in the Chroma database, measurement results cannot be subsequently altered. The change function in the Archive only allows adding of calculations or editing of meta information (e.g. attribute values).

And in Analysis as well, it is clear at a single glance whether values represent original data or whether they have been modified via parameter changes.

To prevent direct manipulation, the Chroma database is fully encrypted and cannot be opened using any other programs.





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