

26.04. 2012 - Non-Contact Color Measurement of Liquid Paints in Quality Control and Formulation

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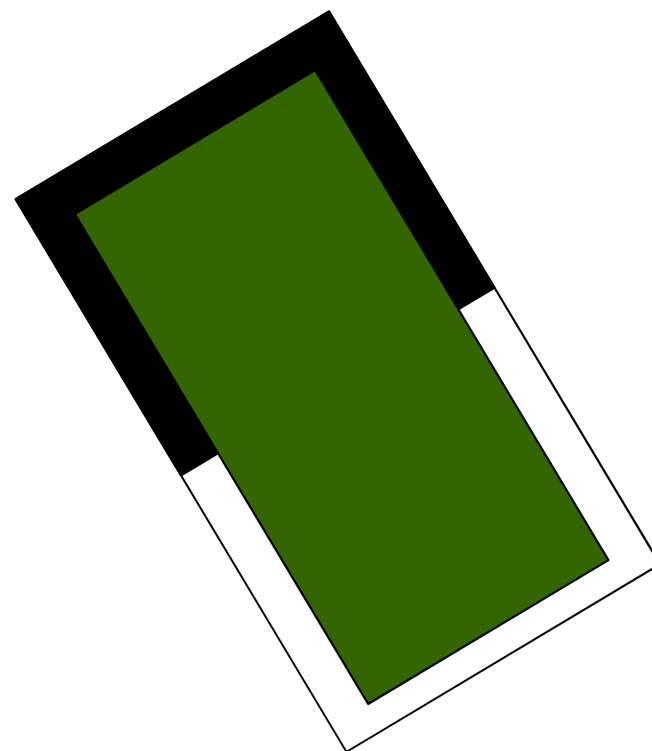
Non-Contact Color Measurement

- Challenge
- Tools
 - VS450
 - Accessories
 - Software
- Preparation
 - How to present samples
- Challenges
 - Distance variation
 - Influence of drying
 - Surface
- Solution – examples
 - Batch-QC
 - QC
 - Formulation
 - Research

- Unsolved challenges
 - Wet Samples with long drying time
 - Alkyd Paints, floor coatings, gels
 - Samples with very sensitive surfaces
 - Powders, creams, pastes
- Avoid any physical contact between sample and instrument
- Measurements through glass
- Main reason Reduce waiting time
 - Waiting time is cost
 - Reduces production capacity
 - Increases delivery time

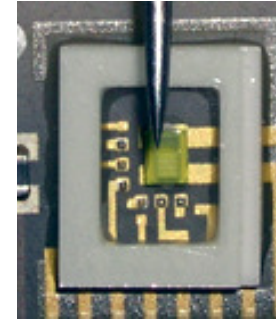


VS450 Non-Contact Spectrophotometer

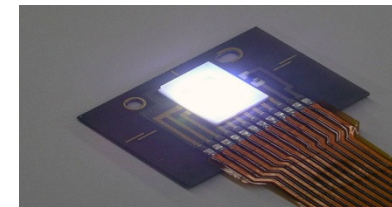


Product – Illumination

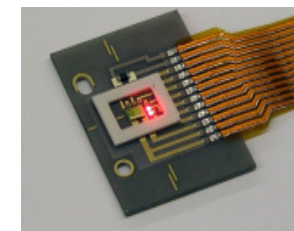
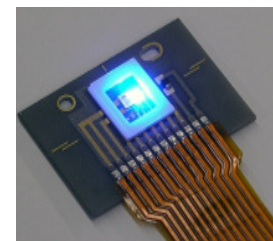
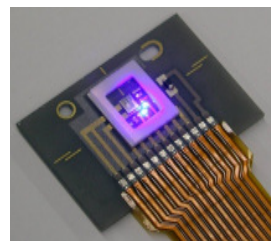
- LED – illumination (extension from VeriColor Technology)
- D65 filtered
- Independent from Ambient Light (No special shuttering required)
- Not temperature sensitive (constant operating temperature at 50° C)



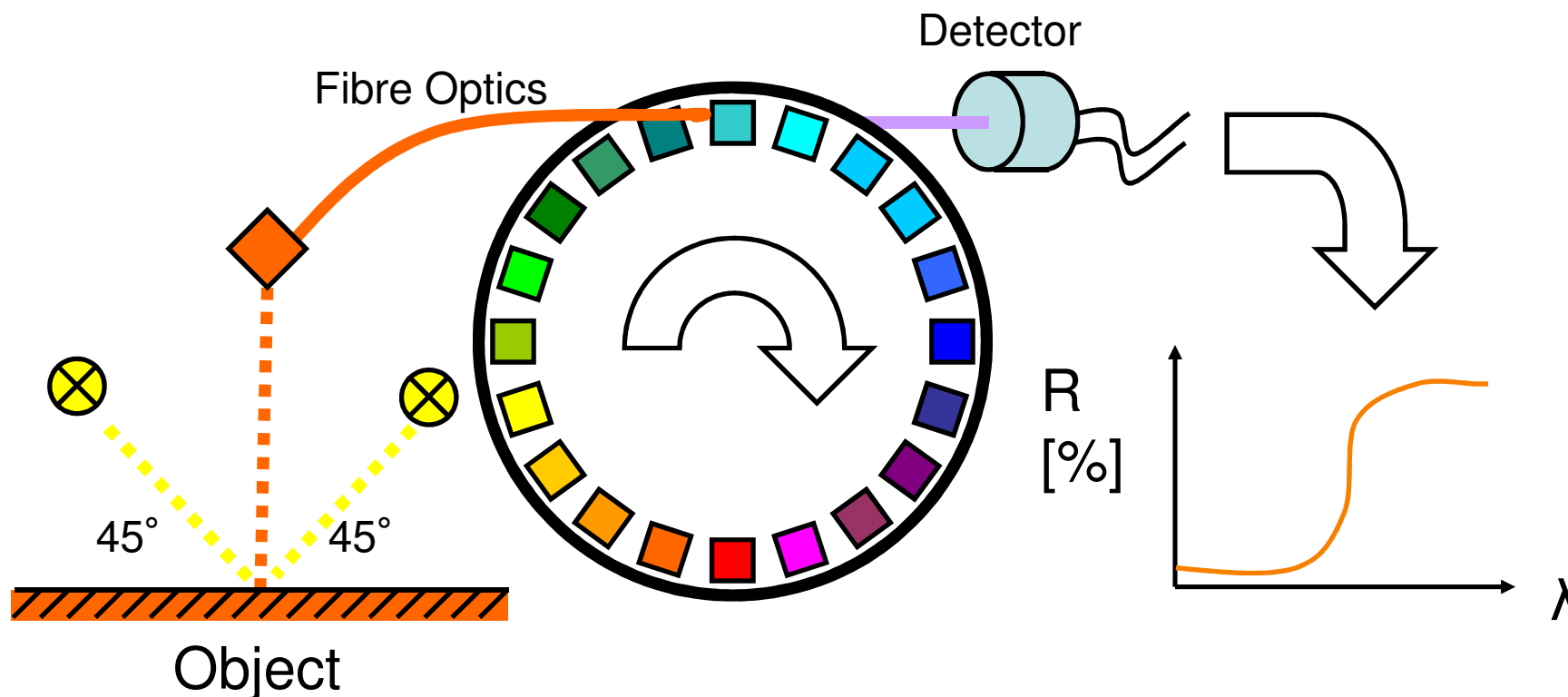
White LED



Chromatic Compensation LEDs



- Geometry dual 45° illumination / 0° measurement
- Spectral engine DRS Direct Rotational System
- Spectral range 400-700 nm (31 channels)



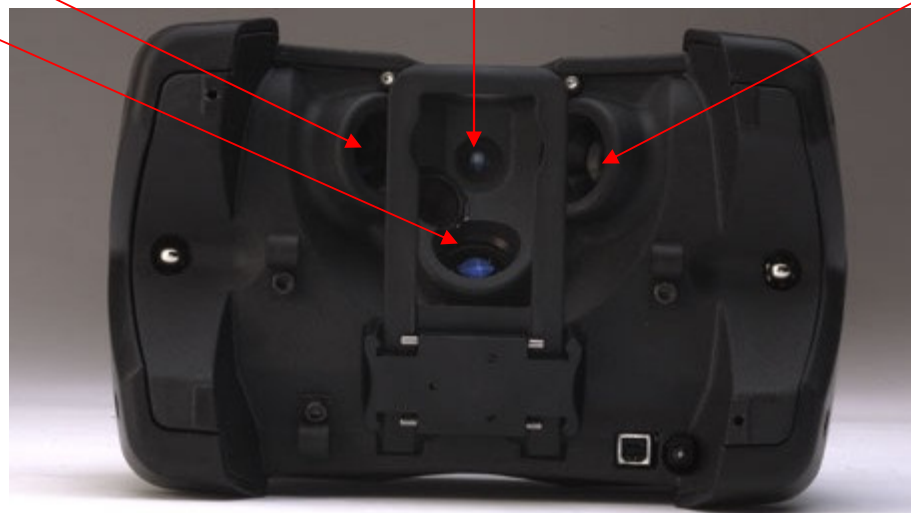
Geometry

- 45/0° geometry with dual beam illumination
 - 90 ° turn – to reduce directionality effects

Illuminators

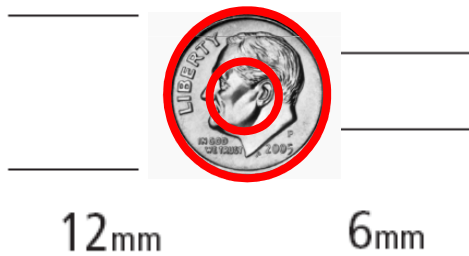
Pick-up

Correlated 60°
gloss



Dual Aperture

- 6mm (0.25") and 12mm (0.50") switchable apertures
 - Calibration is NOT required when switching between apertures



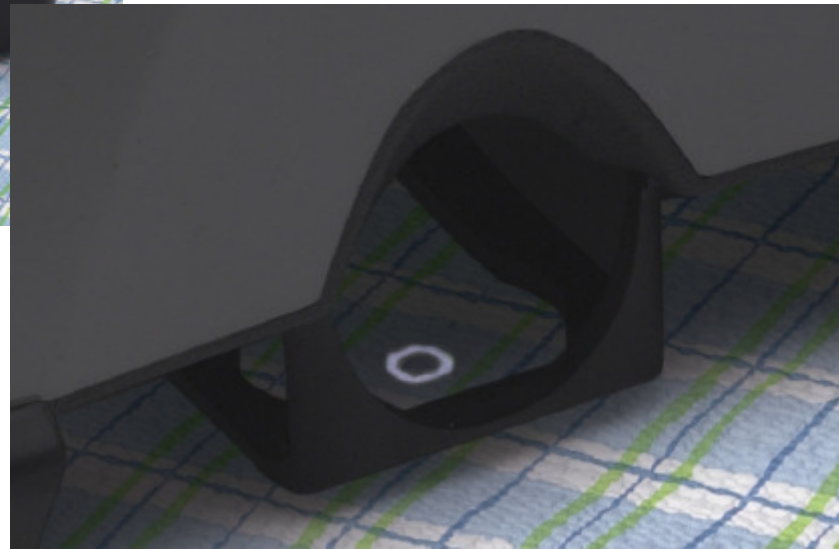
Measurement Distance

- 38 mm measurement distance from sample to pick-up lens
 - Keeps lens system free of wet paint and other contamination
- Proper measurement distance is within the 3 mm distance between the sample and the datum rail
- +/- 2.5 mm insensitivity to depth of field
-



Active Visual Targeting™

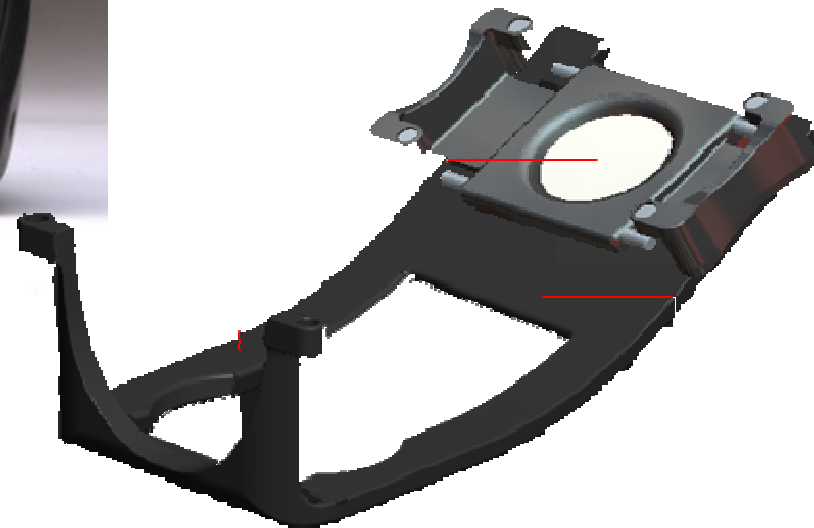
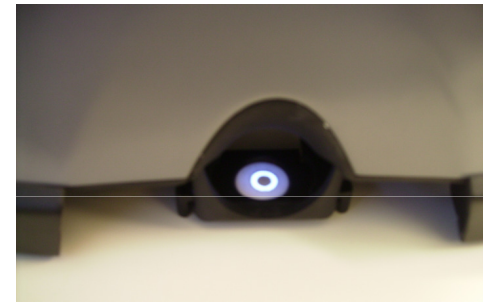
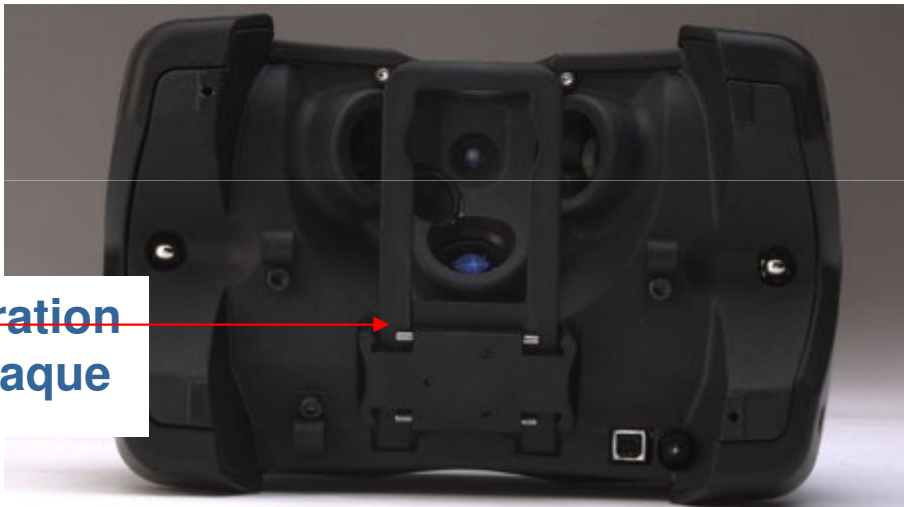
- Illuminates a target ring on the sample to insure accuracy of sample positioning



Calibration

- Integrated calibration plaque – just move it in the right position
- Calibration of both 6mm and 12mm apertures required only once per week (one step process) or 1000 measurements
- No requirement to calibrate when switching between apertures

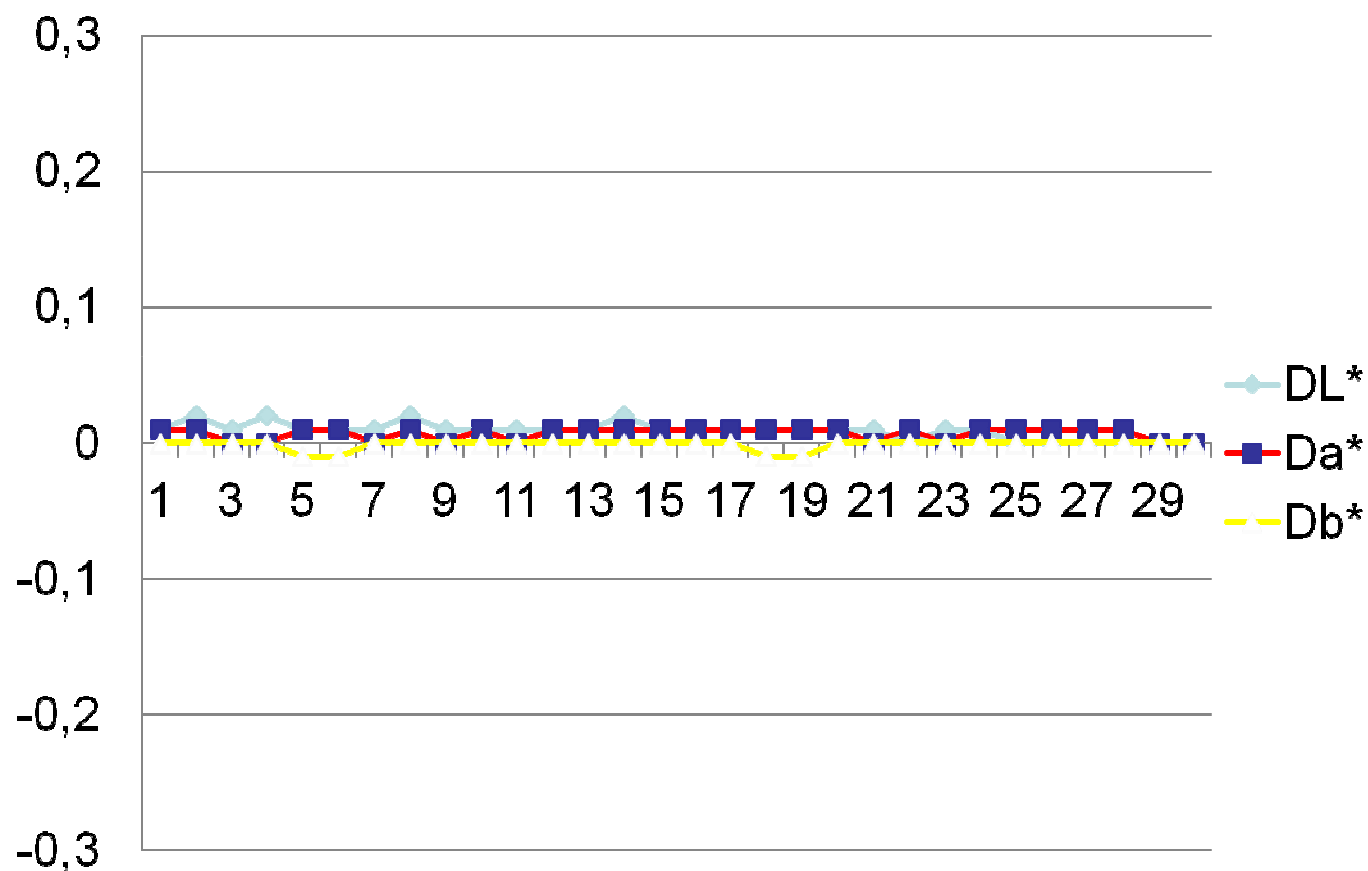
Calibration
Plaque



Instrument Performance

Performance Metric	X-Rite VS450 12 mm	X-Rite VS450 6 mm
Repeatability		
Max	0.025 dE _{ab}	0.035 dE _{ab}
Inter-Instrument -Agreement		
Avg	0.15 dE _{ab}	0.15 dE _{ab}
Absolute 0/45 agreement (964)	0.25 dE _{ab}	
Correlated Gloss 60°		
Deviation AVG	1.8 GU	
Deviation MAX	4 GU	

Short Term Repeatability (measurements)



Coating – RAL 7040

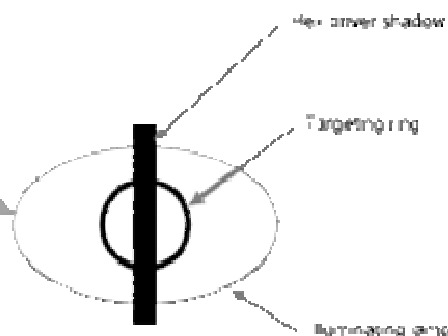
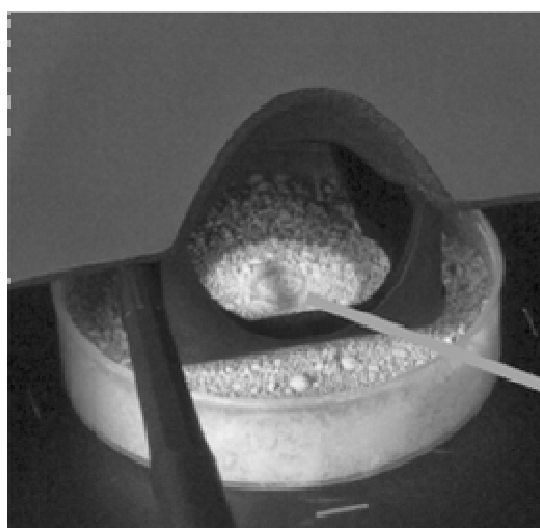
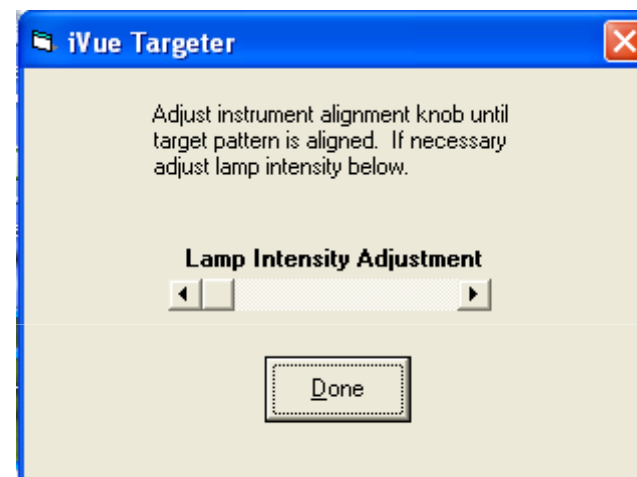
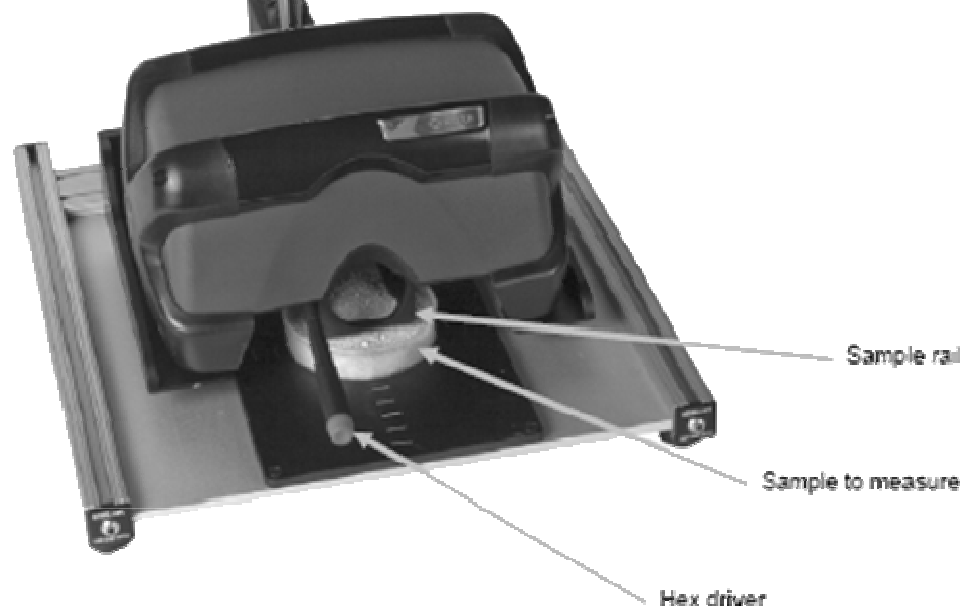
Same sample has been measured in a sequence of 5 seconds

VS450-800 Mounting Stand

- Provides ability to raise and lower the instrument to accommodate variation in sample height

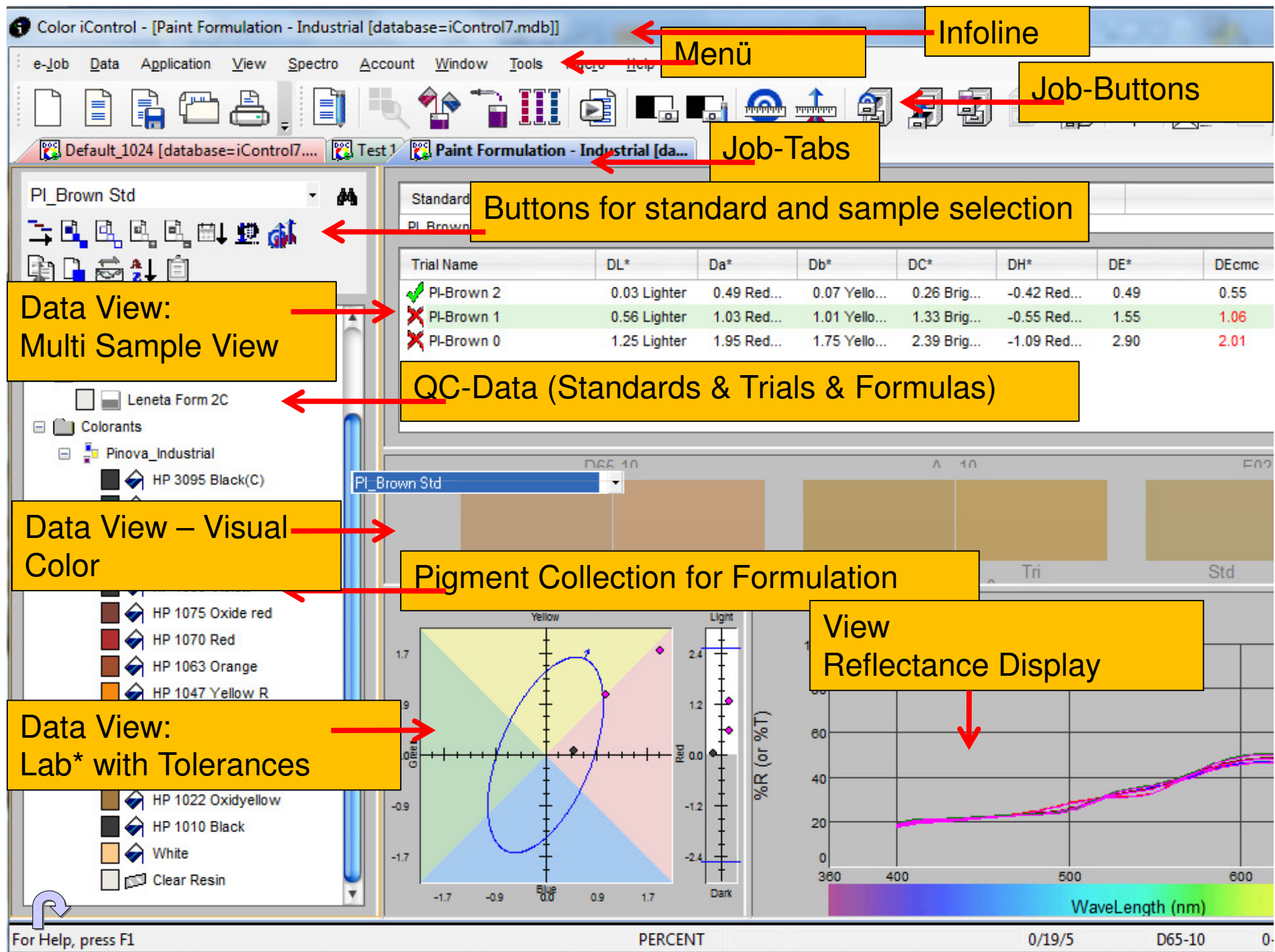


Distance Control with VS450-Stand



VS450-802 Stand with Accessories





Color iControl – Paint Formulation Screen

Menü

Info

Job-Buttons

Job View

Amount: ☐ Batch ☐ Resin ☐ Can

Total Batch Quantity: 100,00000

Can Used: Not Applicable

Resin Selection: ☒ Manual ☐ Auto Full ☐ Auto Traditional

Opacity: Opaque

Thickness:

Collection: Pinova_Industrial

Formulate Save Formula Edit Formula Multi Target Show All Correct

Formulation condition

Formulation buttons

Recipe Display

PI_Brown Std

Dispense

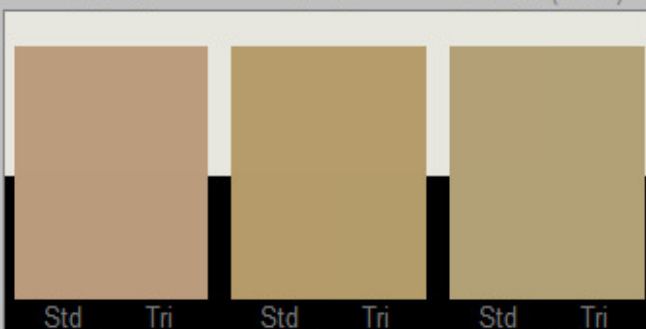
Num	Colorants	Percent	+ Score	D...	PP	MI(1,2)	CI(1,2)	Cost
★ F0002	Clear Resin	94,150	8.0	...	0	0.06	1.12	0.14
	White	4,364						
	HP 1022 Oxidyellow	1,326						
	HP 1070 Red	0,125						

Std/Recipe Contrast

Std/Recipe Reflexion

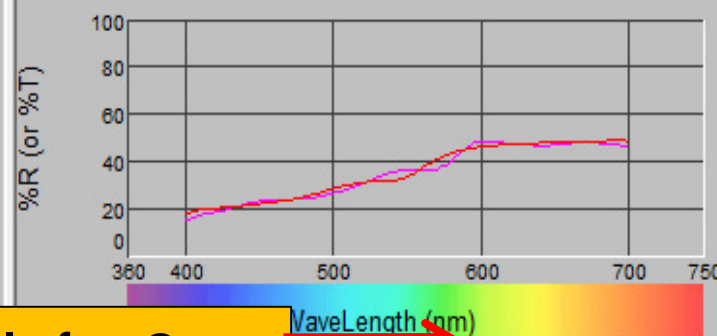
Std/Recipe Lab + Tol

D65-10 A -10 F02-10 (CWF)

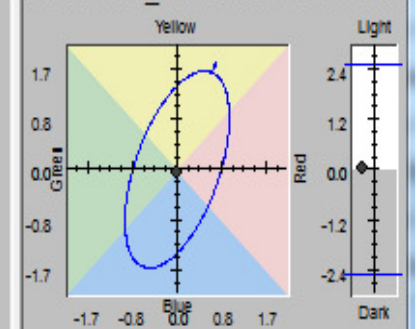


PI_Brown Std Formula# 2

Formula# 2



CIELab: PI_Brown Std Formula# 2



For Help, press F1

Info 2

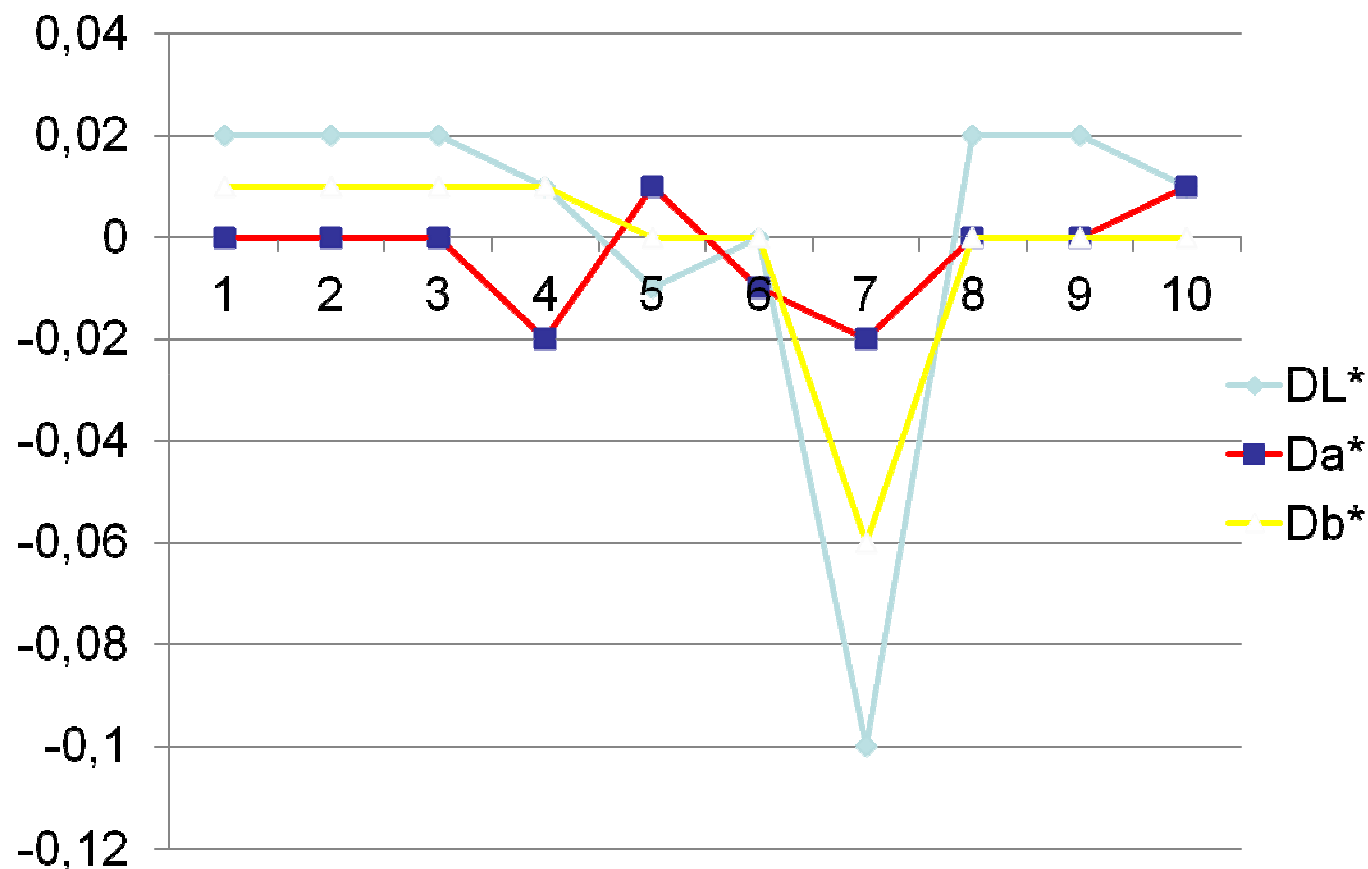
Finished

D65-10

0-Default | N2

Sample Presentation

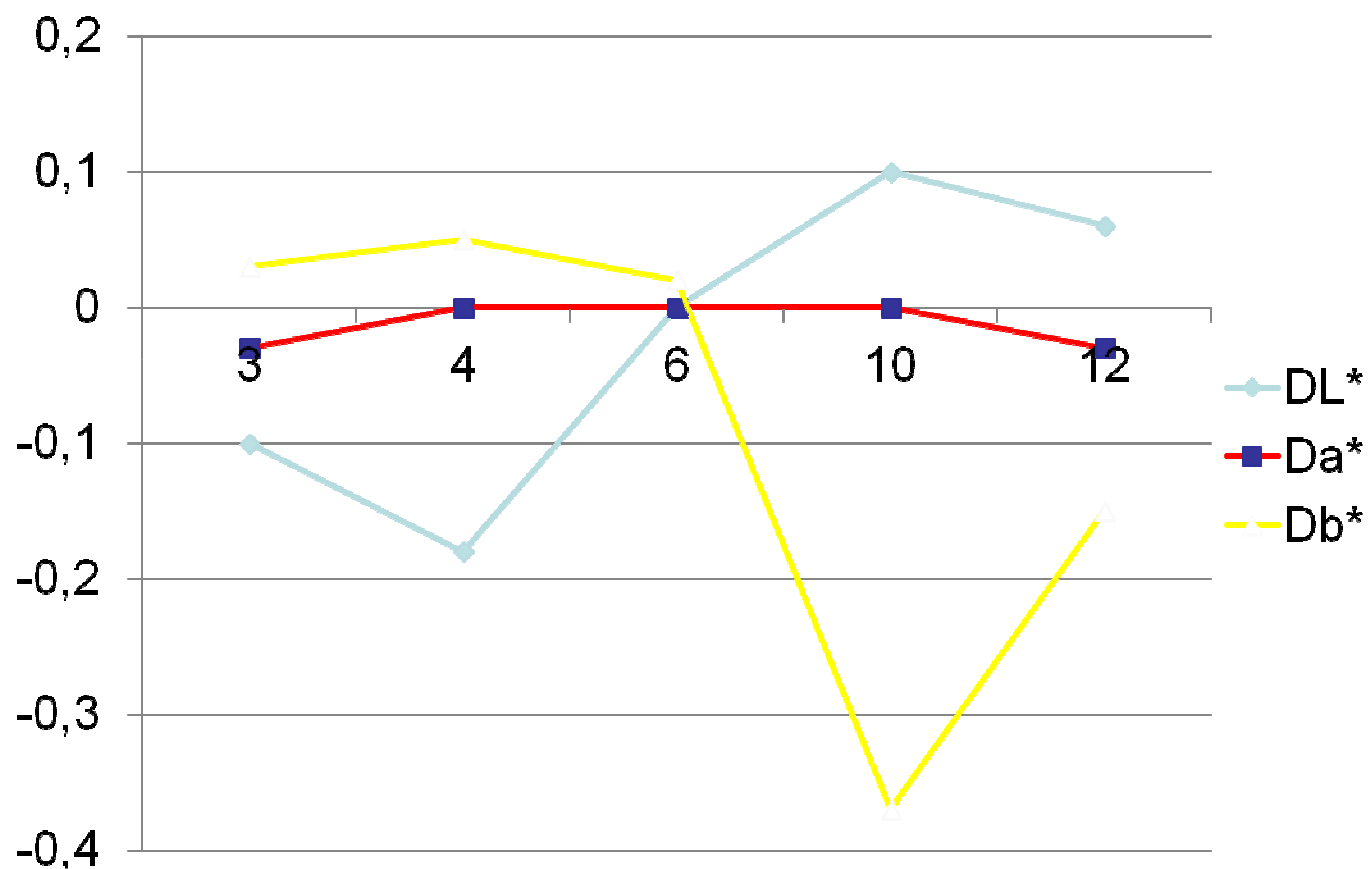
- There are several ways to present the samples.
 - Depend on tools are available
 - Whether paint or coated applications are to be measured
 - How much preparation time and cleaning time is available
- It is important, that the sample presentation is repeatable
 - Before any new way of sample presentation is defined for day to day operation it must be made sure, that the results are repeatable and reproducible.
 - Repeatability needs to be minimum 3 * tolerance
 - Averaging can increase repeatability



Coating – S3040R-B50

Sample has been repositioned after each measurement

Long Term Reproducibility (days)



Coating – S1040-B50G

Same sample has been measured on different days

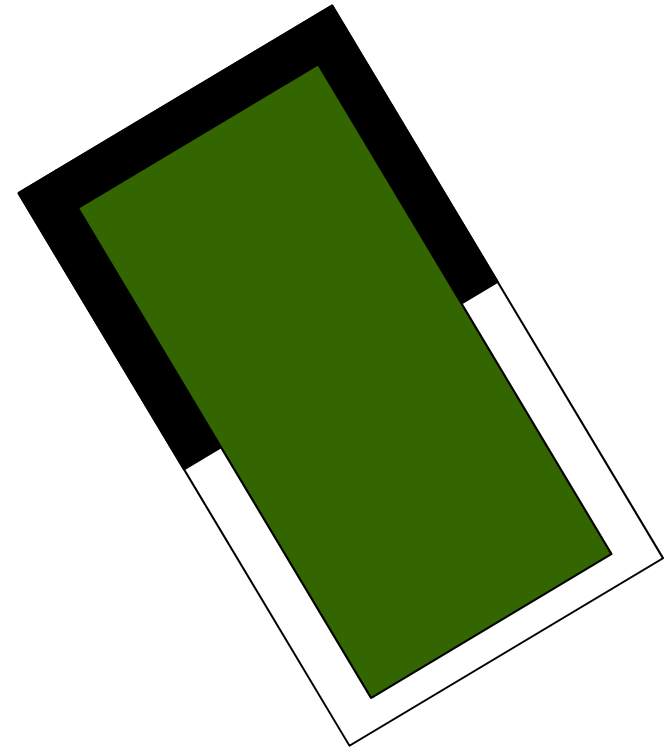
Coated samples

- Coated samples can easily be placed underneath the spectro. The quality of samples certainly has an effect on the measurement results. If necessary multiple measurements have to be made.



Coated samples

- Coated samples can easily be placed underneath the spectro.
- On well controlled samples over Contrast the opacity can be defined as well.



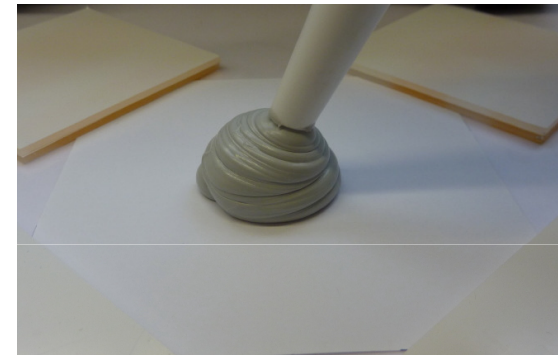
Wet Paint

- Some customers just take the wet paint with a tooth spoon out of the paint can and place the paint underneath the spectro.



Paste

- A customer producing silicon paste places the paste on a sheet of paper and adds a glass on top of it. This is done for 2 reasons – to improve the surface quality and stock the material for visual inspection.



Wet Paint

- Some customers prefer to use disposable Petri dishes



It is important to have measurement distance of 38+- 2.5 mm.

Easiest way of operation – use always the same defined quantity in ml.

For a maximum of space the calibration rail could be taken off and mounted again when required

Wet Paint can be measured with the support of the lab stand VS450-800 directly in a paint container



It is important to have measurement distance of 38+- 2.5 mm.

This can easily be adjusted with the knob at the VS450-800 and the VueTargeter

For a maximum of space the calibration rail could be taken off and mounted again when required


VS450-802 Stand with Accessories



Most customers use the VS450 Stand with one of the accessories to present wet paint.

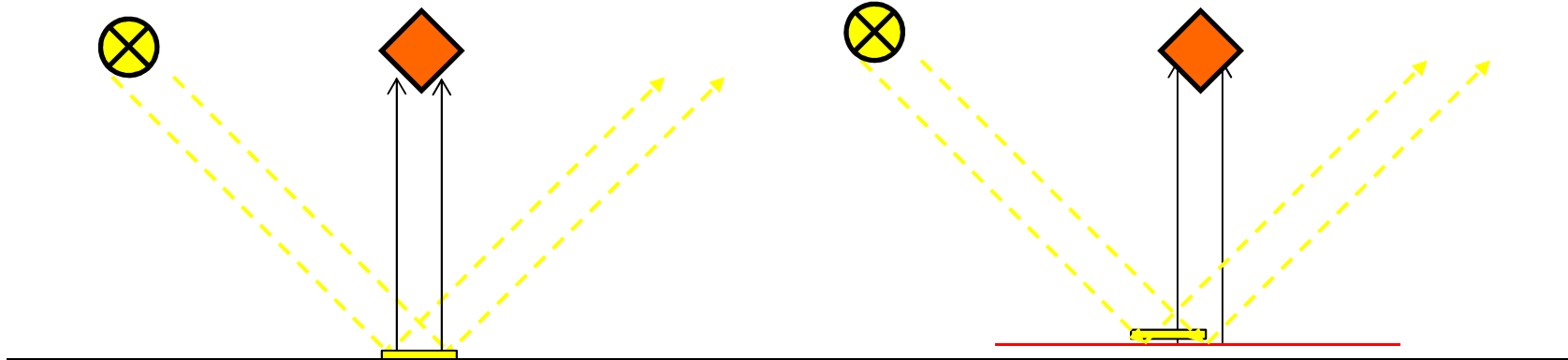
- easy to prepare
- easy to present
- easy to control distance
- reasonable cost

Challenges in the day to day work

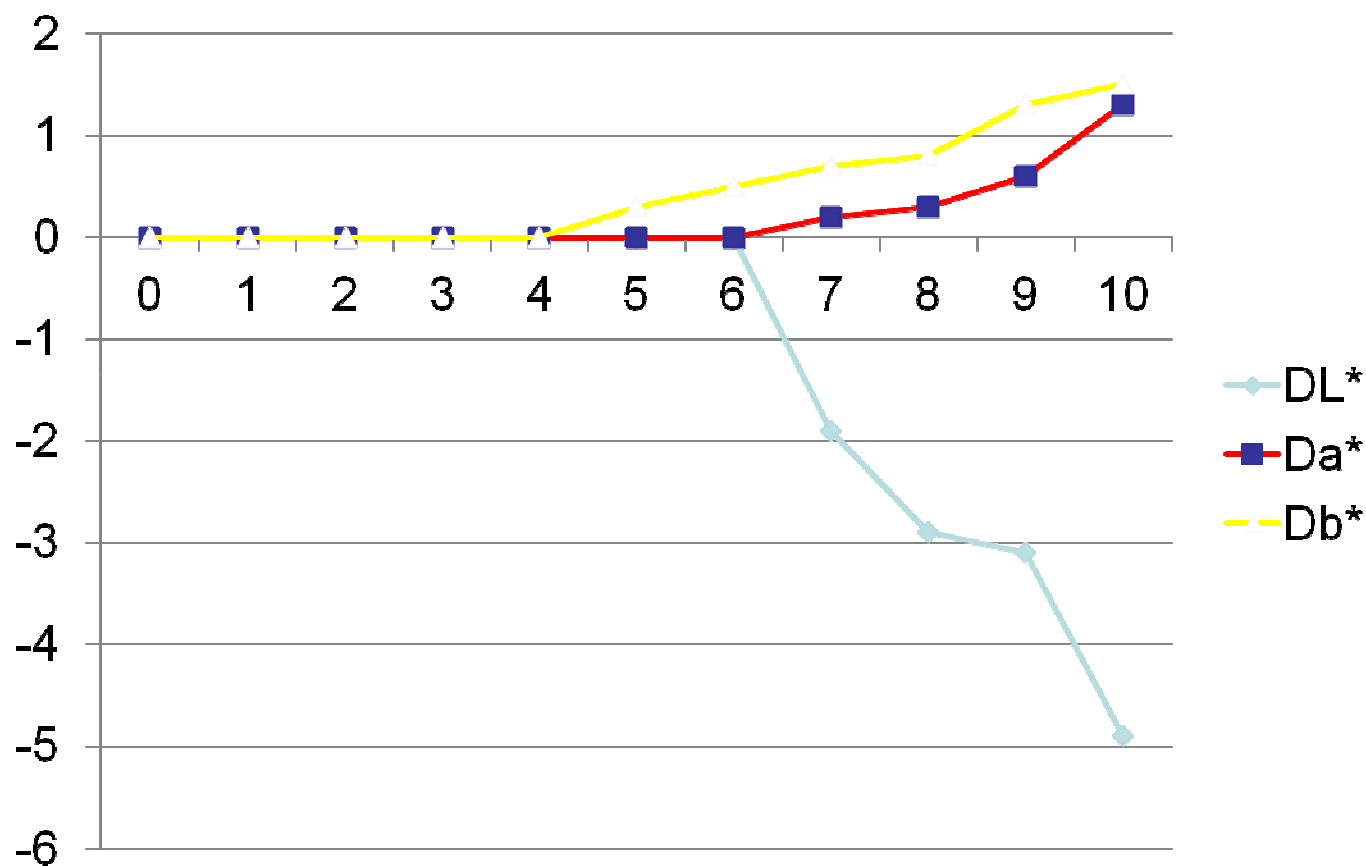
- Distance variation
 - Influence of drying
 - Influence of air bubbles
 - Influence of uneven surface
 - Question – how good is the agreement between wet and dry
- 

Measurement Distance

- If measurement distance is within 38 (+/- 2.5 mm) it is insured, that area is fully lightened and there is no effect to the readings.
- If measurement distance is bigger than 38 +/- 2.5 mm there is risk of not properly lightened area and there will be differences in the reflectance readings



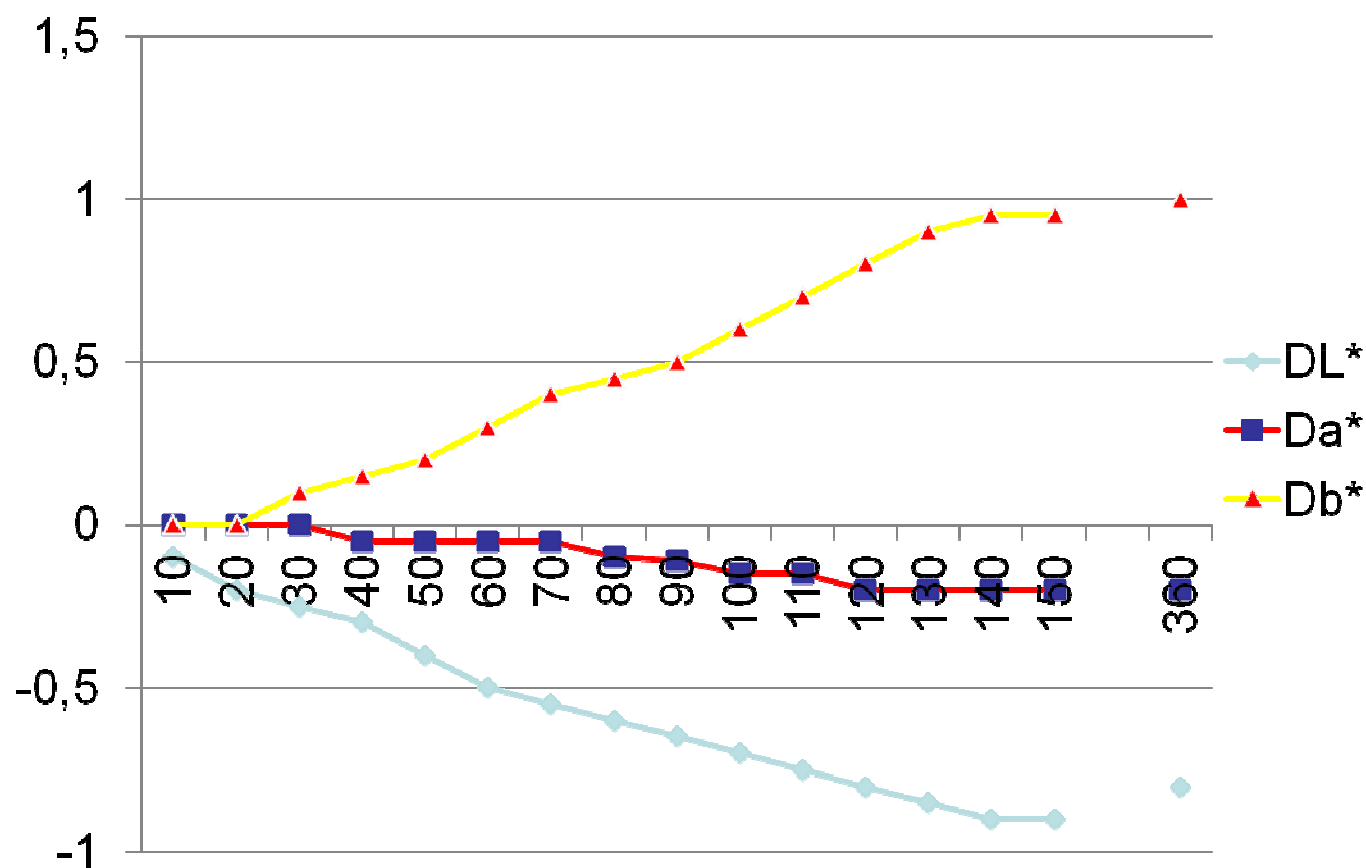
Distance Variation



Wet sample – S1040-B40 G (L=74.9 / a=-29.4 / -

7.9) Distance: 35.5 mm)

Drying behavior (minutes)



Wet Application ($L=91.4$ / $a=-0.3$ / 13.4)

What you see is what you measure !

- Avoid air bubbles on the sample – these can have a big impact on the results.
 - Customer experiences have reported different mixing methods will have an impact on the measuring results.

What you see is what you measure !

- Make sure, that you have an even surface
- With tools like the “spoons” it is easy to provide a smooth surface.



Agreement between wet and dry ?

- Consumers expect a good color agreement in a final (dry) application.
- Comparisons should be always be done using the **same** method.
 - Compare dry to dry
 - Compare wet to wet
- Question: How good is the agreement between dry and wet

Examples of Customer use

- Batch-Control
- QC
- Batch correction
- Formulation
- Research

- Customer challenge
 - 2 K – Floor Coating
 - Small orders (up to 1000l) are individually dispensed in 25 l container.
 - If user mistake (f.e. wrong paint to hardener-ratio) happens – these have high impact on final color.
 - Could become a high value warranty issue
- Customer solution
 - Every container within an order will be compared to the first container – to make sure, that all container will have the same color and proof constant quality in case of a warranty issue.
 - Since it would take a long time, to prepare an application from each container and have it in a way, where it could be measured with a traditional spectro – the VS450 with IQC is used.
 - Paint is just dropped on a sheet of paper and measured within seconds.

- Customer challenge
 - Customer is producing big batches of a slow drying product.
 - With traditional contact based spectrophotometers it takes about 24 hours before the product can be approved.
- Customer solution
 - Customer has developed for standard products a “wet tolerance”
 - in which wet samples in relation to the wet standard has to be – in order to produce a good result in a final dry to dry comparison.
 - Day-to-day production will be controlled with the VS450 in a defined standard procedure.
 - If batch with the “wet-tolerance” – packaging can start – Final QC reports will be done on dry-application
 - If batch outside of “wet-tolerance” - batch will stay in production for “dry result” or – Correction based on wet data will be applied (next page).

- Customer challenge
 - Same as before
- Customer solution
 - Customer has developed for standard products a “wet tolerance”
 - Customer has developed an colorant database
 - All colorant concentration are stored into the database in wet form
 - If in a Day-to-Day production the “wet batch” measurement with the VS450 is not within the “wet-tolerance” a correction will be applied based on the wet database.
 - If batch with the “wet-tolerance” – packaging can start – Final QC reports will be done on dry-application

- Customer challenge
 - Manufacturer of silicon pastes had the challenge to match competition silicon pastes
- Customer solution
 - Customer has build up a colorant database with the VS450 b based on the non-contact measurements.
 - In the Day-to-Day work the customer matches and corrects unknown competition samples with same success rate as other companies measure dry samples with traditional spectros.
 - Production and QC will be done in a non-contact way with the VS450 as well.

- Customer challenge
 - Customer wanted to evaluate the drying behavior of his paints and needed some kind of method to measure the improvements of developments.
- Customer solution
 - The customer utilized in combination with the VS450 non-contact spectrophotometer the iQC – software package, which includes a function of timed measurements
 - The measurement frequency and the number of measurement can be defined.
 - With these tools the drying behavior can be captured and saved.

- We have seen a new type of “NON Contact instrument, which allows to measure wet paint or products which do not allow any surface contact
- We have seen supporting accessories, which allow different ways of sample presentation.
- We have been introduced to different challenges, which need to be considered when measuring wet paint.
- We have seen typical examples of customer use

End of Presentation

Thank you for your interest

Questions?
More Information?

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