



Spectral Data
for printing press makeready according to
ISO 12647-2:2004/DAM1

Instructions
for
SpectroEye & ColorQuality

Version 2007

Table of Content

1	INTRODUCTION	3
1.1	ISO 12647-2:2004/DAM1	3
1.2	Spectral data	3
1.3	Data formats	4
1.4	Overview of reference color values	5
2	LOADING JOBS INTO SPECTROEYE	6
2.1	Downloading the required files	6
2.2	Installation and setup of Download Utility	6
2.3	Firmware update	7
2.4	Deleting old spectral data files	7
2.5	Loading the spectral data files	8
3	SETUP OF THE PRINTING MACHINE WITH THE SPECTROEYE	9
4	WORKING WITH COLORQUALITY	10
4.1	General information on the software ColorQuality	10
4.2	Loading the spectral data files	10
4.3	Opening jobs	11
4.4	Communication with the SpectroEye	11

1 Introduction

X-Rite, Incorporated, a leading global provider of color management and color measurement solutions, is simplifying makeready of printing presses by standard color values utilizing SpectroEye. Since its introduction in the printing industry, SpectroEye has become a standard for color measurements.

X-Rite is offering **spectral data** for the new Lab values according to ISO 12647-2:2004/DAM 1. This enables SpectroEye to work according to the standard while still offering familiar density values as well as the exclusive “Best Match” function for ink control.

In addition, spectral data for **measurement with a polarizing filter** are also included. These are the values that should be used for setting up the printing press because they take the wet/dry effect into account.

1.1 ISO 12647-2:2004/DAM1

ISO 12647-2:2004 specifies CIE-L*a*b* values for process colors according to ISO 2846-1 for 5 different paper types. The standard has been in review for some time now. It has now reached the status of “Amendment 1”. This ensures that these values will be included in the new version of the ISO standard which will hopefully pass in 2007.

The Lab values for yellow for the paper types 1/2 have been slightly changed compared to the 2004 version. All other values for the primary colors (cyan, magenta, yellow, and black) have remained the same for all paper types. The values for the primary colors on white backing are now identical to the values in the target data that has been used for calculation of the new ISO profiles (V2).

The values for paper types 1 to 4 have changed for the secondary colors (red, green and blue). These values are not standardized but are just informational because of the wide spread occurring with standardized process color set.

1.2 Spectral data

The user can use spectral data instead of L*a*b* values to realize considerable time and cost savings and to increase the quality of the printing results significantly.

- Without any additional training, the printer can work using the density values he knows and trusts, whilst the pass/fail indicator is given as color measurements conforming to the ISO standard.
- Before printing, users can utilize the unique “Best Match” function to determine whether modifying the layer density or adding transparent white will achieve a sufficiently accurate match with the reference color. This means users can save a lot of time and money thanks to rapid assessment of the color quality.
- The “Best Match” function can also be used to detect contamination early on and to indicate this in the language of the printer. This means that adjustments can be made at the earliest possible stage, before the ink color drifts out of the tolerance range and the wrong color shade is used for printing.

1.3 Data formats

Data are supplied in 18 downloadable files for the SpectroEye and as jobs for the ColorQuality application.

Two different polarizing filter data have been re-calculated for paper type 1 and 2 compared to the first version, because the wet/dry effect is stronger for substrate 2.

According to ISO12647-2, the values are normative for black backing and informative for white backing:

Black backing: According to ISO 5-4; Density 1.5 ± 0.20 , CIELAB $L^* = 15-27$,
Reflection values 400 to 700 nm 2 - 5%
White backing: According to ISO 5-4; or matte, opaque area with CIELAB $L^* > 92$ and $C^* \leq 3$,
no fluorescence

ATTENTION! The target data for the calculation of the new ISO profile (V2) and thereby the data for the evaluation of the FOGRA media wedge according to FOGRA39 are valid for white backing.

The term "substrate backing" (ie. paper stack with more than 3 blank sheets) used in the old data are taken from the Process Standard Offset Printing 2003 of FOGRA. Those values are the same as the values for white backing of ISO 12647-2:2004. From now on, only black backing and white backing are used.

The files for paper type 1/2 (unpolarized) also contain spectral data for the paper white. Paper white is not useful for measurements with polarizing filters, because the filter suppresses the effect of the brighteners in the paper.

Data files and nomenclature

18 files contain the combinations of the different paper types, each on black and white backing (bb or wb), polarized and unpolarized (u or p). There is only one data file for paper types 1 and 2 for unpolarized measurements, because the values for those paper types on black and white backing are the same. Please use the data file for paper type 1 for both.

File name	Color name	Ink	Paper type	Backing	Physical filter
P1bbu07	C1-bb-u	Cyan	Paper type 1	black backing	Unpolarized
	M1-bb-u	Magenta	Paper type 1	black backing	Unpolarized
	Y1-bb-u	Yellow	Paper type 1	black backing	Unpolarized
	K1-bb-u	Black	Paper type 1	black backing	Unpolarized
	R1-bb-u	Red	Paper type 1	black backing	Unpolarized
	G1-bb-u	Green	Paper type 1	black backing	Unpolarized
	B1-bb-u	Blue	Paper type 1	black backing	Unpolarized
P3wbp07	C3-wb-p	Cyan	Paper type 3	white backing	Polarized
etc.				

1.4 Overview of reference color values

Color values for black backing, unpolarized (bb-u)

ISO 12647-2:2004/DAM 1

Paper type	1			2			3			4			5		
	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*
Black	16	0	0	16	0	0	20	0	0	31	1	1	31	1	2
Cyan	54	-36	-49	54	-36	-49	55	-36	-44	58	-25	-43	59	-27	-36
Magenta	46	72	-5	46	72	-5	46	70	-3	54	58	-2	52	57	2
Yellow	87	-6	90	87	-6	90	84	-5	88	86	-4	75	86	-3	77
Red	46	67	47	46	67	47	45	62	39	52	53	25	51	55	34
Green	49	-66	24	49	-66	24	47	-60	25	53	-42	13	49	-44	16
Blue	24	16	-45	24	16	-45	24	18	-41	37	8	-30	33	12	-29

Color values for white backing, unpolarized (wb-u)

ISO 12647-2:2004/DAM 1

Paper type	1			2			3			4			5		
	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*
Black	16	0	0	16	0	0	20	0	0	31	1	1	31	1	3
Cyan	55	-37	-50	55	-37	-50	58	-38	-44	60	-26	-44	60	-28	-36
Magenta	48	74	-3	48	74	-3	49	75	0	56	61	-1	54	60	4
Yellow	89	-5	93	89	-5	93	89	-4	94	89	-4	78	89	-3	81
Red	47	68	48	47	68	48	47	67	43	54	55	26	53	58	37
Green	50	-68	25	50	-68	25	50	-64	27	54	-44	14	50	-46	17
Blue	24	17	-46	24	17	-46	25	20	-44	38	8	-31	34	12	-29

Color values for black backing, polarized (bb-p) *

Paper type	1			2			3			4			5		
	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*
Black	9,5	0,0	1,5	8,5	0,5	1,5	13,5	0,0	1,0	17,0	-0,5	0,0	23	0	3
Cyan	52,0	-37,0	-49,0	53,0	-38,0	-49,5	53,0	-37,0	-45,0	56,0	-30,0	-44,5	57	-31	-38
Magenta	44,0	73,5	-3,5	44,0	75,0	-5,0	44,0	72,0	-2,5	52,0	53,0	-3,5	47	63	1
Yellow	86,0	-6,0	93,5	87,0	-6,0	95,0	83,0	-5,0	92,0	85,5	-3,5	85,5	85	-3	85
Red	44,0	69,0	51,0	45,0	69,0	51,0	44,0	64,0	43,0	48,0	60,0	35,0	47	63	42
Green	46,0	-68,0	24,0	48,0	-69,0	25,0	46,0	-63,0	26,0	49,0	-50,0	17,0	45	-51	19
Blue	21,0	16,0	-46,0	22,0	16,0	-47,0	22,0	18,0	-43,0	29,0	9,0	-39,0	24	13	-38

Color values for white backing, polarized (wb-p) *

Paper type	1			2			3			4			5		
	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*
Black	9,5	0,0	1,5	8,5	0,5	1,5	13,5	0,0	1,0	17,0	-0,5	0,0	23	0	4
Cyan	53,0	-38,0	-50,0	54,0	-39,0	-50,5	56,0	-39,0	-45,0	58,0	-31,0	-45,5	58	-32	-38
Magenta	46,0	75,5	-1,5	46,0	77,0	-3,0	47,0	77,0	0,5	54,0	56,0	-2,5	50	54	3
Yellow	88,0	-5,0	96,5	89,0	-5,0	98,0	88,0	-4,0	98,0	88,5	-3,5	88,5	88	-3	89
Red	45,0	70,0	52,0	46,0	70,0	52,0	46,0	69,0	47,0	50,0	62,0	36,0	48	64	45
Green	47,0	-70,0	25,0	49,0	-71,0	26,0	49,0	-67,0	28,0	50,0	-52,0	18,0	47	-54	20
Blue	21,0	17,0	-47,0	22,0	17,0	-48,0	23,0	20,0	-46,0	30,0	9,0	-40,0	26	13	-37

Measurement conditions: 45°/0° measurement geometry; D50 illumination; 2° standard observer

Measuring device: SpectroEye

* The use of the values measured with a polarizing filter are recommended for testing by X-Rite. The company is not liable for the accuracy of the values.

2 Loading jobs into SpectroEye

2.1 Downloading the required files

For the direct loading of the download files into SpectroEye, the software Download Utility, version 1.50 or later is required. Proceed as followed on the GretagMacbeth website:

1. Go to www.gretagmacbeth.com
2. Select "Products"
3. Select "Instruments"
4. Select "SpectroEye"
5. Select "Software/Downloads"

The following files need to be loaded from this website:

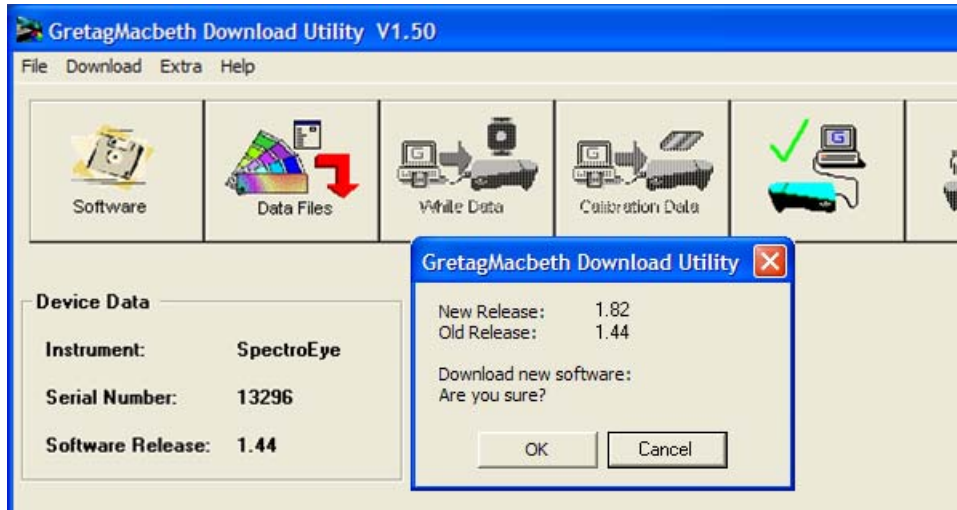
- Download Utility
- SpectroEye Firmware
- Spectral ISO 12647 Data 2007

2.2 Installation and setup of Download Utility

- Install Download Utility
- Open Windows Explorer: Search for the program under C:\Program Files\GretagMacbeth\Download Utility
- Move the latest SpectroEye firmware version 1.82 (File: **Eye182.esw**) or later into the folder "**Data**".
- Move measurement value files **P1BBU07 to P5WBP07** to the folder "**DataBase**".

2.3 Firmware update

- Connect the SpectroEye to the PC and start Download Utility.
- The instrument is found and the latest firmware version is displayed.
- Press the “Software” button and run the firmware update.



2.4 Deleting old spectral data files

You should delete the old data files in SpectroEye before you upload the new files to the instrument to avoid mix ups.

	<p>If you have other jobs saved in addition to the ISO spectral data that you want to save, you can select the ISO spectral data for deletion manually. Select the files to delete from</p> <p>“Database” – “Jobs” – “Delete Job”</p>
	<p>If you want to delete all jobs, select</p> <p>“Database” – “Jobs” – “Delete all jobs”</p> <p>from the main menu.</p>

2.5 Loading the spectral data files

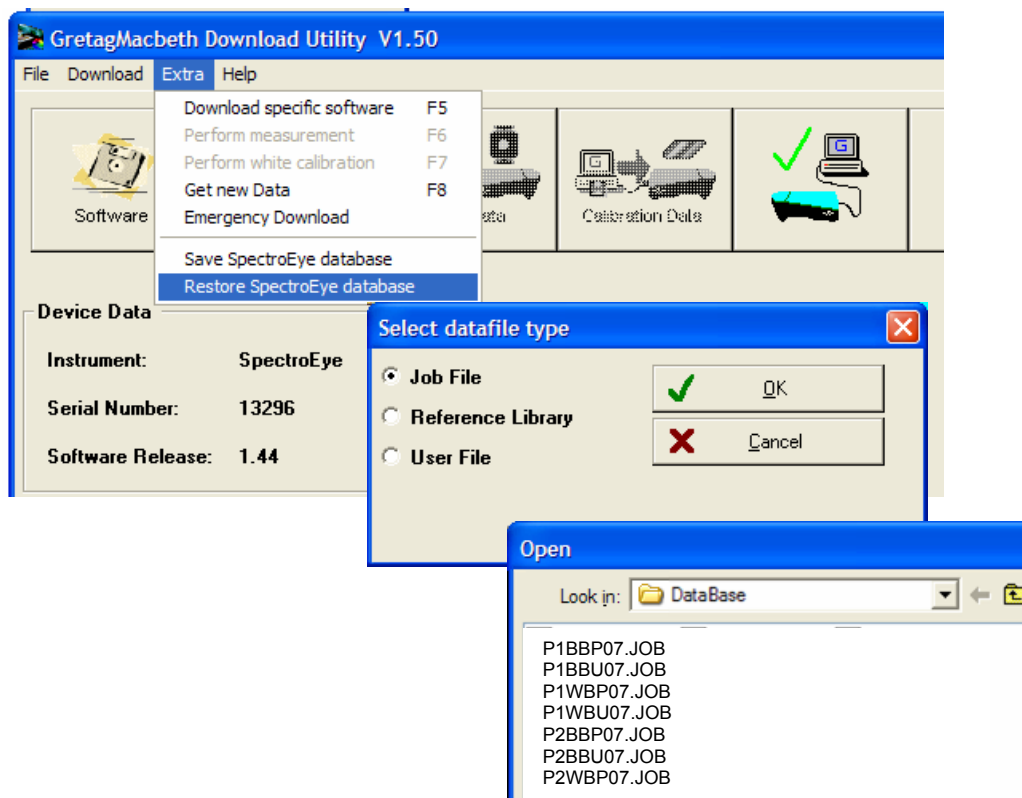
First you need to decide what and how the measurement will be carried out.

- Paper type: P1 to P5
- Measurement backing: bb (black backing) or wb (white backing)
- Physical filter: U (unpolarized = no filter) or P (polarized = polarizing filter)

It is recommended to test the measurement using polarization filters and to check after drying whether the unpolarized reference values have also been achieved.

Now load the relevant file into the measuring device:

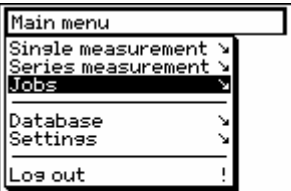

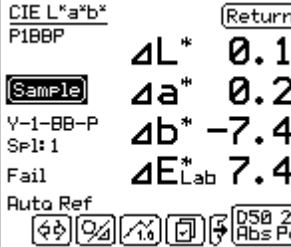
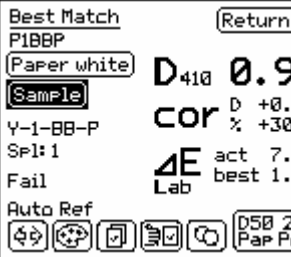
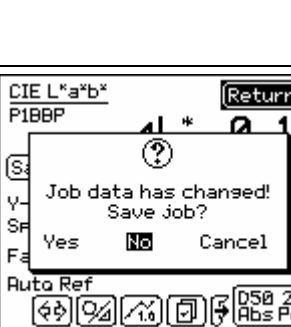
→ “Download Utility” – “Extra” – “Restore SpectroEye database” – “Job File”



You can only transfer those files one by one to the SpectroEye.

3 Setup of the printing machine with the SpectroEye

Proceed as follows with the SpectroEye:

	<p>In the main menu, select “Jobs” mode.</p>
	<p>Select the relevant job. e.g. P1BBP = paper type 1, Black Backing, Polarized (black backing), (pol filter)</p> <p>The instrument automatically selects the proper settings for filter, illuminant, observer and white reference.</p>
	<p>Measured yellow sample is <u>automatically</u> compared to the reference value for yellow “Y-1-BB-P” and the color difference displayed.</p> <p>However, it is better to select the “Best Match” measurement functions as these will also display suggestions to correct the values.</p>
	<p>The Best Match function is a combination of colorimetric and densitometric calculation and shows immediately which corrections needs to be made to achieve the closest possible match with the reference values.</p> <p>For example, → Correction: The printing needs to be approx. 30% thicker, i.e. the thickness needs to be increase by approx. 30% or by D = 0.16. → Evaluation: The current color difference is $\Delta E_{curr} = 7.45$. The best possible can be achieved $\Delta E_{best} = 1.65$.</p>
	<p>When exiting the job, answer “No” to the question as to whether you want to save the job data, so that the device memory is not overloaded.</p> <p>However, if the measurement values need to be evaluated, they obviously do need to be saved. The software ColorQuality can then be used for the evaluation (see next chapter).</p>

The selected settings make it fast and easy to achieve the best possible preset references. The corrections which need to be made are displayed immediately or that other corrections in the combination of the ink and print media substrate would not produce better results. This means that time and therefore costs are saved each time the printing machine is set up.

4 Working with ColorQuality

Increasing numbers of printers are confronted with customer demands to log color measurement values and thus to demonstrate the quality of the printed matter.

The SpectroEye is the ideal tool for this when used in combination with the software ColorQuality.

4.1 General information on the software ColorQuality

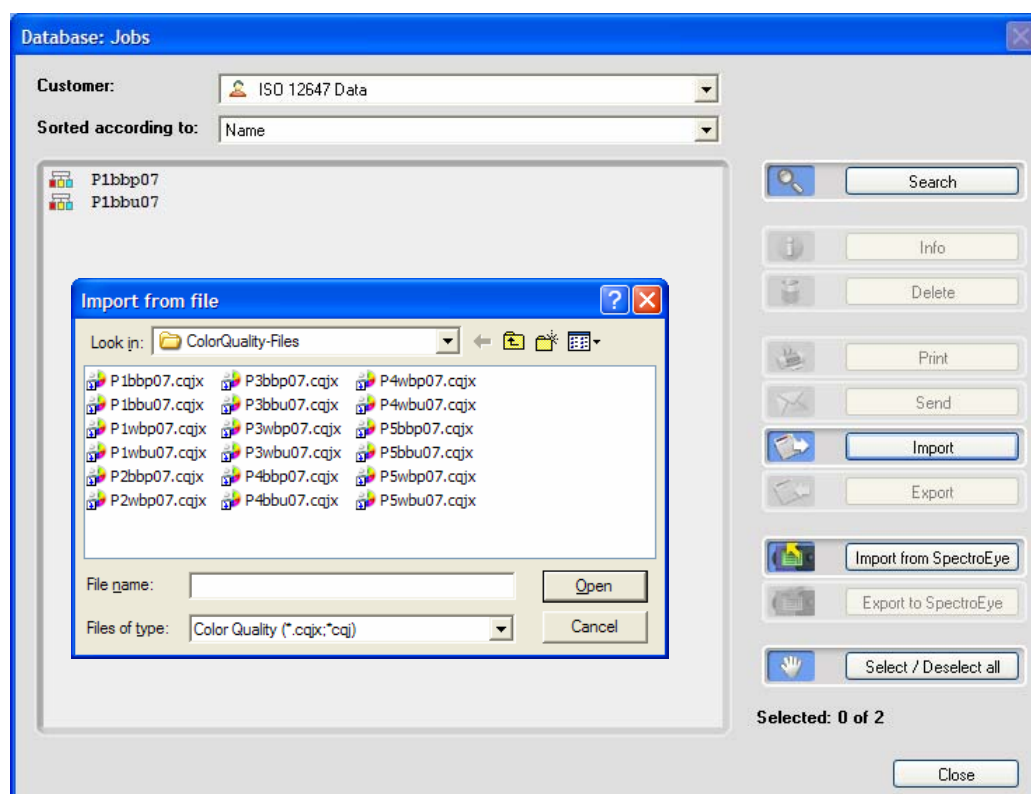
ColorQuality full version is a chargeable software product for PC which can only be operated with a dongle (software protection device). The product can be ordered from authorized X-Rite dealers.

Version 5 or later should be used.

4.2 Loading the spectral data files

The reference value files can be downloaded from the www.gretagmacbeth.com website to your PC.

The commands “Database” – “Jobs” – “Import” can be used afterwards to import the files into ColorQuality.



4.3 Opening jobs

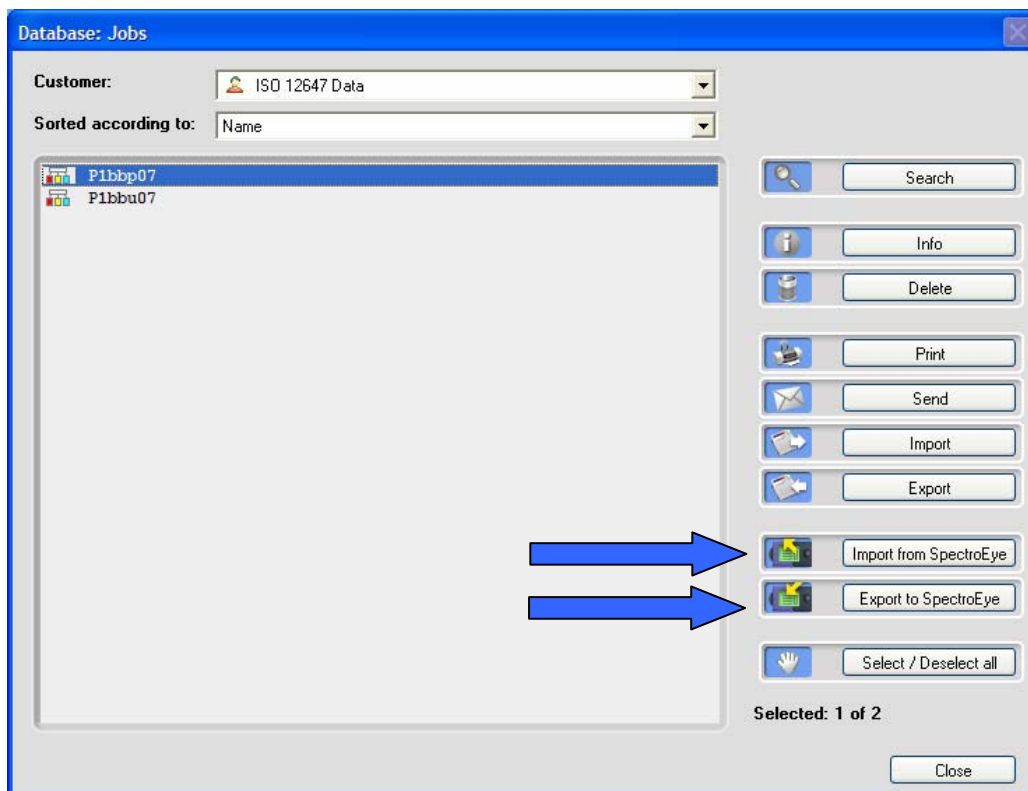
The jobs should be opened as a “Repeat job” in ColorQuality. Measurement values can then be transferred straight into the software and displayed in different views.

4.4 Communication with the SpectroEye

If the SpectroEye remains directly connected to the PC during the measurements, the measurement values can be transferred directly into the ColorQuality software. It doesn't matter here which view is set on the SpectroEye. The total reflectance curve is always applied. In the software the measurement results can be displayed as tables, trend diagrams, etc.

You have to use the data files designated to SpectroEye, in order to use the SpectroEye offline and while still evaluating the measurement values in the application.

After a series of measurements, select “Database” – “Jobs” – “Import from SpectroEye” to load the stored values from SpectroEye into ColorQuality for evaluation.



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