



# Application Notes

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# **ErgoSoft ColorQPC™**

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Rev. 1.1

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## Introduction

**ErgoSoft ColorQPC™** is a color quality process control solution for monitoring and certifying color results from a digital printing system. **ColorQPC** permits production shops to

- Determine whether a color profile produces accuracy color results,
- Assess potential color differences with ink and media lot changes or printer maintenance,
- Ensure critical spot colors in a production job are printed correctly,
- Certify that a printer, ink and media combination print can reproduce color output to a specific printing standard.

**ColorQPC** consists of two modules: **ColorQPC Measure** and **ColorQPC Analyze**.

**ErgoSoft ColorQPC™ Measure** prints and measures a definable set of colors from a **Swatch Book** or **Named Colors** recipe and checks whether the printed colors fall within preset color tolerances.

**ErgoSoft ColorQPC™ Analyze** provides quality departments and production managers with an overall summary of color process control information from a given printer.

Both **ColorQPC** modules include options to conduct color process control comparisons to an expected set of color values or to results from previous production runs. The color coded HTML reports also make it easy to identify which colors or production jobs passed or exceeded the required color tolerances.

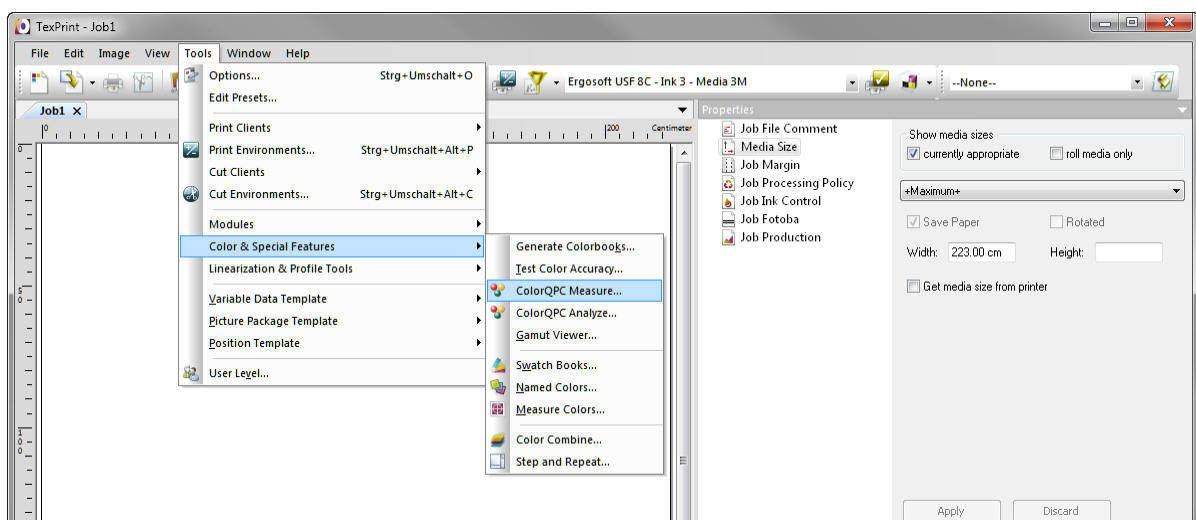
**ColorQPC™** will be included in most standard and Premium editions of the **ErgoSoft RIP V14** (such as TexPrint, PosterPrint Pro, PosterPrint Premium) and works with all supported color measurement devices.

# ColorQPC Measure – Creating a New Measurement Session

## Introduction

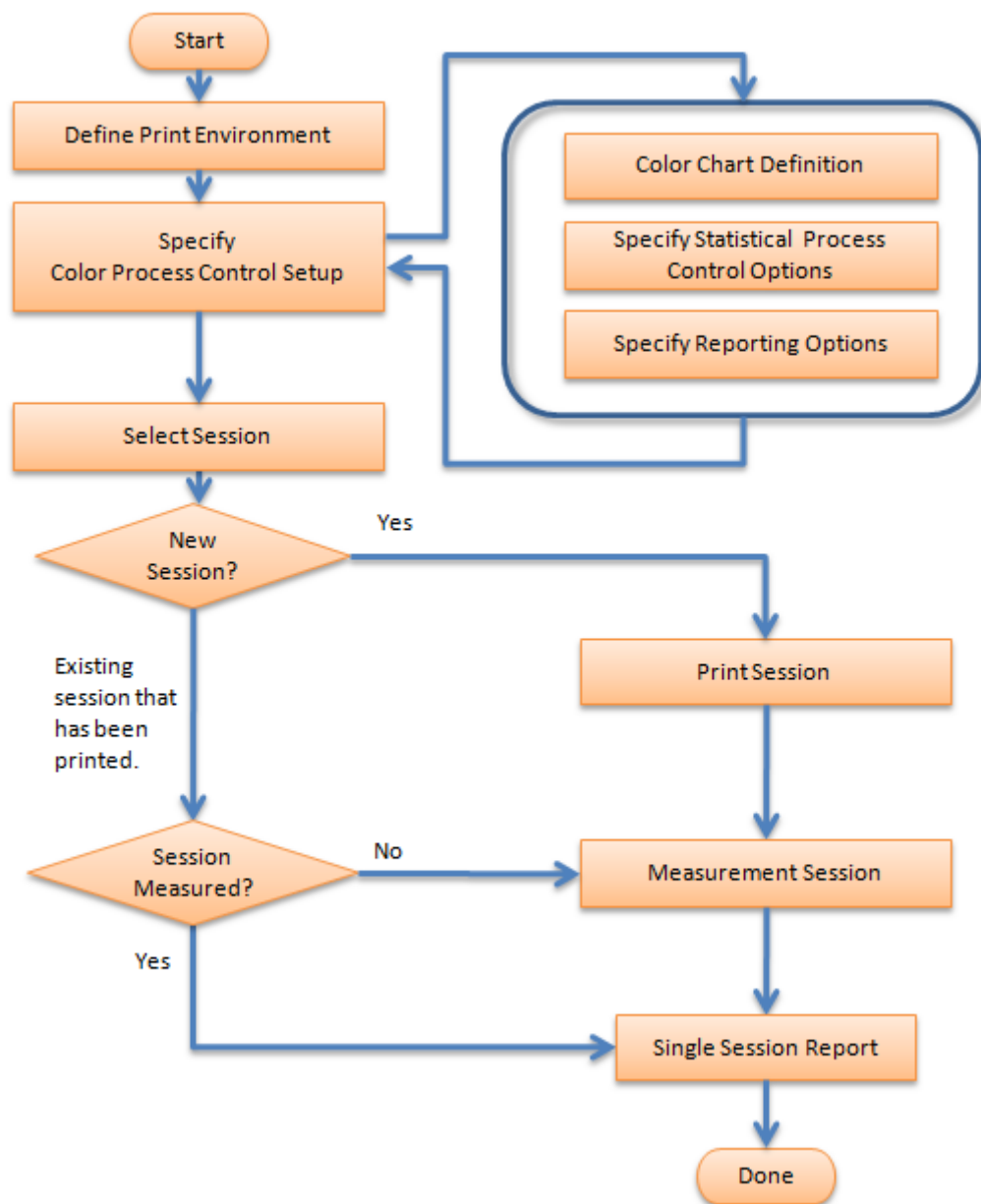
**ErgoSoft ColorQPC™ Measure** prints and measures a definable set of colors from a *Swatch Book* or *Named Colors* recipe and checks whether the printed colors fall within preset color tolerances. Customizable color difference statistics and summary results are reported on screen and as an HTML document for easy assessment of the results. **ColorQPC** incorporates adjustable controls for setting warning and fail tolerances that alert printer operators about color control errors before, during and after a production job. This reduces production waste and certifies that the printed output meets a customer's color critical requirements. Special reporting features within **ColorQPC** determines whether specific tested colors are within a printer's color gamut and optionally excludes these colors from the quality statistics.

**ColorQPC Measure** is launched using menu *Tools > Color & Special Features > ColorQPC Measure*.



## Workflow Overview

The overall workflows for *ColorQPC Measure* is shown in the figure below and explained in the next chapters.



- **Define Print Environment:** A Print Environment is selected based on the print job requirements.
- **Specify Color Process Control Setup:** The color process control setup provides the definition for monitoring specific colors before, during or after a production run. Three specific items are included in the setup:
  - **Color Test Chart Design:** The design of the color test chart is based on the colors to be monitored, either from a Swatch Book or Named Colors, and the chart geometry for the color measurement device being used.
  - **Statistical Process Control (SPC) Parameters:** The statistical process defines what is considered acceptable, marginal and out-of-tolerance colors on the color test chart.
  - **Reporting Options:** The options to be used as part of the statistical analysis report (e.g. Company Name, Customer Name, Reference ID, and others).
- **Select Session/Print Session:** The user selects whether to start a new session with this Color Chart and SPC parameters.
  - If it is a new session, the module generates a print job and ID, which then is printed.
  - If an existing session is chosen, the session is assumed to have been printed, but not necessarily measured.
  - If the session has already been printed and measured then it goes to Single Session Report.
- **Measure Session:** The Test Chart is measured using the device designed to the printed color test chart.
- **Session Report:** Single session analysis provides specific color difference details between the measured and expected results. The analysis indicates whether the printed job passed, marginally passed or failed.

In addition to single session reports in *ColorQPC Measure*, *ColorQPC Analyze* offers the possibility to evaluate all the sessions associated with a Color Process Control setup. This function is described later in this document.

The workflow in *ColorQPC Measure* permits the user to complete the print and measurement and reporting steps at different times.



## Workflow 1: New Session

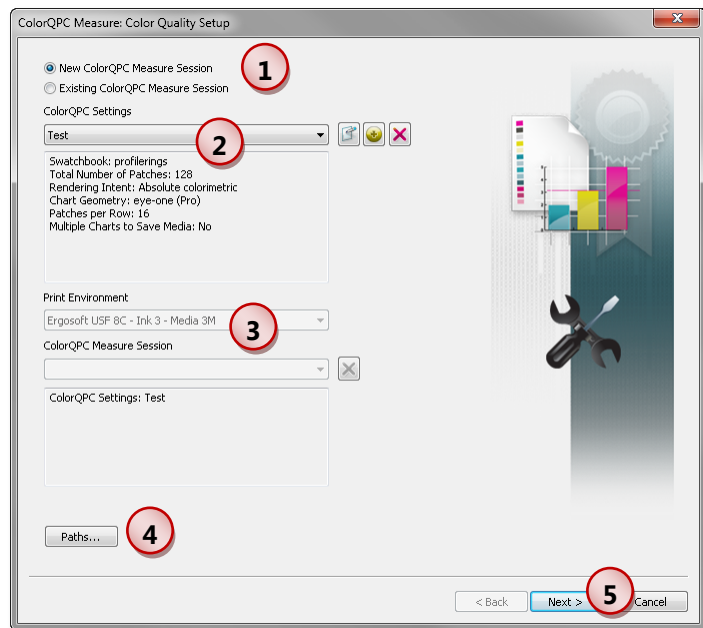
### STEP I. Setup

1 Select **New ColorQPC Measure Session**.

2 Choose the **ColorQPC Setting** from the pull-down menu that you want to use for the current **ColorQPC Measure** session.

■ Administrators can edit, create and delete ColorQPC settings. For a description of the **ColorQPC Settings**, please refer to chapter "ColorQPC Setup Details".

■ The **ColorQPC Settings** summary is displayed in the information window.



3 The current **Print Environment** and information about the status of the current **ColorQPC Measure** session is displayed.

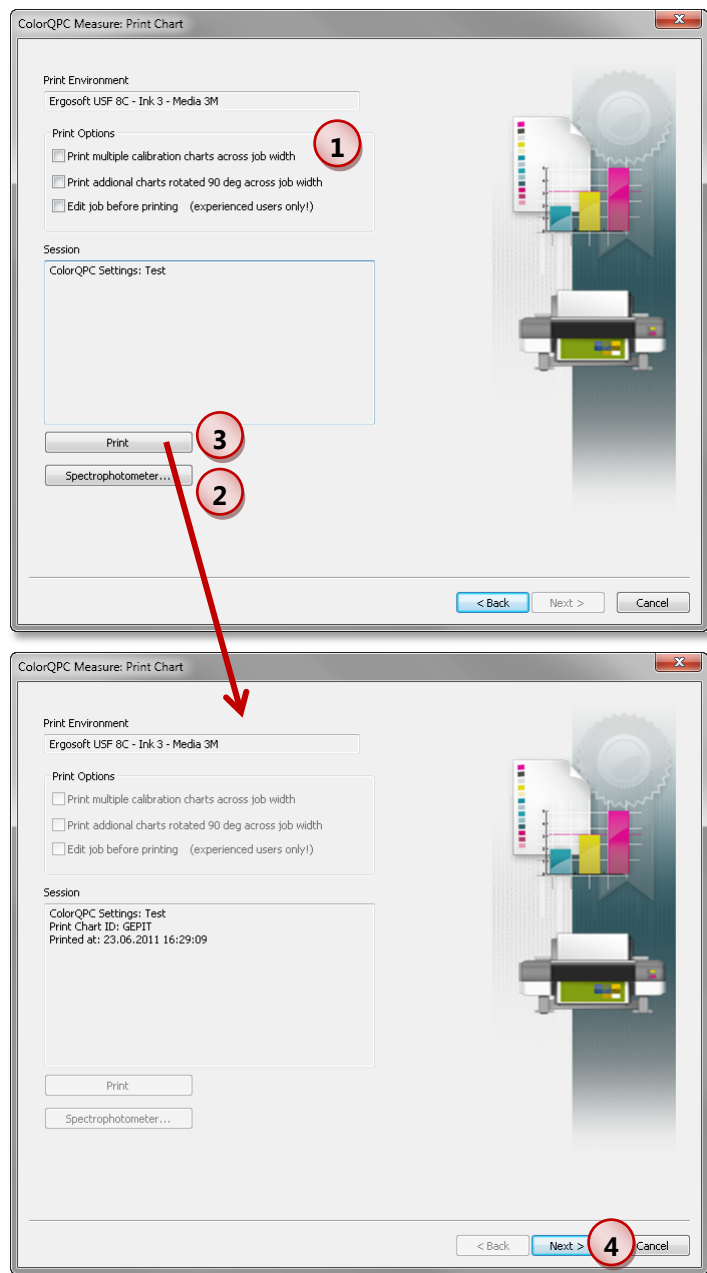
4 Clicking the button **Paths** optionally saves data from the current session to a specific location that is different than the standard location in the user data folder. Please note that this setting only changes the path for the current session and is not a global setting.

5 Click the **Next** button to continue.

## STEP II. Print

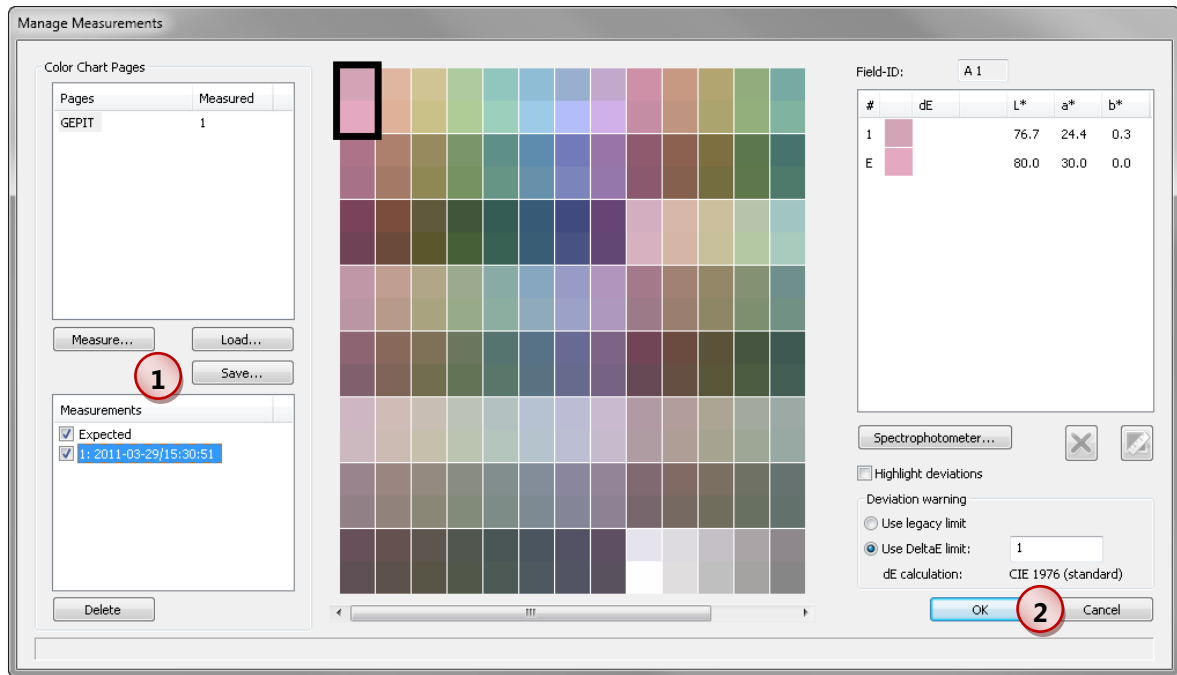
1 For printing, the chart is automatically created according to the configuration of the selected **ColorQPC Settings** for the current measurement session. **ColorQPC Measure** automatically rotates charts for better media usage whenever possible. **Print Options** provide additional options for printing the chart:

- Option **Print multiple calibration charts across job width** duplicates the calibration chart across the entire printing width such that every second chart is rotated by 180°. This prevents having to reprint the chart if one chart is damaged.
- Option **Print additional charts rotated 90° across job width** works together with previous option and adds a second row of calibration charts that is rotated by 90° respectively by 270°.
- When using the **Edit job before printing** option, a generated chart can be viewed and modified in the **ErgoSoft RIP** before printing. Since print environment settings can be changed accidentally before printing and in turn impact results, it is advisable to use this option only in limited instances.



- 2 Click the **Spectrophotometer** button to change the measuring device to be used.
- 3 Click the **Print** button to print the chart.
- 4 Click the **Next** button to measure the chart. Clicking **Cancel** either prompts to save the session as a file, if a chart has been printed, or exits the **ColorQPC Measure** module. The saved session file can be reopened at a later time in order to measure the printed chart (see the description of workflow 2).

### STEP III. Measure



- 1** The **Manage Measurement** dialog includes controls for measuring and saving the session chart measurements:
  - Click the **Measure** button to start the measurement. When having measured the complete chart, click **OK** to transfer the measurement into the **Manage Measurements** dialog. We recommend performing minimum 3 measurements to be able to identify measurement errors.
  - Click the **Save** button to save the measurements.
  - Click the **Load** button to load saved measurements of the chart in order to continue an interrupted measuring session. Please note that you can only load measurements exactly made for the session chart. A warning message may be displayed if the measurements are potentially made for another measurement session.
  - The functions on the right side of the dialog allow highlighting deviations, deleting and re-measuring single patches (when it is supported in the measuring device).
- 2** Click the **OK** button to continue. Click **Cancel** to cancel measuring and return to the **ColorQPC Measure: Print Chart** dialog.

Please note that the measurements are displayed in absolute colorimetric. When the **ColorQPC Setting** is defined with the relative colorimetric rendering intent, the displayed Lab values may vary from the actual measured Lab values. Changing the rendering intent is described in the chapter entitled "ColorQPC Setup Details".

## STEP IV. Compare Measurements

**1** Choose the method of analyzing and displaying the current measurement in the reports.

■ **Show measurements only**

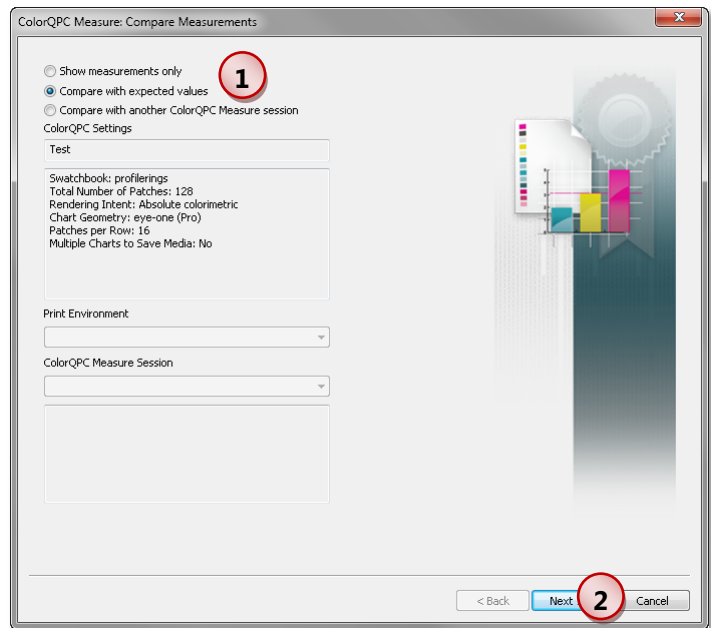
Only the measurement values and out-of-gamut information are displayed.

■ **Compare with expected values**

Compare the measurement session results to expected Lab values for the test chart.

■ **Compare with another ColorQPC Measure session**

Compare the measurement session results to a previous session (i.e. a “golden standard”). In this case, you have to select a print environment and another measure session to report results.



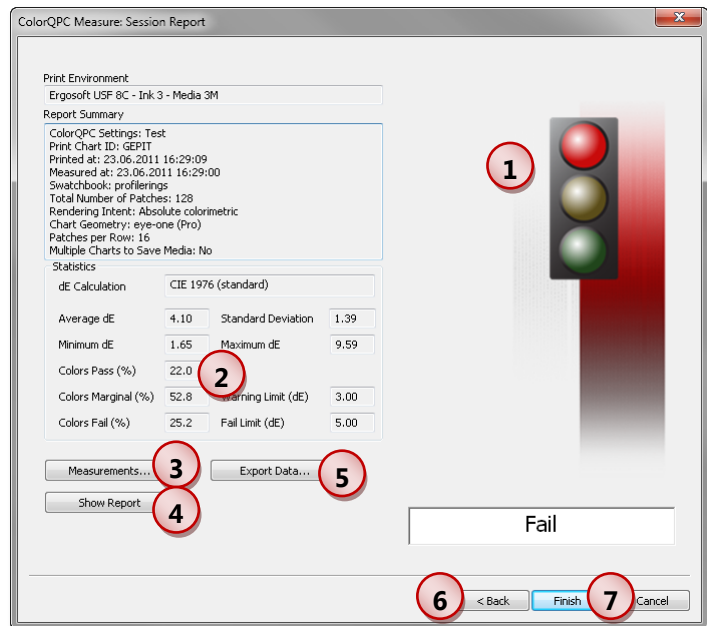
**2** Click the **Next** button to continue. Clicking **Cancel** prompts either to save the session or discard the results. Saved sessions can be evaluated at a later time (see the description of workflow 3).

## STEP V. Measurement Session Report

The measurement session report dialog displays results based on the analysis method in Step IV.

**1** The signal lamp icon and the message below icon visually highlight the analysis results based on the warning and fail delta E (dE) color limits defined in the **ColorQPC Settings**:

- Red: One or more color patches are higher than fail limit.
- Yellow: One or more color patches are higher than the warning limit and no colors exceed the fail limit.
- Green: All color patches are lower than warning and fail limits.
- When the analyses is based on the **Compare with expected values** option, the warning and fail limits are based on the color differences between the measured values and expected Lab values for each color patch. The **Compare with another ColorQPC Measure session** analyses uses the warning and fail limits to compare the results between two measurement sessions. No icon is displayed for the **Show measurements only** option.



- 2** Overall statistics for the measurement session based on the **ColorQPC Settings**. This information is not displayed with the **Show measurements only** option.
- 3** Clicking the **Measurements** button redisplay the measurement dialog and permits re-measure of all or parts of the test chart.
- 4** Clicking the **Show Report** button creates an HTML report, automatically saves it, and displays it in the default web browser. Refer to Step VI: HTML Report for more details about the report.
- 5** Clicking the **Export Data** button allows to save the measurement data in csv format.
- 6** Clicking the **Back** button returns to the **Compare Measurements** dialog. This provides the option to perform other comparisons using the session measurements.
- 7** Clicking the **Finish** button closes the **ColorQPC Measure** session and saves the session information while the **Cancel** button closes the session without saving.

## Step VI. HTML Report

The HTML report is only created and saved when clicking the **Show Report** button.

**1** Report header: Displays information about the **ColorQPC Measure** session according to the ColorQPC Settings.

**2** Displays visual signal lamp icon, statistics and pass, warning or fail messages.

**3** Displays the list of colors printed including the approximate color as a square, the name of the color defined in the Swatch book or Named Colors, the expected Lab values, the measured Lab values and the color difference (dE) between the expected and measured results. The color coding used in the color difference column designates whether or not a color passed the evaluation:

- Gray indicates out-of-gamut colors (Only shown if comparison done to expected values).
- Green indicates specific color passed
- Yellow indicates specific color was higher than the warning limit, and
- Red indicates specific color exceeded the fail limit.

ColorQPC Measure Session Report								
<div> <div>ergosoft</div> <div>ColorQPC</div> </div>								
<div> <div>ABC Customer</div> <div> <div>Customer Name</div> <div>Customer 01</div> </div> <div> <div>Reference ID</div> <div>1130-056</div> </div> <div> <div>Description</div> <div>Production Job</div> </div> <div> <div>Print Environment</div> <div>Ergosoft USF 8C - Ink 3 - Media 3M</div> </div> <div> <div>ColorQPC Settings</div> <div>Test</div> </div> <div> <div>Rendering Intent</div> <div>Absolute colorimetric</div> </div> <div> <div>Chart ID</div> <div>GEPIT</div> </div> <div> <div>Print Time</div> <div>23.06.2011 16:29:09</div> </div> <div> <div>SPC</div> <div></div> </div> <div> <div>dE Calculation</div> <div>CIE 1976 (standard)</div> </div> <div> <div>Warning Limit (dE)</div> <div>3.00</div> </div> <div> <div>Fail Limit (dE)</div> <div>5.00</div> </div> </div>								
<div> <div>Statistics</div> <div>Out-of-Gamut Colors Excluded</div> <div> <div>Avg. dE</div> <div>4.10</div> </div> <div> <div>Standard Deviation</div> <div>1.39</div> </div> <div> <div>Min dE</div> <div>1.65</div> </div> <div> <div>Max dE</div> <div>9.59</div> </div> <div> <div>Colors Passed (%)</div> <div>22.0</div> </div> <div> <div>Colors Warning (%)</div> <div>52.8</div> </div> <div> <div>Colors Fail (%)</div> <div>25.2</div> </div> </div>								
<div> <div>Result</div> <div>Fail</div> </div>								
		Expected			Measured			
Color	Name	L*	a*	b*	L*	a*	b*	dE
	Ring8030	80.00	30.00	0.00	76.68	24.42	0.33	6.50
	Ring8031	80.00	21.00	21.00	81.04	18.32	19.01	3.50
	Ring8032	80.00	0.00	30.00	81.79	2.90	25.98	5.27
	Ring8033	80.00	-21.00	21.00	79.73	-18.97	15.79	5.60
	Ring8034	80.00	-30.00	0.00	76.80	-30.33	-5.18	6.10
	Ring8035	80.00	-21.00	-21.00	75.48	-22.39	-19.41	4.99
	Ring8036	80.00	0.00	-30.00	72.88	-9.30	-19.86	15.49
	Ring8037	80.00	21.00	-21.00	76.23	15.07	-11.71	11.65
	Ring7030	70.00	30.00	0.00	71.85	32.34	1.69	3.43
	Ring7031	70.00	21.00	21.00	72.02	22.33	22.08	2.65
	Ring7032	70.00	0.00	30.00	71.29	2.69	30.92	3.12
	Ring7033	70.00	-21.00	21.00	69.49	-19.12	19.16	2.68
	Ring7034	70.00	-30.00	0.00	67.27	-29.88	-5.78	6.40
	Ring7035	70.00	-21.00	-21.00	67.19	-21.33	-24.61	4.58
	Ring7036	70.00	0.00	-30.00	66.95	-2.12	-27.57	4.44
	Ring7037	70.00	21.00	-21.00	69.75	18.31	-16.66	5.12
	Ring6030	60.00	30.00	0.00	61.29	32.38	1.60	3.14
	Ring6031	60.00	21.00	21.00	62.73	22.53	20.35	3.19
	Ring6032	60.00	0.00	30.00	61.62	3.57	27.28	4.77

## Workflow 2: Existing Session – Printed but not Measured

This workflow is done when measuring and analyzing a chart printed at an earlier time.

### STEP I. Setup

1 Select **Existing ColorQPC Measure Session**.

2 Choose the **ColorQPC Setting** from the pull-down menu for which you want to load a **ColorQPC Measure** session.

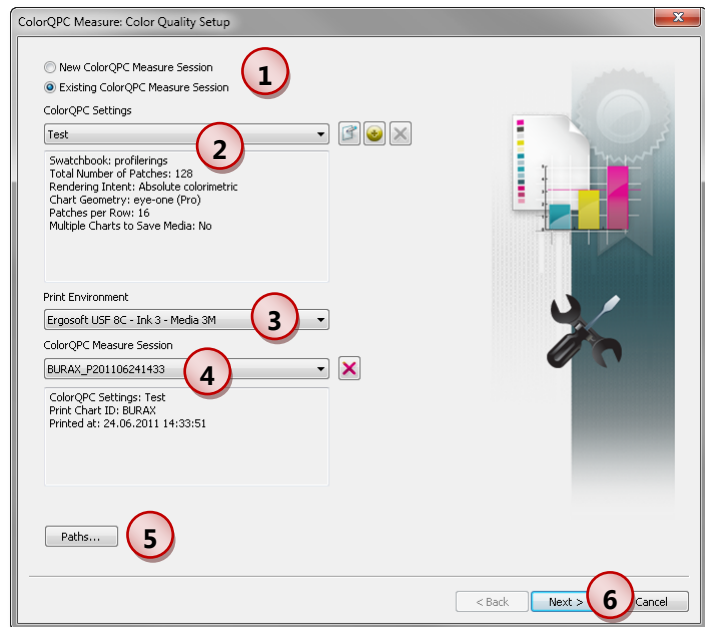
3 Select the desired **Print Environment**. Please note that only print environments used with the selected ColorQPC settings will be displayed.

4 Select the **ColorQPC Measure Session** that you want to measure. The ChartID and print time is displayed in the lower information field. Please note that the measurement session list only shows sessions created with the selected print environment and **ColorQPC Settings**.

Clicking the **Delete** button next to the list will remove the selected **ColorQPC Measure** session from the system.

5 Clicking the button **Paths** optionally saves the data for the current session in a specific location that is different from the standard location in the user data folder. Please note that this setting only saves reports and results for the current session and is not a global setting.

6 Click the **Next** button to continue.  
The **Manage Measurements** dialog will be displayed. Follow Steps III to VI in the "New Session" workflow for reporting and saving session results.



## Workflow 3: Existing Session – Printed and Measured

### STEP I. Setup

1 Select **Existing ColorQPC Measure Session**.

2 Choose the **ColorQPC Setting** from the pull-down menu for which you want to load a **ColorQPC Measure** session.

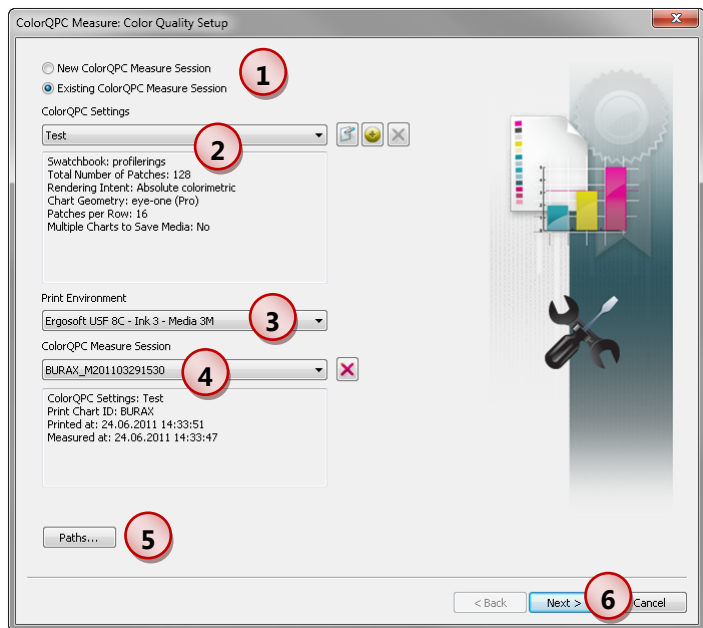
3 Select the desired **Print Environment**. Please note that only print environments used with the selected ColorQPC settings will be displayed.

4 Select the **ColorQPC Measure Session** that you want to evaluate. The ChartID, print time and measurement time is displayed in the lower information field. Please note that the measurement session list only shows all sessions created with the selected print environment and ColorQPC settings.

Clicking the **Delete** button next to the list will remove the selected **ColorQPC Measure** session from the system.

5 Clicking the button **Paths** optionally saves the data for the current session in a specific location that is different from the standard location in the user data folder. Please note that this setting only saves reports and results for the current session and is not a global setting.

6 Click the **Next** button to continue.  
The **ColorQPC Measure: Compare Measurements** dialog will be displayed. Follow Steps IV to VI in the “New Session” workflow.

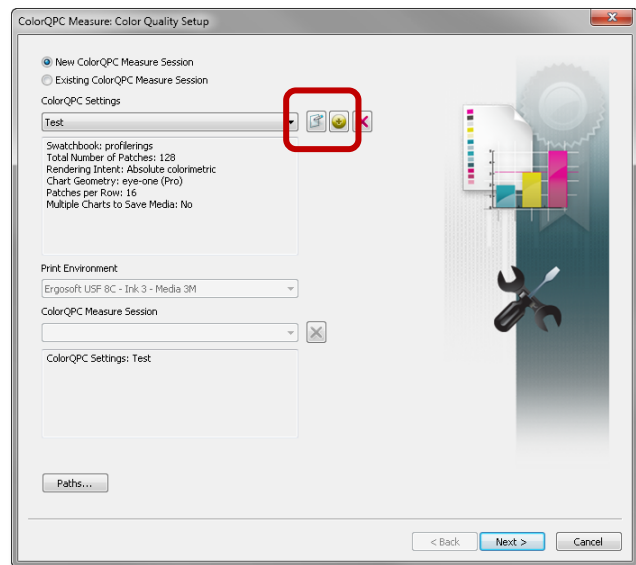




## ColorQPC Setup Details

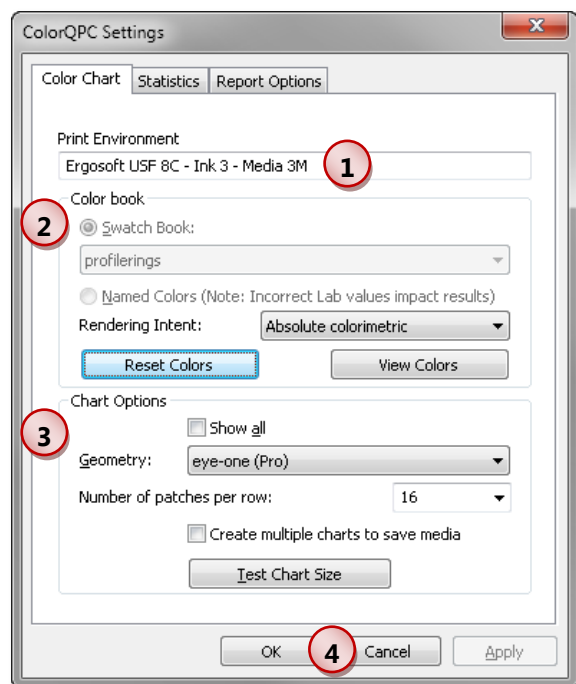
### Launch Setup

In the **ColorQPC Measure: Color Quality Setup** dialog, choose the **ColorQPC Settings Edit** or **Create** buttons to configure the ColorQPC settings for *ColorQPC Measure*.



Tab 1. Color Chart

- 1 The current print environment is displayed.
- 2 The **Color book** to be used for creating the test chart can be selected with various options.
  - Choose **Swatch Book** or **Named Colors**. Please note that the lab values of **Named Colors** may not be accurate and can impact the results.
  - Choose to evaluate with either **Absolute** or **Relative Colorimetric** rendering intent.
  - **Reset colors** when an alternative set of Swatch Books or Named Colors are required. Please note that once the ColorQPC Settings are saved, the current Swatch Book/Named Colors are stored for the ColorQPC Setting. If the Swatch Book or Named Colors are changed in the **ErgoSoft RIP**, these changes will not be updated in the list of stored colors.
  - **View Colors** pops up an HTML file to verify the colors and Lab values to be used for the chart.



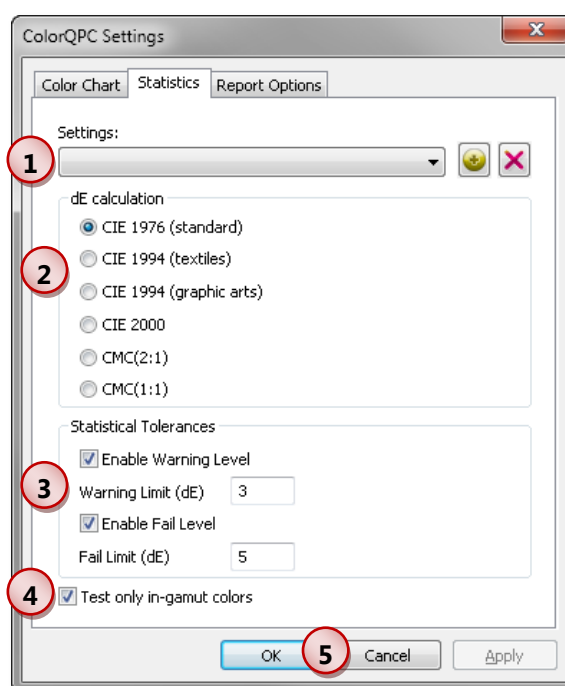
### 3 Chart Options

- Selection of color measurement device and geometries required for the printed test chart.
- The number of patches per row can be selected for the color device. The pulldown provides a list of recommended numbers for the specific color measurement device and geometry.
- **Test Chart Size** summarizes the number of charts and the number of rows/columns to be printed.

- 4 Clicking **OK** prompts to save the ColorQPC settings.

## Tab II. Statistics

- 1 The **Statistics** can be saved as a preset by clicking on the **Add** button or deleted with the **Delete** button.
- 2 Choose the desired Delta E calculation used for the reports.
- 3 Enable and choose the desired Warning and/or Fail Delta E limits.
- 4 Choose whether the report is based on all colors or only in gamut colors. Default is checked on.
- 5 Clicking **OK** prompts to save the ColorQPC settings.



### Tab III. Report Options

- 1 The **Report Options** can be saved as a preset by clicking on the **Add** button or deleted with the **Delete** button.
- 2 Company name and optional reporting fields can be added to the report.
- 3 Clicking **Ok** prompts to save the ColorQPC settings.

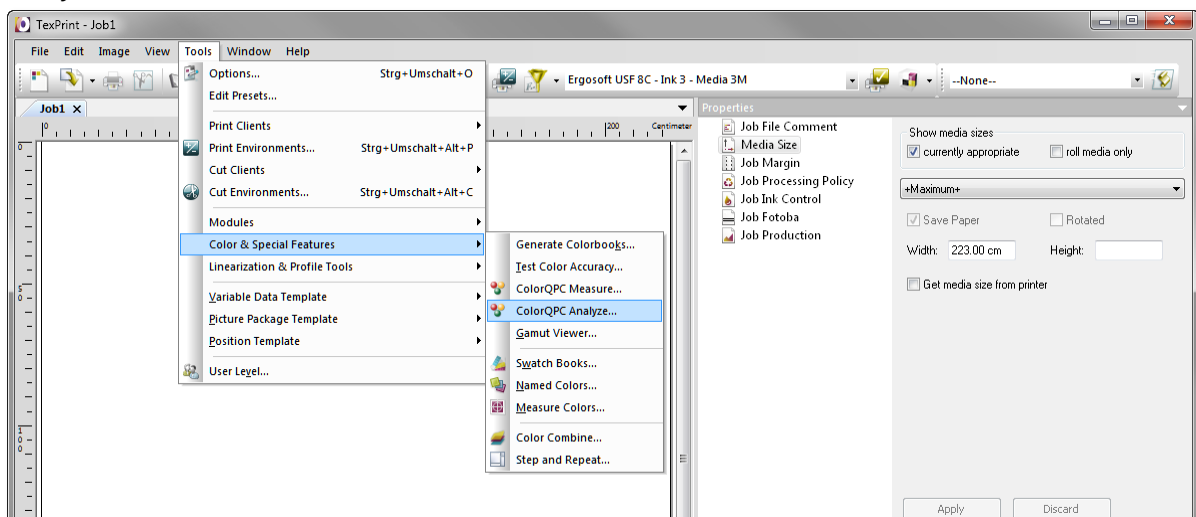
The screenshot shows the 'ColorQPC Settings' dialog box with the 'Report Options' tab selected. The dialog has three tabs: 'Color Chart', 'Statistics', and 'Report Options'. The 'Report Options' tab contains a 'Settings:' section with a dropdown menu (circled with a red '1') and two buttons: a green plus icon and a red X icon. Below this are four fields: 'Company Name' (containing 'ABC Customer'), 'Customer Name' (checked checkbox, circled with a red '2', containing 'Customer 01'), 'Reference ID' (checked checkbox, containing '1130-056'), and 'Description' (checked checkbox, containing 'Production Job'). At the bottom are three buttons: 'OK' (circled with a red '3'), 'Cancel', and 'Apply'.

# ColorQPC Analyze – Comparing Measurement Sessions

## Introduction

**ErgoSoft ColorQPC™ Analyze** provides quality departments and production managers with an overall summary of color process control information from a given printer. **ColorQPC Analyze** computes historical color results either for all print production jobs or for jobs run over a specific time frame. This makes it possible to monitor color quality trends and certify the color results from a given digital printing system. **ColorQPC Analyze** generates an on-screen and HTML result that summarizes the overall color difference information and lists the production runs that either passed or exhibited color errors.

**ColorQPC Analyze** is launched using menu *Tools > Color & Special Features > ColorQPC Analyze*.



## STEP I. Session Selection

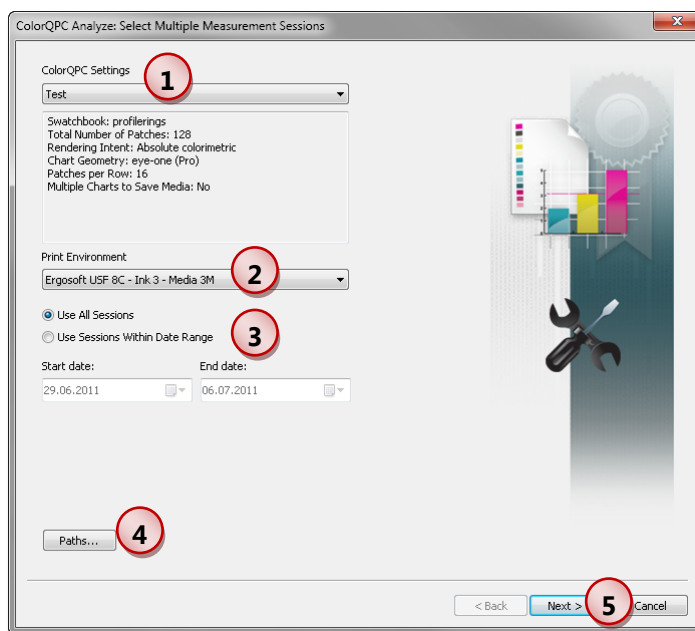
1 Choose the **ColorQPC Setting** from the pull-down menu that you want to use for the current *ColorQPC Analyze* session.

2 Select the **Print Environment** for which you want to analyze the *ColorQPC Measure* sessions. Please note that only print environments used with the selected ColorQPC settings will be displayed.

3 Choose whether to analyze all sessions or sessions within a specific range of dates.

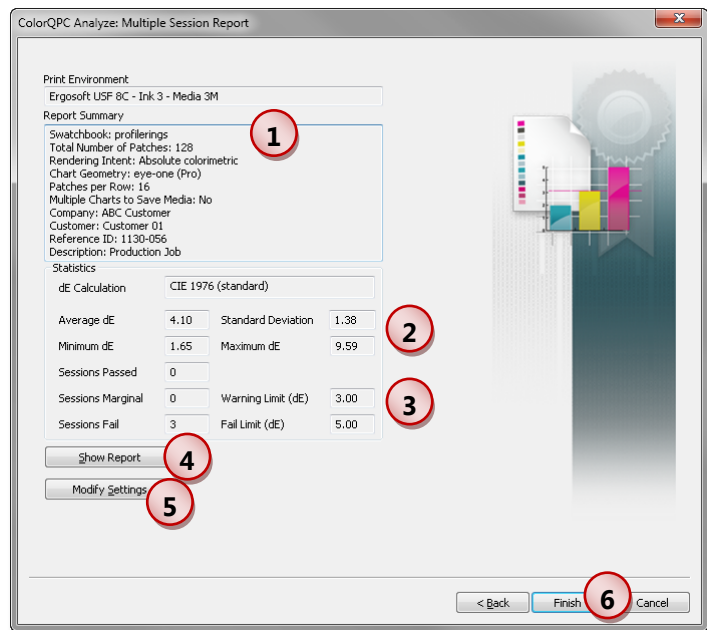
4 Clicking the button **Paths** optionally saves data for the current session in a specific location that is different from the standard location in the user data folder. Please note that this setting only saves reports and results for the current session and is not a global setting.

5 Click **Next** to continue.



## STEP II. Multiple Session On-Screen Report

- 1 Highlights the Report information.
- 2 Provides overall statistics for all evaluated sessions.
- 3 Indicates the number of passing, marginal and failing sessions.
- 4 Clicking **Show Report** displays an HTML version of the report (description see next chapter).
- 5 **Modify settings** makes it possible to temporarily change to the statistics and report options (description see chapter "ColorQPC Setup Details") for testing purposes.
- 6 Clicking **Finish** or **Cancel** closes the dialog.



## STEP III. HTML Report

The HTML report provides an overall summary of the **ColorQPC Analyze** session statistics. Please note that the report is generated when required and will be overwritten if another report is created. To permanently save it, use the Save or Print functions in the web browser.

**1** Report header: Displays information about the **ColorQPC Analyze** session according to the ColorQPC Settings.

**2** Displays statistics and number of pass, warning or fail sessions.

**3** Displays the list of colors printed. The list includes the approximate color as a square, the name of the color and Lab values defined in

the Swatch Book or Named Colors, the average Lab values from all evaluated colors, the average color difference (dE) between the expected and measured results, the standard deviation in dE between the expected and measured results, and the analysis results for each color in all the evaluated sessions.

The color coding used in the **PWF** columns designates whether or not a color passed the evaluation:

- Gray indicates out-of-gamut colors (Only shown if comparison done to expected values),
- Green indicates specific color passed for all evaluated sessions,
- Yellow indicates specific color was higher than the warning limit in one or more sessions, and
- Red indicates specific color exceeded the fail limit in one or more sessions.

ColorQPC Analyze Session Report

ergosoft

ColorQPC

ABC Customer

Customer Name

Customer 01

Reference ID

1130-056

Description

Production Job

Print Environment

Ergosoft USF 8C - Ink 3 - Media 3M

ColorQPC Settings

Test

Rendering Intent

Absolute colorimetric

SPC

dE Calculation

CIE 1976 (standard)

Warning Limit (dE)

3.00

Fail Limit (dE)

5.00

Statistics

Out-of-Gamut Colors Excluded

Avg. dE

4.10

Standard Deviation

1.38

Min dE

1.65

Max dE

9.59

Sessions Pass

0

Sessions Warn

0

Sessions Fail

3

Color	Name	L*	a*	b*	Avg dE	Std Dev	P	W	F
	Ring8030	80.00	30.00	0.00	6.50	0.00	0	0	3
	Ring8031	80.00	21.00	21.00	3.50	0.00	0	3	0
	Ring8032	80.00	0.00	30.00	5.27	0.00	0	0	3
	Ring8033	80.00	-21.00	21.00	5.60	0.00	0	0	3
	Ring8034	80.00	-30.00	0.00	6.10	0.00	0	0	3
	Ring8035	80.00	-21.00	-21.00	4.99	0.00	0	3	0
	Ring8036	80.00	0.00	-30.00	15.49	0.00	0	0	3
	Ring8037	80.00	21.00	-21.00	11.65	0.00	0	0	3
	Ring7030	70.00	30.00	0.00	3.43	0.00	0	3	0
	Ring7031	70.00	21.00	21.00	2.65	0.00	3	0	0
	Ring7032	70.00	0.00	30.00	3.12	0.00	0	3	0
	Ring7033	70.00	-21.00	21.00	2.68	0.00	3	0	0
	Ring7034	70.00	-30.00	0.00	6.40	0.00	0	0	3
	Ring7035	70.00	-21.00	-21.00	4.58	0.00	0	3	0
	Ring7036	70.00	0.00	-30.00	4.44	0.00	0	3	0
	Ring7037	70.00	21.00	-21.00	5.12	0.00	0	0	3
	Ring6030	60.00	30.00	0.00	3.14	0.00	0	3	0
	Ring6031	60.00	21.00	21.00	3.19	0.00	0	3	0
	Ring6032	60.00	0.00	30.00	4.77	0.00	0	3	0
	Ring6033	60.00	-21.00	21.00	3.44	0.00	0	3	0
	Ring6034	60.00	-30.00	0.00	5.58	0.00	0	0	3
	Ring6035	60.00	-21.00	-21.00	5.34	0.00	0	0	3
	Ring6036	60.00	0.00	-30.00	5.97	0.00	0	0	3

## Suggested Methods for using ColorQPC

### Checking Profiles

For checking the color accuracy of profiles, use the following procedure:

- Select the desired print environment. Ensure the desired ICC color profile is loaded in the print environment.
- Launch **ColorQPC Measure**.
- Select a ColorQPC Setting. It is recommended to start with one of the standard default settings (e.g. *Digital Textile Standard Quality Barbieri LFP 8mm*).
- Edit the settings, if necessary, to work with a specific color measurement device.
- Change reporting options if desired.
- Create a new measurement session.
- Follow the process in this document to print and measure the session.
- Select the **Compare with expected values** option in the **Compare Measurements** dialog.
- Create report to assess results.
- If desired, repeat process with one of the high quality default ColorQPC Settings. Please note that the inherent color repeatability of some printer, ink and media combinations may be higher than the warning and fail limits in the high quality default settings.



## Process Control

The following procedure describes a method for maintaining color process control tolerances with **ColorQPC**. This procedure assumes that the color profile in the print environment was created for the printer, ink and media combination used for process control monitoring.

### STEP I. Create Baseline Measurement Sessions

Measurement sessions are done over time to understand the color repeatability of the current process.

- Select the desired print environment.
- Launch **ColorQPC Measure**.
- Select a ColorQPC Setting. It is recommended to start with one of the standard default settings (e.g. *Digital Textile Standard Quality Barbieri LFP 8mm*).
- Edit the settings, if necessary, to work with a specific color measurement device.
- Change reporting if desired.
- Save the Baseline ColorQPC Setting and change name if desired.
- Create a new measurement session.
- Follow the process in this document to print and measure the session.
- Select the **Show measurements only** option in the **Compare Measurements** dialog.
- Finish and save session.
- Repeat the process to create, print, and save measurement sessions with the same printer, ink type, media type, Print Environment, and ColorQPC setting on a shift or daily basis for at least 5 shifts or 5 days. Increasing the number sessions will provide more realistic information about the process.

## STEP II: Compute Baseline Warning and Fail Limit Statistics

Using the measurements from the Step I, the overall warning and fail limits can be computed for the process.

- Select the desired print environment as in Step I.
- Launch **ColorQPC Analyze**.
- Select ColorQPC Setting and print environment used in Step I.
- Generate the **Multiple Session Report**.
- Record at the average dE and standard deviation values in the report.
- Compute a baseline warning limit by multiplying the standard deviation by 2 and adding this value to the average dE. Compute a baseline fail limit by multiplying the standard deviation by 3 and adding this value to the average dE.

For example:

Average dE = 4

Standard Deviation = 0.75

Warning Limit =  $4 + (0.75 \times 2) = 5.50$

Fail Limit =  $4 + (0.75 \times 3.0) = 6.25$

- Close **ColorQPC Analyze**.

Please note that high average and/or standard deviation values may be a sign that either the profile is incorrect or there are problems with the printing process. A high average value indicates that colors are being printed incorrectly in every session while a high standard deviation is a symptom that the printing process has a large degree of variability between sessions.

## STEP III. Update Warning and Fail Limit Statistics in ColorQPC Settings

- Select the print environment used in Step I.
- Launch **ColorQPC Measure**.
- Edit the ColorQPC Setting used in Step I. for the baseline measurement sessions.
- Go to the **Statistics** tab. Enter the warning and fail limit values computed in Step II and click **OK**.

## STEP IV. Process Control

With the updated ColorQPC Setting, subsequent measurement sessions can now be compared to the baseline statistics computed in Step III.

- Create a new measurement session using the print environment and the ColorQPC Setting modified in Step III.
- Follow the process in this document to print and measure the session.
- Select the **Compare with expected values** option in the **Compare Measurements** dialog.
- Create report for the session. If the report results in a warning message, it is worthwhile to check which colors are out-of-tolerance. A fail message would indicate a printing error or unexpected change in the printing process.