



GRACoL®
General Requirements for Applications
in Commercial Offset Lithography

G7 Qualification Kit Targeted



GRACoL®
General Requirements for Applications
in Commercial Offset Lithography

How to Use This Qualification Kit

The G7 Qualification kits are designed to give you information on best practices and recommended procedures. The kit contains a checklist, as well as supporting materials.

Here is how to use the kit:

1. Download the most recent version of 'Procedures for IDEAlliance G7 Master Qualification Submission' from the IDEAlliance website. This will provide you with information on what you need to send as well as where to send it. The most current version can be found in the downloads section at www.gracol.org.
2. Follow the G7 Checklists at the front of the G7 Qualification Kit. These checklists provide a simplified overview of the best practices for the G7 calibration process you will be performing. The checklists are intended to be filled out by both the Expert and the G7 Master candidate.
3. Refer to any additional material contained in the sections following the qualification kit. This supplemental information is intended to provide you with additional material to help you perform the best calibration possible.



Checklist for Targeted G7 Master Qualification

No.	OK	Expert	Master	Task
1				Record press conditions at time of test by completion of prequalification document or equivalent.
2				Complete Equipment audit.
3				Demonstrate the use of Fan Graph for NPDC curve creation (optional if using software)
4				Demonstrate the use of software if used to create NPDC curves.
5				Using linear plates adjust ink densities on press so CMYK Solids are within 5 ΔE_{ab}^* of targeted specification.
6				Adjust ink densities on press so 2 Color Overprints are within 5 ΔE_{ab}^* of targeted specification (if possible).
7				Measure 3 copies of NPDC data from NPDC curves from press run using linear plate.
8				Create NPDC correction curve and enter corrections in RIP.
9				Print to same press conditions as calibration run.
10				Verify CMYK Solids are within 5 ΔE_{ab}^* of targeted specification.



11				Verify 2 Color Overprints are within 5 ΔE_{ab}^* of targeted (not always achievable).
12				Verify gray balance is correct.
13				Measure 3 copies of NPDC data from press run using calibrated plate.
14				Verify NPDC curve is correct.
15				Measure 3 IT8/7.4 targets and compare to targeted data set using Tolerance Classification spreadsheet or other software.
16				Record final print conditions (new target densities, etc.) for G7 Master on-site reference.
17				Review process control procedures with customer.
18				Verify press to proof match (assumes availability of verified proofing system). Alternately, compare in Photoshop by assigning first the press profile and then the reference profile.
19				Customer and Expert to initial indicating they have reviewed and understand the G7 process as well as process control procedures.
20				Post application and 1 set of linear NPDC, 3 sets of corrected NPDC data as well as 3 sets of corrected IT8/7.4 data using IDEAlliance web site per instructions in Procedures for IDEAlliance G7 Master Qualification Submission.
21				Print Application Receipt for G7 Master site reference.



22				Send press sheets to IDEAlliance per instructions in Procedures for IDEAlliance G7 Master Qualification Submission.
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Checklist for Targeted/Colorspace G7 Proof

No.	OK	Expert	Master	Task
1				Create a targeted proof using proof software and proofing device
2				Measure NPDC Curves and confirm NPDC Curve is correct.
3				Measure IT8/7.4 and compare to targeted data set using Tolerance Classification spreadsheet or other software
4				Review process control intervals, procedures, guidelines
5				Customer and Expert to initial indicating they have reviewed and understand the procedures to calibrate proofer to G7 Targeted condition as well as process control basics
6				G7 Expert to post application, NPDC data as well as an IT8/7.4 data using IDEAlliance web site per instructions in Procedures for IDEAlliance G7 Master Qualification Submission
7				Print Application Receipt for G7 Master site reference
8				Send proof to IDEAlliance per instructions in Procedures for IDEAlliance G7 Master Qualification Submission.



G7 Qualification Kit Supplemental Materials



GRACoL G7 Qualification Kit
3/3/10

Dear GRACoL Expert,

The GRACoL G7 Qualification Kit is designed to give you everything you need to make sure that your customer's can realize the benefits of the GRACoL & G7 Master Printer Qualification. The kit contains a number of tools to help you complete the qualification, as well as checklists designed to act as a simple guide through the process.

Thanks for your interest, and please feel free to send us any comments:

The GRACoL Committee; Ron Ellis, chair, Jeff Collins, co-chair, Mike Eddington, co-chair.

Thanks to the following individuals for the time and effort they put into developing these documents:

Glenn Andrews
Bruce Bayne
Gerry Gerlach
David Piccus
Steve Suffoletto
Mike Strickland
Joseph Staszak

G7/GRACoL Qualification Kit – List of Contents

The list below itemizes all of the material contained within the kit.

Document Name	Required	Notes
Pre/Post-Qualification Check List	Yes	
Process Control Sheet	Yes	
Qualification Checklist	Yes	
Equipment Audit	Yes	
Master Printer Application	Yes	
Process Control Guidelines	Yes	
Process Control Log	Yes / Similar	
IDEAlliance Control Strip 12647-7	Yes / Similar	
IDEAlliance G7 Press Bar	Yes / Similar	
P2P25xa Target	Yes	
IT8/7.4 Target	Yes	
IDEAlliance G7 Press Test Form	Yes / Similar	
Measurement Reference Files (IT8, P2P)	Yes	
GRACoL Proof Guidelines	Yes	
GRACoL Proof QC Spreadsheet	Yes/Similar	
G7 Master Requirements Doc	Yes	
Cover Letter		

Company Name: _____

G7 Pre Qualification Checklist Sheetfed



version 1.3

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Purpose

The primary purpose of this document is to define your current press condition compared to manufacturer recommended settings prior to a G7 calibration.

A checklist of consumables, settings, pressures, conductivity readings, etc. provide the press operator, management, and G7 Expert the required awareness of press fitness and condition in order to identify necessary adjustments to optimize print quality in preparation for a G7 calibration.

Well documented press conditions will help you adhere to manufacturer recommended specifications, track problems, establish standard operating procedures, and manage GRACoL/SWOP specifications consistently after the G7 calibration.

It is highly recommended to read the IDEAlliance® *Press Operator's Guide to G7* before completing this document. It can be found at www.gracol.org.

Instructions

Be as thorough as possible when completing this form. However, if you are unable to answer many of these questions it is perfectly acceptable. For example, you may not own a torque wrench, measure ink trap, know density tolerances, or water pH. If you have any concerns please contact your G7™ Consultant or Press Manufacturer.

Press Description

Manufacturer	
Model	
Total Units	
Units to be used for G7 Calibration	
Perfector	<input type="checkbox"/> Yes <input type="checkbox"/> No
UV	<input type="checkbox"/> Yes <input type="checkbox"/> No
Waterless	<input type="checkbox"/> Yes <input type="checkbox"/> No
Coater	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> UV <input type="checkbox"/> Aqueous
CIP 3 or 4	<input type="checkbox"/> Yes <input type="checkbox"/> No
Measuring Device Make/Model	
Total Impressions	
Press Age	
Press Speed Max	
Average Production Speed	
Press Speed for G7 Calibration	

Press Maintenance

Maintenance/Service Contract	<input type="checkbox"/> Yes <input type="checkbox"/> No
Date of Last Yearly Maintenance	
Maintenance Log?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Date of Last Roller Inspection	
Was a durometer used?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Frequency of Roller Stripe Check	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Other
Frequency of Roller Maintenance	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Other
What is the Roller Maintenance Routine?	
What problems areas of concern on press are there?	

Plates

Manufacturer	
Name	
Thickness	
Line Screen	
Dot Shape	
Imaging Resolution	
Plate Control Target/Slug	<input type="checkbox"/> Yes <input type="checkbox"/> No

Plate Packing

Manufacturer	
Name	
Thickness	
Describe How Packing is Built	

Paper 1

Manufacturer	
Name	
Finish	
Grade	
Weight/Thickness	
Paper White	L*: a*: b*:

Blankets

Manufacturer	
Name	
Thickness	
Torque Wrench Spec	

Ink

Manufacturer	
Set Name	
ISO 2846 Compliant	<input type="checkbox"/> Yes <input type="checkbox"/> No

Fountain Solution

Manufacturer	
Name	
Temperature	
Solution pH Range	Actual
	Recommended
Solution Conductivity	Actual
	Recommended
RO Water Used	<input type="checkbox"/> Yes <input type="checkbox"/> No
Water pH	
Water Conductivity	

Plate Height to Bearer

Unit	Actual	Recommended
1		
2		
3		
4		
5		
6		
7		
8		

Paper 2

Manufacturer	
Name	
Finish	
Grade	
Weight/Thickness	
Paper White	L*: a*: b*:

Blanket Packing

Manufacturer	
Name	
Thickness	
Describe How Packing is Built	

Blanket Wash

Manufacturer	
Name	

Roller Wash

Manufacturer	
Name	

Press Wash

Manufacturer	
Name	

Blanket Height to Bearer

Unit	Actual	Recommended
1		
2		
3		
4		
5		
6		
7		
8		

Plate to Blanket Squeeze

Unit	Actual	Recommended
1		
2		
3		
4		
5		
6		
7		
8		

Blanket to Impression Squeeze

Unit	Actual	Recommended
1		
2		
3		
4		
5		
6		
7		
8		

Ink Roller Stripes

Roller	Unit 1		Unit 2		Unit 3		Unit 4	
	Stripe	Duro	Stripe	Duro	Stripe	Duro	Stripe	Duro
1st Form to Plate								
2nd Form to Plate								
3rd Form to Plate								
4th Form to Plate								
Ductor to Ink Roller								
Forms to Oscillator								

Roller	Unit 5		Unit 6		Unit 7		Unit 8	
	Stripe	Duro	Stripe	Duro	Stripe	Duro	Stripe	Duro
1st Form to Plate								
2nd Form to Plate								
3rd Form to Plate								
4th Form to Plate								
Ductor to Ink Roller								
Forms to Oscillator								

Dampener Roller Stripes

Roller	Unit 1		Unit 2		Unit 3		Unit 4	
	Stripe	Duro	Stripe	Duro	Stripe	Duro	Stripe	Duro
Form to Plate								
Form to Oscillator								
Metering to Oscillator								
Bridge Roller	<input type="checkbox"/> On <input type="checkbox"/> Off		<input type="checkbox"/> On <input type="checkbox"/> Off		<input type="checkbox"/> On <input type="checkbox"/> Off		<input type="checkbox"/> On <input type="checkbox"/> Off	

Roller	Unit 5		Unit 6		Unit 7		Unit 8	
	Stripe	Duro	Stripe	Duro	Stripe	Duro	Stripe	Duro
Form to Plate								
Form to Oscillator								
Metering to Oscillator								
Bridge Roller	<input type="checkbox"/> On <input type="checkbox"/> Off		<input type="checkbox"/> On <input type="checkbox"/> Off		<input type="checkbox"/> On <input type="checkbox"/> Off		<input type="checkbox"/> On <input type="checkbox"/> Off	

*Ink Density

Ink	House Density	+/- Tolerance
K		
C		
M		
Y		

*TVI (Dot Gain) 50%

Ink	House TVI %	+/- Tolerance
K		
C		
M		
Y		

Press Process Control Tools

Durometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Packing Gauge	<input type="checkbox"/> Yes <input type="checkbox"/> No
Micrometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
ph Meter	<input type="checkbox"/> Yes <input type="checkbox"/> No
Conductivity Meter	<input type="checkbox"/> Yes <input type="checkbox"/> No
Plate Reader	<input type="checkbox"/> Yes <input type="checkbox"/> No
Torque Wrench	<input type="checkbox"/> Yes <input type="checkbox"/> No
Densitometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Last Factory Calibration Date	
Spectrophotometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Last Factory Calibration Date	

Prepress Workflow

Manufacturer	
Model	

Proofer

Manufacturer	
Model	
RIP	
Ink	
Paper	
Other	

L*a*b*

Ink	L*	a*	b*
K			
C			
M			
Y			
R			
G			
B			

*Wet Ink Trap

Ink Overprints	House Trap %	+/- Tolerance
M/Y (Red)		
C/Y (Green)		
C/M (Blue)		

Lighting

Viewing Booth	<input type="checkbox"/> Yes <input type="checkbox"/> No
Lamp Manufacturer	
Lamp Model	
Lamps Last Changed	
Are Lamps 5000K?*	<input type="checkbox"/> Yes <input type="checkbox"/> No
Press Console Lighting	<input type="checkbox"/> Yes <input type="checkbox"/> No
Lamp Manufacturer	
Lamp Model	
Lamps Last Changed	
Are Lamps 5000K?*	<input type="checkbox"/> Yes <input type="checkbox"/> No

*Use GATF Rehm Indicator to check 5000K lighting (included in kit)

Platesetter

Manufacturer	
Model	

Prepress Process Control Tools

Spectrophotometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Last Factory Calibration Date	
Plate Reader	<input type="checkbox"/> Yes <input type="checkbox"/> No
Last Factory Calibration Date	

*Ink Density, TVI, and Ink Trap are not recommended metrics for targeting GRACoL, SWOP, or ISO 12647-2 through G7 calibration. For this checklist the data is only a gauge to understand your current process control practices.



IMPORTANT: G7 Master Applications are now submitted online at <http://www.idealliance.org>

Company Name: _____

G7 Master Equipment Audit



version 1.7



Proofer 1 Target Values (Dot Proof)

Ink	Densities	+/- Toler	L*a*b*
K			
C			
M			
Y			
R			
G			
B			

Proofer 2 Target Values (Dot Proof)

Ink	Densities	+/- Toler	L*a*b*
K			
C			
M			
Y			
R			
G			
B			

Prepress Workflow 1

Manufacturer	
Model	

Proofer 1 - G7 Qualified ☐ Yes ☐ No

Manufacturer	
Model	
RIP	
Ink	
Paper	
Other	

Platesetter 1

Manufacturer	
Model	

Plate Reader 1

Plate Reader	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	
Last Calibration	

Prepress Workflow 2

Manufacturer	
Model	

Proofer 2 - G7 Qualified ☐ Yes ☐ No

Manufacturer	
Model	
RIP	
Ink	
Paper	
Other	

Platesetter 2

Manufacturer	
Model	

Plate Reader 2

Plate Reader	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	
Last Calibration	

Spectrophotometer 1

Spectrophotometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	<input type="checkbox"/> iSis <input type="checkbox"/> i1Pro <input type="checkbox"/> _____
Last Calibration	

Spectrophotometer 2

Spectrophotometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	<input type="checkbox"/> iSis <input type="checkbox"/> i1Pro <input type="checkbox"/> _____
Last Calibration	

Spectrophotometer 3

Spectrophotometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	<input type="checkbox"/> iSis <input type="checkbox"/> i1Pro <input type="checkbox"/> _____
Last Calibration	

Spectrophotometer 4

Spectrophotometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	<input type="checkbox"/> iSis <input type="checkbox"/> i1Pro <input type="checkbox"/> _____
Last Calibration	

Press 1 Description

Manufacturer	
Model	
Total Units	
Units used for G7 Calibration	
Perfector	<input type="checkbox"/> Yes <input type="checkbox"/> No
UV	<input type="checkbox"/> Yes <input type="checkbox"/> No
Waterless	<input type="checkbox"/> Yes <input type="checkbox"/> No
Coater	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> UV <input type="checkbox"/> Aqueous
CIP 3 or 4	<input type="checkbox"/> Yes <input type="checkbox"/> No
Measuring Device	Make/Model
Scanner	
Handheld	
Closed Loop System	

Press 2 Description

Manufacturer	
Model	
Total Units	
Units used for G7 Calibration	
Perfector	<input type="checkbox"/> Yes <input type="checkbox"/> No
UV	<input type="checkbox"/> Yes <input type="checkbox"/> No
Waterless	<input type="checkbox"/> Yes <input type="checkbox"/> No
Coater	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> UV <input type="checkbox"/> Aqueous
CIP 3 or 4	<input type="checkbox"/> Yes <input type="checkbox"/> No
Measuring Device	Make/Model
Scanner	
Handheld	
Closed Loop System	

Press 1 Ink Target Values

Ink	Densities	+/- Toler	L*a*b*
K			
C			
M			
Y			
R			
G			
B			

Press 2 Ink Target Values

Ink	Densities	+/- Toler	L*a*b*
K			
C			
M			
Y			
R			
G			
B			

Press 1 Ink

Manufacturer	
Set Name	
ISO 2846 Compliant	<input type="checkbox"/> Yes <input type="checkbox"/> No

Press 2 Ink

Manufacturer	
Set Name	
ISO 2846 Compliant	<input type="checkbox"/> Yes <input type="checkbox"/> No

Press 1 Paper

Manufacturer	
Name	
Finish	
Grade	
Weight/Thickness	
Paper White	L*: a*: b*:

Press 2 Paper

Manufacturer	
Name	
Finish	
Grade	
Weight/Thickness	
Paper White	L*: a*: b*:

Company Name: _____

G7 Master Proof Equipment Audit



version 1.7



Proofer 1 Target Values (Dot Proof)

Ink	Densities	+/- Toler	L*a*b*
K			
C			
M			
Y			
R			
G			
B			

Proofer 2 Target Values (Dot Proof)

Ink	Densities	+/- Toler	L*a*b*
K			
C			
M			
Y			
R			
G			
B			

Prepress Workflow 1

Manufacturer	
Model	

Proofer 1 - G7 Qualified ☐ Yes ☐ No

Manufacturer	
Model	
RIP	
Ink	
Paper	
Other	

Platesetter 1

Manufacturer	
Model	

Plate Reader 1

Plate Reader	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	
Last Calibration	

Prepress Workflow 2

Manufacturer	
Model	

Proofer 2 - G7 Qualified ☐ Yes ☐ No

Manufacturer	
Model	
RIP	
Ink	
Paper	
Other	

Platesetter 2

Manufacturer	
Model	

Plate Reader 2

Plate Reader	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	
Last Calibration	

Spectrophotometer 1

Spectrophotometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	<input type="checkbox"/> iSis <input type="checkbox"/> i1Pro <input type="checkbox"/> _____
Last Calibration	

Spectrophotometer 2

Spectrophotometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	<input type="checkbox"/> iSis <input type="checkbox"/> i1Pro <input type="checkbox"/> _____
Last Calibration	

Spectrophotometer 3

Spectrophotometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	<input type="checkbox"/> iSis <input type="checkbox"/> i1Pro <input type="checkbox"/> _____
Last Calibration	

Spectrophotometer 4

Spectrophotometer	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	<input type="checkbox"/> X-rite <input type="checkbox"/> Techon <input type="checkbox"/> _____
Model	<input type="checkbox"/> iSis <input type="checkbox"/> i1Pro <input type="checkbox"/> _____
Last Calibration	



IMPORTANT:

The current G7 How To Document can be obtained at
<http://www.idealliance.org>



GRACoL®
General Requirements for Applications
in Commercial Offset Lithography

Proposed Guidelines for Proofing Component of G7 Master Qualification

A. Tools

- 1. IDEAlliance 12647-7 proofing control wedge.**
- 2. Spectrophotometer, preferably a strip-reading model such as EyeOne, iSis, DTP70, or Barbieri LFP or Swing.** The choice of UV- or non-UV filtered measurements will depend on a variety of factors, including the degree of UV fluorescence of the proofing and press substrates, instrument design, and viewing conditions. When in doubt, take both filtered and non-filtered measurements and determine which method or combination of methods yields the best visual proof-to-press match.
- 3. (Optional) Proof verification software.** Free Excel-based tool (provided), or third-party verification tool. The qualifying report should include data for all 54 patches of the control wedge. The verification software must implement Idealliance characterization data sets for GRACoL, Swop #3, and SWOP #5.
- 4. Online reporting mechanism (to be developed).**
- 5. Means of printing and affixing proof compliance report to proof.** This can be as little as stapling a printout of the free Idealliance worksheet to each proof or can be a third-party product that prints labels.
- 6. Checklist to be filled out by qualifying consultant confirming that all required steps in the qualifying process have been performed (to be developed).**
- 7. A suitable test form, such as the GRACoL7_v31 or the SWOP Proofing Form.**

B. Procedure for Initial Qualification

1. Proofing device should be in good operating condition (e.g., inkjet nozzles clean, printheads aligned, etc.)
2. Print test form with 12647-7 control wedge.
3. Measure and record ISO tolerances for the 12647-7 control wedge (examples



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only; official tolerances to be determined):

dE (abs):

Avg. all patches	3.0
Peak all patches	6.0
Paper white	3.0
Peak primary solids	5.0
Peak primary (deltaH)	2.5
Avg. neutral CMY patches	1.5

4. If the proof does not pass, diagnose the problem, correct, and repeat the above procedure until a passing result is obtained.

5. Have designated personnel demonstrate the ability and means to produce and verify passing G7 (GRACoL or SWOP) proofs using the IDEAlliance worksheet or a third-party verification tool. In addition, personnel must demonstrate the system they intend to use for labeling passing G7 proofs.

6. Sample proof, proof verification report, and checklist must be included with the G7 Master application.

7. Complete the Proofing Qualification Checklist (to be developed) verifying that Steps 1 through 7 above has been successfully accomplished.

COLORIMETRY Process Control Specifications

Metric			Tol.	DE 'ab	L*	a*	b*	C*	h'
Paper			2.0	3.1	94.3	-0.01	-0.24	0.2	360
Solids	Primary	K	5.0	2.3	17.9	-0.27	-1.35	1.4	359
		C	5.0	1.6	54.9	-34.8	-49.5	60.5	328
		M	5.0	4.2	47.9	71.1	-1.4	71.1	56
		Y	5.0	5.6	87.8	-3.7	85.0	85.1	358
	Overprint	R _{MY}	7.0	6.5	47.2	65.6	40.8	77.3	54
		G _{CY}	7.0	8.4	48.6	-61.4	17.0	63.7	308
		B _{CM}	7.0	1.8	24.7	17.5	-44.4	47.7	35
		CMY	8.0	6.6	22.7	-0.1	-6.6	6.6	360
Neutrality	25% HC		2.0	1.8	75.5	0	-1.46	1.5	358
	50% HR		3.0	2.5	57.5	0	-0.96	1.0	355
	75% SC		4.0	3.6	39.5	0	-0.46	0.6	357
25% HC						50% HR		75% SC	
Tonality <small>+p -p</small>	K	0.02	0.28			0.55		0.96	
	CMY	0.02	0.31			0.59		0.96	
T.V.I. (XYZ) Ref = 50% Lpi = 175			3	K	C		M	Y	
				18	12		15	14	

Company: R.I.T

Date: 1-16-09

Press: Heidelberg 6/c + Perf. + Coater

Consultant: Steve Suffoletto

Paper: Sappi – Lustro Gloss, 80lb

Ink: Superior

Notes:

1. This form is for documenting Colorimetry metrics from the calibration results, which now become the target aims.
2. These new targets may not be ideal to ISO 12647, which were used during the calibration test, because they represent real production results.
3. Values inside the table are for demonstration purpose and example only. Record values rounded to the nearest tenth (0.0) decimal.
4. While ISO 12647 currently uses DE'ab (1976), it's not preferred due to some inaccuracy and poor correlation to visual appearance. Alternatively, a weighted color difference DE CMC, '94, '00 or DIN '99 should be used instead.
5. Measurement conditions: Instrument X-Rite 530, Illuminant D50, Observer Angle 2-degree, Backer is black

COLORIMETRY Process Control Specifications

Metric			Tol.	DE '....	L*	a*	b*	C*	h'
Paper									
Solids	Primary	K							
		C							
		M							
		Y							
	Overprint	R _{MY}							
		G _{CY}							
		B _{CM}							
		CMY							
Neutrality	25% HC								
	50% HR								
	75% SC								
			25% HC		50% HR		75% SC		
Tonality <small>+p -p</small>	K								
	CMY								
T.V.I. (XYZ) <small>Ref = Lpi =</small>			K	C	M	Y			

Company: _____ Date: _____

Press: _____ Consultant: _____

Paper: _____ Ink: _____

Notes:

1. This form is for documenting Colorimetry metrics from the calibration results, which now become the target aims.
2. These new targets may not be ideal to ISO 12647, which were used during the calibration test, because they represent real production results.
3. While ISO 12647 currently uses DE*ab (1976), it's not preferred due to some inaccuracy and poor correlation to visual appearance. Alternatively, a weighted color difference DE CMC, '94, '00 or DIN '99 should be used instead.
4. Measurement conditions: Instrument ?, Illuminant D50, Observer Angle 2-degree, Backer is ?

DENSITOMETRY Process Control Specifications

Metric	Tolerance	Black	Cyan	Magenta	Yellow
Paper	.01	.06	.07	.06	.05
Density (SID) Absolute - Relative (-p) Wet - Dry Press Coated - Uncoated Backer: White, Black, Self	0.07	1.75	1.45	1.45	1.05
Dot Gain (TVI) Lpi = 175 Ref = 50% CtP Linear - Curved	3	19	18	18	17
Mid-tone Spread	<= 4				
Gray Balance (GB) C50,MY40,K0	<= 0.02				
Mid-Tone Density	0.02	0.50	0.54		
Print Contrast (PC) Ref = 75%	5	45	37	37	32
Hue Error (HE) +p -p	3	NA	25	47	5
Grayness (G) +p -p	3	98	10	15	2
Trap (T) Unit/Sequence = K C M Y Wet - Dry	5	NA	Blue C+M 80	Red M+Y 75	Green C+Y 90

Company: R.I.T

Date: 1-16-09

Press: Heidelberg 6/c + Perf. + Coater

Consultant: Steve Suffoletto

Paper: Sappi – Lustro Gloss, 80lb

Ink: Superior

Notes:

1. This form is for documenting traditional densitometry metrics from the calibration results, which now become the target aims.
2. Densitometry metrics are useful for process control, troubleshooting and problem solving.
3. Specifications require both a single target aim value and tolerance limits on both sides (+/-).
4. Values inside the table are for demonstration purposes and an example only.
5. This document was modified from a form © in 1994 by Steve Suffoletto at R.I.T..

DENSITOMETRY Process Control Specifications

Metric	Tolerance	Black	Cyan	Magenta	Yellow
Paper					
Density (SID) Absolute - Relative (-p) Wet - Dry Press Coated - Uncoated Backer: White, Black, Self					
Dot Gain (TVI) Lpi = 175 Ref = 50% CtP Linear - Curved					
Mid-tone Spread					
Gray Balance (GB) C50,MY40,K0					
Mid-Tone Density					
Print Contrast (PC) Ref = 75%					
Hue Error (HE) +p -p					
Grayness (G) +p -p					
Trap (T) Unit/Sequence = Wet - Dry		NA	Blue C+M	Red M+Y	Green C+Y

Company: _____ Date: _____

Press: _____ Consultant: _____

Paper: _____ Ink: _____

Notes:

1. This form is for documenting traditional densitometry metrics from the calibration results, which now become the target aims.
2. Densitometry metrics are useful for process control, troubleshooting and problem solving.
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Process Control Concepts

This document is a short introduction to basic process control concepts. Another resource that contains additional information about process control is the “Press Operators Guide to G7” (POG) dated October 2008 and also available on the GRACoL web site.

Modern printing is a manufacturing process. For predictable print quality results the process must be controlled. However, there are many sub-processes, components, conditions, variables, and parameters that affect the outcome. They should be identified, defined, prioritized, then controlled with specifications that include a target and tolerance limits. The press-to-proof calibration (also known as a fingerprint or profile) sets the reference baseline or target aims (real). Another source for the target (virtual) may be the standard reference printing condition defined by the characterization data obtained from the IT8.7/4 target. Obviously, a signed color managed contract proof is also a target that the printer is expected to visually match within reason.

It may be helpful to think of a horseshoe game analogy. The target that you are aiming for is the stake that was pounded firmly into the ground. The objective is to always get a ringer around it. The farther away the horseshoe is from the target (accuracy), the less points scored. Regarding color, the farther away a sample is from a reference target, the larger the color difference of Delta E (DE or ΔE).

Process Control (PC) requires a feedback loop to provide a signal for when corrective action intervention should occur. The feedback loop comes from periodic sampling of the process or product. The sample should be representative of the process at that period in time. Therefore, by itself ($n = 1$) it is only a temporary snapshot that is static. A typical sampling plan for sheetfed during the production run is to pull a sample every 1,000 sheets for measurement. For a press printing at 15,000 sheets per hour (sph) this is every 4 minutes.

Once the sample is obtained it now needs to be measured. Having sophisticated color measurement technology, such as off-line scanners or closed loop color control, is efficient in saving time and materials. Not having this option should not be an excuse for not using process control! It can still be done with hand-held devices but with less efficiency.

Deciding on which parameters or metrics to measure (process or product) and how to measure them (densitometry or colorimetry) is important. Traditional densitometric measurements of

Solid Ink Density (SID) and Tone Value Increase (TVI) or dot gain are still very valuable for detecting subtle changes. Gray Balance or Neutrality is also a historic metric, either with density or mid-tone spread, but a new concept to many. Hue Error, Grayness, Trapping and paper Brightness may be better measured with colorimetry using CIE Lab.

The process control feedback loop compares the actual value of the sample against the specifications. The specification consists of target and tolerance limits. The target is always a single value. The tolerances are on both opposite sides of the target. One is above, upper or plus (+), the other below, lower or minus (-). Generally, the tolerance limits are selected so that when inside the tolerance limits, the sample is acceptable to the customer (product control) or represents normal process behavior (process control). Likewise, when a value is outside the tolerance limits, the sample is unacceptable to the customer or represents abnormal process behavior. Only when statistical process control limits are properly calculated from the actual process can one say a process is “in” or “out” of control. This is called Statistical Process Control (SPC).

Obviously, there needs to be a compromise and tradeoff between tolerance that are too wide or too tight. Customers prefer tight tolerance thinking this will make the printer pay more attention and be more careful so they get higher quality. The printers prefer wide tolerances so they can have higher productivity and less scrap and waste which affects profitability. Therefore, specifications should be mutually agreed upon by the customer and the printer and then formally documented in writing. A common concern about present specifications is that they are not realistic because they are too wide (barn door) or the tolerance are not even defined and missing (how do I keep score?). To suggest possible tolerances, one needs relevant knowledge and practical experience of what the process can do (capability) and cannot do (limitation). Having an expectation, or more strongly a requirement, or more authoritatively a demand, will not make the process do what it inherently will do naturally anyways. About all you can do to change the weather is complain, wait, or move to different location!

After conducting your press-to-proof calibration, the consultant should complete the process control specification sheet summarizing the test results. At the minimum, the target aims need to be clearly and completely defined. They should also be able to provide guidance, advice and recommendations on what the tolerances should be for your unique conditions and market. Then, you will need to routinely monitor, track and record your process performance for accuracy and consistency. To assist you in doing so, we have developed a generic log with an Excel template as an example.