

Customer Support

SAMPLE PREPARATION GUIDE

FOR

COLORANT FILES

USED WITH

DATACOLOR FORMULATION SOFTWARE

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(optically clear, measured by transmission)
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by reflectance

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Overview

This guide will instruct the user in creating an accurate colorant data base for use with the Datacolor ChromaCalc 3.0 color matching software. The resulting file provides the system with the information necessary to match and correct colors in your product. The samples made to characterize your colorants will be referred to as "primaries."

The software is capable of matching colors by measuring the reflectance of opaque, translucent, and transparent samples or by measuring the transmittance of optically clear samples.

II What is needed to start

The quality of the results obtained from your system is dependent upon the quality of the data derived from your primaries.

The system cannot produce results that are more accurate than the data your primaries provide.

If you are preparing these samples for use when attending the Datacolor International User's Course, make samples for only one of the four types of colorants sets described here. **Do not make primaries for more than the number of colorants requested in this guide.**

Each primary described in your database must be representative of the materials you are actually using in your finished products. Obtain a standardized lot of each of your colorants.

Use of a clean analytical balance with at least two place accuracy is recommended for weighing. Colorant/resin mixes should be of the largest practical size to improve accuracy.

Select one technician to do the sample preparation in order to remove the variability which differences in laboratory technique can create. This technician will quickly become familiar with preparation procedures.

Review procedures within your laboratory and production environment. Installation of a color control system will frequently point out existing variations that have been ignored in the past.

Choose the resin used in the majority of color matches for the products you manufacture. Successfully building a file in this resin will give you the quickest maximum use of your system, as well as give you the knowledge and experience necessary to build any additional files you may require.

If the product line you are characterizing normally contains additives (stabilizers, clarifiers, fillers, etc.), be sure your primaries contain them at their normal levels.

For many of our system users, the choice of process equipment is fixed by what is available and in normal use. However, if lab formulations are the major activity, the primaries should be produced on the equipment used for lab formulation. If production adjustments are the major goal, then process samples on the equipment that gives the best correlation to production output.

Sample surface should be as consistent as possible throughout the primaries. Samples for transmission measurement, in particular, should have planar, non-textured surfaces to maximize optical clarity.

If you are coming to our training course, you must bring these samples with you. Please read this completely before proceeding! If you are not sure which of these types of databases you need, call and discuss this with us. The wrong samples will be of little or no use to you.

This guide outlines how to prepare samples for three different types of databases. The first type is called opaque or translucent. It characterizes resin and colorant mixes that have a high degree of light scattering and can contain white pigment such as TiO₂ as part of the colorant mix. The white pigment may be virtually all of the colorant present or be totally absent. This type of file is the most commonly used by plastics compounders.

The second type of database would characterize resin and colorant mixes that are optically clear and would be measured by transmission. These would be clear resins most commonly colored with dyes.

The third type of database would characterize resin and colorant mixes that scatter light and may or may not contain a white pigment. If the product does contain a white pigment, it is present only at fixed levels. Examples of this type would be synthetic fiber products where the white is there as a delusterant or in vinyl products such as siding for houses.

III What to make for opaque or translucent system

These guidelines apply whether you use dry/pure colorants, or extended materials (pastes, dispersions, flushes, etc.) that you purchase or make yourself.

You will be characterizing 6 colorants: white, black, red, yellow, blue and green.

White colorant - Prepare two samples using your main white colorant (e.g., TiO₂). Both samples will be the masstone, i.e., 100% of the colorant in the sample will be that particular white colorant.

The first sample should have white colorant loading that represents the normal range of your pigment loadings. For example, if upon examining your product's history you find the average pigment load in the final end product is usually between 0.7% and 1.5%. You might make the first white sample with a 1.2% load (if you manufacture color concentrate/masterbatch, your colorant loading is determined from the colorant content after the concentrate/masterbatch is let down).

The second sample should have a white colorant loading less than that of the first sample. It should be low enough that there is a perceptible drop in the level of opacity at the sample thickness you are producing, otherwise a sample of greatly reduced thickness may be required in some instances.

Black colorant - You are asked to prepare five (5) samples to characterize this colorant.

- 5% black and 95% white
- 10% black and 90% white
- 30% black and 70% white
- 50% black and 50% white
- 100% black

The white used in these mixes should be the same white colorant used in the preceding step.

The loadings of the black-and-white mixes and the loading of the masstone sample in the resin system need not be constant. If your normal product load is like the example in the white colorant section (i.e., 0.7% to 1.5%), your black-and-white mixes may be loaded at different levels within that range. Your masstone sample may be at the low end of that range or even lower if that represents how you would make a masstone black product. Use additional surfactants or wetting agents where required to optimize dispersion.

Note: Although the program has the capacity to use as many as 10 primaries for the black and other colorants as well, if these primaries are being prepared for our users' training course, you can limit the number of primaries prepared. For class you will need the following:

<u>Number of Samples</u>	<u>Colorant</u>
2	White
5	Black
5	Red
5	Yellow
5	Blue
5	Green

We strongly encourage you to prepare all 10 primaries for one of the colorants.

If you are preparing the database for use outside of the course, you may want to make complete set of 10 primaries for each colorant. See concentration suggestions in the following section.

Other colorants - To characterize each of the following colorants, you will make five (5) samples: **yellow, red, green and blue**. Use yellow, red, green and blue colorants that are most often employed in your color matching.

Your primary samples for each colorant will include four (4) mixes with the white colorant and one (1) mix with the black colorant previously used in this guide.

Your four colorant-and-white mixes should be prepared in this manner:

- 5% colorant and 95% white
- 10% colorant and 90% white
- 30% colorant and 70% white
- 50% colorant and 50% white

Your colorant-and-black mix should be prepared in this manner:

- 99% colorant and 1% black

Once again, your loadings of the primary samples can be varied based on what you know to be prudent for each colorant mix, using additional surfactants or wetting agents where required.

Note: If you are preparing these samples for use at our training course, pick one of the colors (red, blue, yellow or green) and make these additional mixes with white:

- 2% colorant and 98% white**
- 15% colorant and 85% white**
- 20% colorant and 80% white**
- 40% colorant and 60% white**
- 70% colorant and 30% white**

Colorant mixes - In order to test the colorant data from your primary samples and to be able to learn to use the formulation and correction programs, it is necessary that you prepare samples of colorants mixed in the following proportions at loadings suitable for your product:

**** IMPORTANT NOTE ****

Be sure to make and bring these samples to the users' course. They are a necessary part of the instruction and a gauge of any difficulty that may arise particular to your operations.

A.	Yellow	20	B.	Yellow	21	C.	Black	10
	Red	20		Red	22		Yellow	30
	Blue	5		Blue	4		Red	40
	White	55		White	53		White	20

D.	Black	9	E.	Red	3	F.	Red	3
	Red	38		Yellow	12		Yellow	15
	Yellow	34		Green	25		Green	22
	White	19		White	60		White	60

G. & H. Repeat sample **D** twice more from scratch. These samples will be used to test the reproducibility of your preparation procedure and your process.

WORKSHEET FOR OPAQUE/TRANSLUCENT PRIMARIES

Colorant Name :

% Colorant (If colorant is paste, dispersion, flush. etc.):

D e n s i t y :(Specific Gravity, lbs./gal, gr./cc):

Enter actual weight of each primary

	<u>Primary 1</u>	<u>Primary 2</u>	<u>Primary 3</u>
Colorant:			
White :			
Black :			
* Resin :			

	<u>Primary 4</u>	<u>Primary 5</u>
Colorant :		
White :		
Black :		
* Resin :		

*** Weight of resin should include weights of added processes aids, etc.**

IV What to make for transparent systems

Colorants - You will make five (5) samples to characterize each of the following colorants: yellow, red, green, and blue. Use yellow, red, green, and blue colorants that are most often employed in your color matching.

For each colorant make one sample at the minimum concentration you can precisely prepare.

For each colorant make one sample at the maximum concentration you would use for that particular colorant in that particular resin and process.

The remaining three concentrations for each colorant should be well spaced between that colorant's minimum and maximum concentration. For example, if the minimum and maximum concentrations for a red were 0.01 and 3.00 respectively, the remaining eight concentrations could be:

Minimum (0.10) 0.50 1.50 2.50 (3.00) Maximum

Note: The program has the capacity to use as many as 10 primary samples to characterize a colorant. Since this guide is most commonly used by people preparing for our users' training course, we limit the number of primaries to 5 for all but one of the colorants. Pick only one of the colorants (yellow, red, green or blue) and using the same guidelines as above, prepare 10 concentrations spaced from the minimum to the maximum concentration. If you are preparing a database outside of the course, you may follow this procedure for all your colorants.

Resin - You will need to make a sample of your resin processed by your coloring procedure in the absence of colorant but with any additives normally present in this product (clarifiers, etc.).

Colorant mixes - In order to test the colorant data from your primary samples and to be able to learn to use the formulation and correction programs, it is necessary that you prepare samples of colorants mixed in the following proportions:

A.	Yellow	40.0	B.	Green	30.0
	Red	40.0		Red	20.0
	Blue	20.0		Blue	50.0
C.	Yellow	30.0	D.	Yellow	20.0
	Green	40.0		Green	20.0
	Blue	30.0		Red	60.0

E. & F. Repeat sample A. twice more from scratch. These samples will be used to test the reproducibility of your preparation procedure and your process.

The actual loadings (or concentrations) of these colorant mixes into your resin system is left up to you to choose. Only samples A., E. and F. should be identical in loading.

**** IMPORTANT NOTE ****

Be sure to make and bring these samples to the users' course. They are a necessary part of the instruction and a gauge of any difficulty that may arise particular to your operations.

WORKSHEET FOR TRANSPARENT PRIMARIES

Colorant Name:

% Colorant :(If colorant is paste, dispersion, flush. etc.)

D e n s i t y :(Specific Gravity, lbs./gal, gr./cc)

C o s t :

Enter actual weight and thickness of each primary

	<u>Primary 1</u>	<u>Primary 2</u>	<u>Primary 3</u>
Colorant :			
* R e s i n :			
Thickness :			

	<u>Primary 4</u>	<u>Primary 5</u>
Colorant :		
* R e s i n :		
Thickness :		

*** Weight of resin should include weights of added processes aids, etc.**

V. SAMPLE PREPARATION GUIDE APPLICATIONS USING NO WHITE OR FIXED LEVELS OF WHITE AND MEASURING SAMPLES IN REFLECTANCE

In the production of plastic products where white colorants such as TiO₂ are either not used at all or incorporated at a fixed level and the product is measured in reflectance because it is not optically clear, the sections I, II, and IV in the sample preparation guide should be followed. This would apply to such products as synthetic fibers and vinyl siding.

The resin used in primary samples should then contain that proper fixed level of white. For example, synthetic fiber might contain 0% TiO₂ or perhaps 0.1% incorporated as a delusterant. In vinyl siding, the TiO₂ might be held at a 10% loading.

These primary samples are then used to build a file which Datacolor's plastics software calls the "Transparent Reflectance" option.

If you have any questions regarding sample preparation, please call your application specialist.