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# DATA SHEET TUTORIAL

## I. PURPOSE

This short tutorial is intended to provide simple, easy to understand explanations of the terms used to describe the strength and performance of flex vinyl banner for WF printing.

Technical data sheets should be the basis for an informed discussion of the important performance metrics for any digital print media or substrate. Most manufacturers publish their technical data sheets on their websites. But, as the manufacturer's product goes to market through layers of distribution, matching product to manufacturing source, and published data sheet to product, is prone to error. NuConCept will do its best to put the information from the data sheets provided by our suppliers into a common format, and make those data sheets available to you on our website or by request. We hope you will refer to these data sheets when answering questions from your customers.

## II. TEST METHODS

NuConCept, and other suppliers, make reference in their data sheets to "test methods". These methods typically make reference to the source of standardized test method.

- DIN: acronym for "Deutsches Institut fur Normung", translated "German Institute for Standardization". This organization develops standardized test methods that are used and accepted worldwide.

- ISO: acronym for "International Organization for Standards". Similar to DIN, its methods are sometimes considered less meaningful than the corresponding DIN methods.

- NFPA: acronym for National Fire Protection Association". It is concerned with fire protection, and publishes test standards regarding the flame resistance of various materials.

## III. TESTED PARAMETERS

Now, the parameters themselves:

A. Support Material ... the inner materials that provide strength to the banner or print media, not so much to the print surface. For flexible vinyl banner, the support material is "**scrim**", a textile woven from yarn of various compositions.

B. Thread Count ... the number of yarn or filament **strands per inch**; first number is the count in the "warp" direction, second number for the "weft". Lower thread counts tend to have more scrim-pattern show-through on the print surface. Higher thread counts produce a smoother surface.

*Warp and weft ... the textile industry calls the threads in the lengthwise direction of the fabric the "warp" threads. The threads that are woven across the web, over/under the warp threads are called the "weft". Even when the weight and material of the threads, warp and weft, are identical, a textile can have different strength in the long dimension, compared to the cross-web direction, since warp threads are normally under tension in the weaving process, weft are not.*

C. Denier (de-near') ... literally, a measure of the **weight** of a fiber filament or yarn, equal to the number of grams per 9,000 meters. It has incorrectly become synonymous as a measure of strength. Yarns made of different materials, or different qualities of the same material, can have equal "Denier", but much different strength.

*To illustrate the point, would you rather have a bulletproof vest made out of 10 denier Kevlar, or one made out of 1,000 denier polyester? And, manufacturing methods and quality of a given type of fiber can cause yarn of similar composition and equal denier to have different strength.*

D. Surface material ... the material that is used for the print-face ... for flex-vinyl banner, it is in almost all cases PVC.

*PVC ... acronym for "poly-vinyl-chloride", one of the most widely used man-made plastics the world over ... PVC gets a lot of bad press, but the fact is, it's useful because it resists two things that hate each other: fire and water. Because of its water resistance it's used to make raincoats and shower curtains and water-pipes ... and banners. It has flame resistance, too, because it contains chlorine, more than 50% by weight. When you try to burn PVC, the chlorine atoms inhibit combustion. In it's pure form, PVC is brittle. Combined with plasticizers, another class of chemicals, PVC becomes soft and flexible. Further discussion on plasticizers is reserved for the graduate level courses.*

E. White-point (Color) … we call our banner media “natural white”. What we mean by that term is a measured color using CIELAB color-space dimensions (L*a*b*) in which L* (L-star) is the lightness, on a scale of 0 (black) to 100 (brightest white), a* (a-star) is the red/green axis, and b* (b-star) is the yellow/blue axis. Put simply, our banners all have lightness values over 90, **are near perfect neutral on the red/green axis**, with a* values between -1 and +1 on a -100 to +100 scale, and a **very small bias to blue-white**, with b* values -4 to -5.

*A natural, near-neutral whiteness reduces “metamerism”, which is the perceived color-shift when printed graphics are viewed in different light conditions, indoors and outdoors.*

F. Weight ... the measure of how much a specific quantity of print material weighs. Because banner has its roots in the textile industry, we use a measure common to textile ... "ounces", as in, "this is our 13 oz banner". What that term does not fully reveal is that this refers to the weight of one square yard of a given textile material. So, 13 oz, is more accurately "13 oz per square yard", and is a throwback to the modern textile industry that started in England in the 18th century.

*GSM is another measure of weight, literally "grams per square meter" ... and is the term more commonly used in countries using the metric system (everywhere but here and the UK)*

G. Finish ... for us, we try to keep it simple ... banner comes in "gloss" and "matte" ... and, unfortunately, some banner is in between the two. This we call "semi-matte".

H. Tensile ... short for "tensile strength" and measured by the amount of force required to stretch a piece of banner until it breaks. If comparing one to another, higher is better.

*There are special testing instruments used to do this, and there is a test standard, this "DIN 53354" that spells out the size of the test piece (5 cm wide) that is put into the jaws of the testing instrument. The jaws close and grip the material. Then the jaws move apart, and the machine measures the amount of force (measured in something called "newtons") to break the material in two. We, and many banner producers and sellers, disclose the tensile strength of their products in a semi-standardized measure of "newtons per 5 centimeters" (N/5cm)*

*Newton? ... a metric unit of force ... take it as it is, this isn't physics class.*

I. Tear ... short for "tear strength" ... there is a test standard and testing instrument. This is a measure of the amount of force required to tear the print substrate or banner. This, too, is expressed in Newtons. Higher numbers better than lower

J. Adhesion strength ... sometimes called "peel" strength. Again, there is a test standard and a testing instrument. This is a measure of the amount of force required to cause something like a banner, which is a multi-layer construction of print face / scrim / backing layer, to fail by having one layer separate from another. The DIN standardized test uses a 5 cm wide test sample. The measurement is normally given in "newtons per 5 cm" (N/5cm). Higher is better than lower.

K. Flame resistance ... there are test standards ... in the USA the most common is NFPA 701 ... you might also hear reference to the European standards of B1 and B2, or sometimes M1 and M2.

*Now for some truth about flame resistance, the use of flame retardants on print media, and why we say what we say on our data sheets.*

1. PVC banner will burn, if it is exposed to a flame source that is strong enough, or is part of a fire that is hot enough.

2. Compared to other print substrates, it is much less combustible than (a) paper, (b) paper coated with polyethylene, e.g., photo paper, (c) polyethylene, (d) polypropylene, (e) polyester ... and the list goes on. This is because the chlorine atom that is part of the structure of poly-vinyl-CHLORIDE, inhibits combustion. Inhibit doesn't mean prevent. But, the high concentration of chlorine in the plastic makes it hard to combust.

3. Print substrates, including PVC, can be coated with chemicals to make them less combustible. These chemicals typically contain BROMINE, an element in the halogen family along with chlorine, but heavier. The chemicals most commonly used to inhibit combustion of products that will burn … furniture foam, carpets, textiles, children's apparel, wall coverings, and print substrates … are poly-brominated diphenyl ethers, or PBDE's. This class of chemical has come under fire recently for its toxic effects, and for their questionable efficacy in suppressing combustion.

*Near the top of a recent google-search of "flame retardant chemicals" is this …*

- Toxic flame-retardant chemicals (polybrominated diphenyl ethers, or PBDEs) are widely used in foam furniture cushions, carpets, textiles, foam insulation, children's products and more, despite research showing they may cause neurodevelopmental delays, cancer, and fertility and thyroid problems.
- Ironically, the chemicals also do little to actually suppress flames compared to non-treated items, and some may even increase the release of toxic gases released into the air during a fire.

http://articles.mercola.com/sites/articles/archive/2013/02/12/flame-retardants-health-risks.aspx

*Fair warning … don't read that article unless you want to be alarmed about all the stuff in your house, your closet, and even your Gator-Ade and orange soda. As far as NuConCept banner media, we'll say it straight ... our standard banner products are NOT specially treated to comply with NFPA 701. Our suppliers can do so, for a higher cost, and you can get flame resistant banner by special order. But, we have yet to get a request. And frankly, we don't think it's a good trade-off of risk and reward. If you have a printer that has a job that has to be accompanied with flame-resistant certification, don't sell him our banner material.*

L. Lo-Temp ... there are test standards that measure the temperature below which the banner will show evidence of cracks on the print face when subjected to a certain degree of folding at the low temperature. Put simply, most of our banner show no cracking down to minus 20 C ... four below zero, Fahrenheit.

M. RF Weldable ... a common post-print finishing method to fuse two pieces of banner into one wider piece. Most such welding devices use radio-frequency (RF) energy to melt the two edges, then immediately compress the melted areas together to give a strong and smooth seam.

IV. RELEVANCE – HOW DOES THIS HELP ME HELP MY CUSTOMER?

A. All banner is not alike. There are plenty of people that will tell you "I'm using 13 oz banner" ... by itself, that says everything, and nothing. There are 13 oz banners made with all sorts of different scrims … which fundamentally determine the strength properties of tear and tensile. Even if the scrim is the same, different PVC compositions will have an effect on the printability, the adhesion of the ink to the print face and its scratch resistance, the low-temp crack resistance, and overall banner life.

B. People like to quote the “denier”. Over recent years the USA market for banner has moved toward 1000 denier as a kind of “gold standard”. Helpful, but ultimately if you're looking for a measure of how the banner will hold up, look at Tensile, Tear, Peel and Lo-Temp parameters. Denier is a measure of yarn weight, not strength. Strength of each strand arrives from yarn type and polymer composition, and be very different even if the weight (denier) is the same. Strength of the scrim is a result of the strength of each strand and the thread count. Strength of the banner, in terms of tensile, tear, and peel, is primarily a result of the strength of the scrim, the tensile and tear of the pvc face and back, and the adhesive strength and method used to fuse face and scrim into a finished print substrate.

C. Dimensional stability … some wide format printers (eg., Latex), and many post-print finishing methods (laminating and welding) expose the substrate to heat. Low quality banner can shrink, warp, or otherwise lose dimensional stability when heated. You will see many of NuConCept’s support materials are “100% polyester yarn, HT”. HT is our designation for “high tensile” yarn, made with polyester fibers of higher tensile strength, pound for pound, and a special heat treatment. This makes the yarn stronger, and more dimensionally stable, than comparable yarns with the same nominal denier values. We recommend our products that have HT scrim as true, cross-platform products that will work in solvent, eco-sol, UV, and latex digital printers.

D. The maximum parameters aren’t always the optimum for a given job. NuConCept offers a "good-better-best" assortment ... which we call "Premium", "EveryDay", and "Economy" ... and where the relative value that goes with those terms is definably measured by Tensile and Tear strength for products of similar weight and intended application. Price tends to follow “good-better-best”. We offer the range because we know there are jobs for which your customer needs it only “good enough”.

E. Facts are friendly. A quantifiable comparison can short-stop a lot of mis-informed buying decisions. In the accompanying EXCEL table, we lined up our data sheet parameters with a few products for which the data sheets are available, on-line. We think the table makes some interesting comparisons. We hope you agree.