The Differences Between Film Applicators

Testing the properties of products such as paints, varnishes, cosmetics, or glues for example; is an important part of their development. In order to test them, consistent and reproducible samples need to be made in order to undertake fair, accurate, and comparable tests. This is where film applicators and spiral bar coaters come in.

Whether using manually, or with the Elcometer 4340 Automatic Film Applicator, film applicators and spiral bar coaters are designed to help you create reproducible films of a defined thickness. Elcometer has a wide range of applicators and bar coaters available, perfect for creating films with a variety of products.

In this video, we're going to show you each applicator, how they work, and the sort of applications they're designed for. Unless otherwise stated, all of the applicators we are about to show you can either be used manually or with the Elcometer 4340 Automatic Film Applicator; and if you want to find out more about the Elcometer 4340, make sure you watch our separate video on that too.

Baker Film Applicators

Elcometer 3520 Baker Film Applicator

Starting with a commonly used multi-purpose applicator, Baker Film Applicators are made of hardened stainless steel, and each have four precision specified coating thickness sizes.

The applicator is placed on a flat substrate, with the value of the thickness you wish to create your film closest to the substrate. Then the product you wish make a sample film of is spread evenly in-front of the applicator. Try to avoid getting your product in front of the feet of the applicator, as this can cause it to become uneven and affect the consistency of your film.

Then, with your product in place the applicator is moved across the substrate at a steady speed, guiding the product through a precision engineered gap, which creates a film of your defined thickness. And remember, the thickness defined by the applicator is the wet film thickness, not the dry film thickness. While there are many different designs of applicator, they all essentially work in this way.

It's important to note, when creating these films manually, human error can create inconsistencies between films. Differences in how smoothly you complete the drawdown, how quickly you move the applicator, or how much downward force you place on the applicator while moving it, can all affect the resulting film. This is where the Elcometer 4340 Motorised Automatic Film Applicator comes in in order to remove that human error.

Elcometer 3525 & 3530 Adjustable Baker Film Applicators

In addition to the standard Baker Film Applicators, the Adjustable Baker Film Applicators have, as their name suggests, adjustable feet so you can set the specific gap size. By undoing the hexagonal screws on the base with the wrench provided, you can set the film thickness gap of each foot individually. So by setting both feet to the same thickness you can produce a uniform film, or alternatively you can have one thickness higher than the other allowing you to produce a film wedge of graduating thickness, typically used for testing a product's coverage or hiding power. Both the adjustable and non-adjustable Baker Film Applicators are available in a range of widths and coating thickness options.

Bird-Type Applicators

Elcometer 3550 Single Sided & Elcometer 3540 Four Sided Film Applicators

Another great general use applicator, available with either a single film thickness or four different thicknesses in one, and in a variety of widths, the Bird-type single sided and four sided Film Applicators are easy to clean, and have a flat-edged prismatic body, as opposed to the rounded design of the Baker Applicators. However these applicators work in exactly the same way – simply apply your product evenly in-front of the thickness gap, again avoiding the feet, and then complete the drawdown, whether manual or automatic.

Spiral Bar Coaters

Elcometer 4360 & 4361 Spiral Bar Coaters

Spiral bar coaters work slightly differently to film applicators. Consisting of a cylindrical bar wound with stainless steel wire of a defined diameter; the product you wish to make a sample film of is placed in front of the bar coater and as the bar coater is moved across the substrate (again this could be done manually or automatically) the product flows between the turns of the stainless steel wire. This simulates how a coating is applied when using a paint brush. The product should then settle, or level off, to the wet film thickness defined by the bar coater. As a result, this method only works with products that have high levelling characteristics, with a low viscosity. It is best suited to materials with a viscosity range from about 1 to 1000 centipoise, subject to them flowing out after coating.

When creating a film using a spiral bar coater, it's important to use a rubber matt, also known as an impression bed, as its properties aid the flowing out and levelling of the product once the drawdown has been completed, increasing repeatability.

Made of stainless steel, the Elcometer Spiral Bar Coaters are available in two widths, and are perfect for creating thin films from just 4-500µm thick. Elcometer has over sixty variations of spiral bar coater available.

Full instructions for how to create a film using a spiral bar coater are covered in our separate spiral bar coaters video.

Reservoir Applicators

Elcometer 3508 & 3560 4 Gap Applicators with Reservoir

Precision engineered from hardened stainless steel, with a built in reservoir, the Elcometer 4 Gap Applicators provide four film thicknesses in one gauge. Simply rotate the applicator so your chosen thickness is against the substrate facing away from the direction you will be moving the applicator, fill the reservoir with your product, and complete the drawdown. Some 4 Gap Applicators have two reservoirs, ideal for comparing two coatings simultaneously, or for preparing samples for the Elcometer 1720 Abrasion and Washability Testers. When using manually, to help you achieve a perfectly straight drawdown, ensuring the coating strips remain separate; the Elcometer 3508 4 Gap Applicator comes fitted with a removable guide plate, which allows you to use the edge of either your desk, standalone vacuum table, or a piece of glass as a guide.

Elcometer 3505 Cube Applicators

Available as a single cube, or a strip of five, Cube Applicators allow you to apply 12mm wide film strips with precision. Each cube film applicator is supplied with a set of thickness gauges from 30-1000µm to adjust the film thickness. Simply insert the gauge of your desired film thickness, rest the blade on it, tighten the blade retaining screws, remove the thickness gauge, and then apply product into the reservoir. The strip of 5 cubes allows you to quickly and easily create five identical film strips of the same thickness, or you could position a selection of individual cubes of various thicknesses, in order to create a sample which provides a quick comparison between thicknesses.

Micrometric Applicators

Elcometer 3570 Micrometric Film Applicator

The Micrometric Film Applicator is the only applicator that we recommend using manually, simply because its “three-wheeled” design is more suited to manual usage.

Films can be made up to 1000µm thick, with four different versions providing different film widths from 75-200mm wide.

To adjust the thickness of your film, first set the micrometer to 0, use the supplied hexagonal wrench to undo the screws, so you can push the blade firmly against the flat surface, and then retighten the screws. Finally you adjust the micrometer to the desired wet film thickness of your film.

Then simply apply product into the centre of the reservoir, and move the applicator across the substrate at a constant speed.

Elcometer 3580 Casting Knife Film Applicator

Manufactured in anodised aluminium, with a bevelled blade applicator body, the unique design of the Casting Knife Film Applicator is perfect for applying thick, dense, high viscosity fluids on solid and flat substrates. Simply adjust the two integrated micrometric screws to the same value to set your gap size, pour the product between the sides of the applicator, and move across the substrate to create your film. While this design is ideal for manual film creation, this can still be used with the Elcometer 4340, with the ability to create films up to 6000µm thick, between 50-200mm wide.

Sag Testing

Elcometer 4270 Sag Tester

Made from stainless steel, a Sag Tester is used to establish a coating’s resistance to sag, due to gravity. The tester has 11 notches of increasing clearance, allowing you to create 11 strips of increasingly thicker film. Apply the test sample in-front of the applicator, complete the drawdown, and as soon as the film has been created, remove the tester, and turn the substrate into a vertical position, with the thinnest film at the top. The thickness at which the strips sag enough to join, indicates the sagging tendency of the coating.

For full instructions on how to use any of the applicators in this video, or the Elcometer 4340 Automatic Film Applicator, simply visit Elcometer.com, or click one of the links on-screen.

And please, don’t forget to subscribe to the Elcometer channels to be notified of any new videos.