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Mecmesin
testing to perfection

FORCE & TORQUE
TEST SOLUTIONS FOR

Cosmetics & Personal Care Products

Your reputation lies quite literally in the hands of your consumer.

The performance and quality of cosmetics and personal-care products are often judged by consumers based on their textural feel and the way that the applicator performs. Not to mention the durable packaging - both practical and attractive in design - which needs to convey a high-quality exterior to reflect your brand message and protect the contents.

To help you meet the challenging quality-assurance expectations of your customers, Mecmesin provides a range of force & torque test equipment to cover everything from testing the texture of a cosmetic product, the durability and performance of its applicator, through to the openability of the packaging.

Used extensively in QC laboratories, R&D facilities and Production areas Mecmesin is known for its affordable range of force and torque testing systems and the all-important grips dedicated to the cosmetics sector …. offering excellent value for money and backed up with technical advice and support by a network of trained international distributors.

Supplying to top cosmetics companies around the world our systems are configured specifically to meet your application requirements helping you to ensure repeatable and consistent quality at every point of production. Not only will this help you remain compliant with cosmetics and personal-care industry standards but also save you money by:

- **Identifying rejects early** to minimise waste
- **Eliminating faulty supplier batches** prior to production
- **Optimising use of materials** to reduce quantities and meet recycling targets
- **Ensuring suitability of packaging** to reduce damage and spillages
- **Establishing product durability** to ensure customer satisfaction until end-of-use
- **Guaranteeing consistency in products** for continual quality, building customer loyalty

"Mecmesin's automated torque tester allows us to enhance our existing test methods and create new ones for our quality-control records. It is accurate, provides good reproducibility and we can totally rely on it for the results we get. Furthermore I recommend Mecmesin as a nice company to work with and very helpful staff who assisted us with getting the tester and it's software set-up to meet our needs."

- Jérôme Villeval, Homologation packaging, L'Oréal

Torque

For many cosmetic products the packaging is fundamental to its added-value and plays a crucial part in the consumer's decision-making process. In addition the packaging is often integrated with the product contents, acting as an applicator or dispenser, such as a lipstick barrel or mascara brush.

The use of innovative shapes and forms made from a range of flexible and hard materials are ideal for creating eye-catching designs for the consumer. However the more packaging becomes aesthetic in itself the more difficult it can be to grip and to test.

To ensure both packaging and cosmetic applicators meet their functional purpose with ease, Mecmesin test equipment caters for a wide-range of torque capacities and offers numerous gripping fixtures to meet the challenges of holding your cosmetic products.

Mecmesin provides test equipment on 2 levels.

1 ***Manually-operated torque testers*** are often used as an affordable, quick and easy way to check release torque. It is becoming increasingly recognised that there are drawbacks with such devices given that operators must operate them by hand.

- Repetitive strain injury to operators who must test frequently
- Inconsistent and inaccurate results caused by variable speed of testing, differing lateral gripping forces and varying 'axial-load' on closures

2 ***Automated torque testers*** are becoming increasingly used as the 'master' tester to determine the torque characteristics of packaging. The motorised test frame delivers a constant speed-of-rotation, thereby eliminating variability caused by operators testing at differing speeds. The measuring head applies a constant axial-load and the custom-gripping fixtures (known as 'mandrels') fit snugly around the closures and applicators gripping them uniformly without deformation. Although the initial cost is higher than a manual tester the repeatability and consistency of results, together with the added benefit of being more comfortable to use for the operator, make the return-on-investment worthwhile within a reasonable timeframe.

Packaging

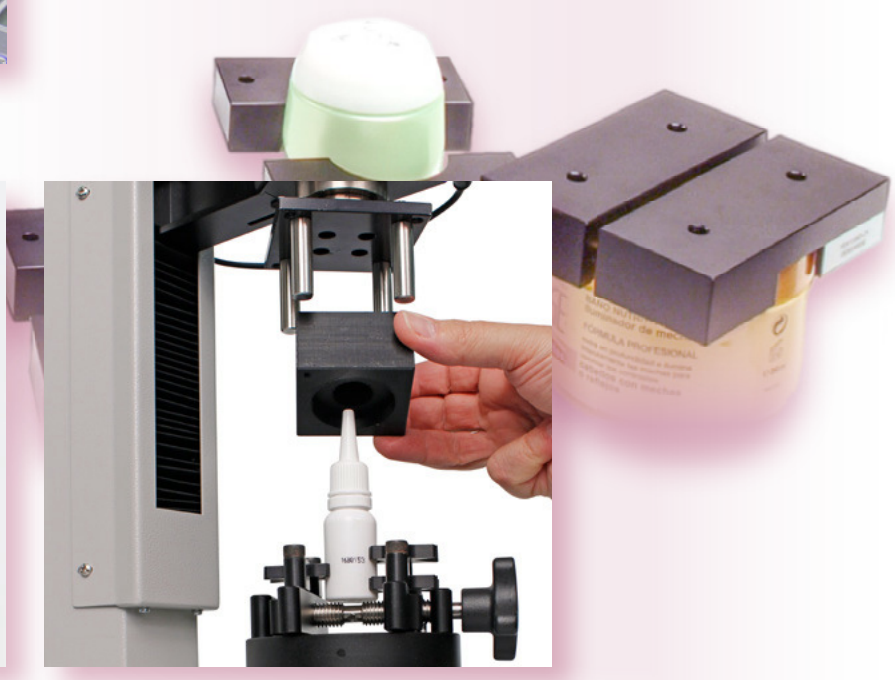
Caps and closures are a fundamental part of cosmetic packaging. When applied to containers they must be easy to open for consumers both young and old. In addition they must retain an effective seal that protects your product from leakage and outside contamination when the package is being re-closed under normal conditions.

The measurement of applied torque and release torque (also known as 'closing' and 'opening' torque) is a commonly-used and reliable indicator of the performance and integrity of packaging across the cosmetics and personal-care industries. By testing torque parameters from a batch of samples immediately after application and at a specified time-interval (usually 24 hours) you can verify that the capping machines and their individual capping heads are performing in line with expectations.

▲ Testing release torque of plastic lid using Vortex automated tester

▲ Testing release torque of plastic closure using Tornado manual tester

▲ Testing opening torque of closure/dispenser using Vortex automated tester

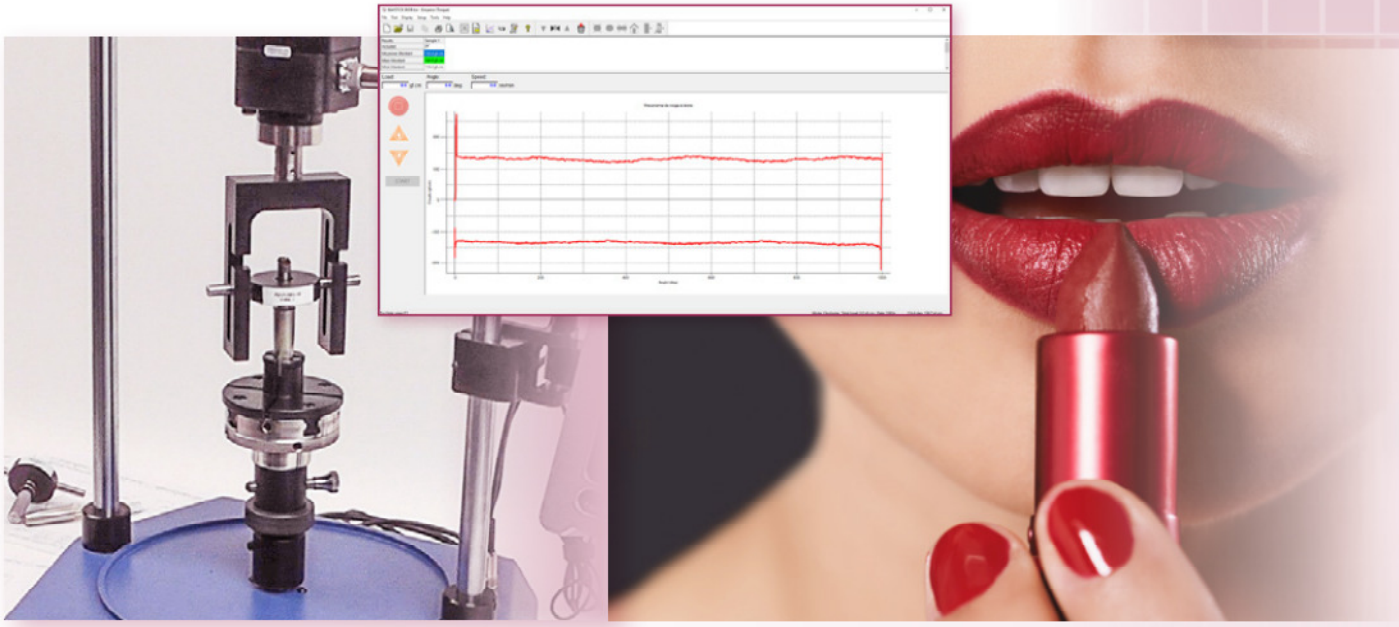


▲ Testing release torque of dropper bottle using a dedicated mandrel on Helixa automated tester

Applicators & Dispensers

The role played by the applicator is a lot more important nowadays. It is key for a product as it delivers and applies the formula, whilst needing to be attractive as well as functional. Plus it has to be quick and easy to use; consumers don't have too much time nowadays and they want it to work right away.

Cosmetic applicators and dispensers need to exhibit the same protective and usage characteristics as packaging in terms of being easy to operate for consumers and retaining an effective seal when being tightened and re-closed. They do however tend to require much lower levels of torque to be measured and therefore pose specific challenges for gripping, necessitating the use of light-weight fixtures and having a torque sensor with enough sensitivity and accuracy to measure even the finest of loads.



▲ Testing the free-running torque and end-stop torque of a lipstick barrel in both opening and closing directions

▲ Testing the tightening torque of the wand to overcome the ramp in the threaded mascara container

Force

Subjecting your products and materials to tensile and compression forces is a key way to ensure your cosmetics packaging and applicators are resilient enough to meet customer needs and expectations.

Specialising in dedicated grips and fixtures for the cosmetics industry, our range of versatile tensile testers offer an affordable testing solution to help you measure the mechanical strength of your materials to ensure your products meet their quality control specifications.

Whether your application be top-load/compression, tension, peel or flexure, you can rely on the accuracy and performance of a Mecmesin tester to meet your needs.

Packaging Test Methods

There are very few international standards specifically for cosmetics packaging and applicators so many companies tend to draw upon generic packaging standards in combination with their own in-house test methods. Common generic standards cover the following:

Coefficient of Friction

Packaging materials are cut, fed and passed through production at high speeds. Cardboard and films are often coated with lacquers and inks which affect their surface properties. Materials with a rough or uneven surface texture will create too great a friction and may impact the efficiency of the production line. Testing the frictional qualities of the surface will help ensure raw materials are suitable for machinery and help prevent the chances of jams or damage during the packaging process.

Top-Load

Top-load is the downward axial force which must be withstood by plastic bottles and aluminium containers during the capping, filling and stacking process. In general empty bottles and containers are tested to destruction for their mechanical strength, in order to correlate their performance when filled and used in real-life. Finding the right balance between light-weighting of materials to meet cost targets yet retaining sufficient strength of cosmetic containers to be practical for use, can often be achieved by top-load testing.

Peel & Adhesion

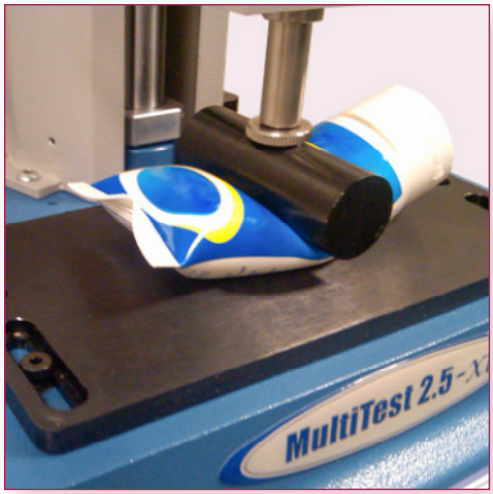
Products such as creams and gels adopt a hermetic aluminium seal as part of their packaging. Much like food, cosmetics have a fixed shelf-life… and whilst not ingested they are applied to sensitive parts of the body. Achieving a balance between a strong seal that keeps contents fresh and sterile whilst being easy to remove by consumers is very important to both the user- experience and thus your brand reputation.

Flip-Cap Opening

Flip caps are a common closure for many 'semi-solid' cosmetics such as shampoos, gels, and moisturisers. Opening and closing forces are evaluated through tension and compression testing. This helps to ensure that leaks are prevented during use (often when contents are upside-down and their weight is applied to the flip-cap), whilst also remaining easy to open and close by the end user.
In addition the strength of the hinge can also be tested to ensure it is able to sustain repetitive use without breaking off.

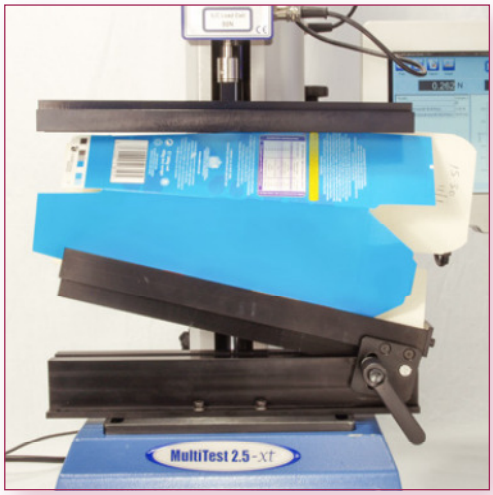
Burst Tests on Seal Strength

For products such as toothpaste and hair gels that come in tubes, force is required to squeeze out the contents. Compressive burst testing is used to check the strength of the seal on the welded seam. This helps prevent leaks by checking it can not only withstand the force applied during application, but also the pressures from stocking and transportation when the product is not in use.



Foldability of Cardboard Packaging

The properties of cardboard packaging needs to be tested for crease and fold strength as these are important factors in the performance of cartons on high speed packaging lines. Ensuring creases in boards are correct and uniform can be determined using tensile testers with dedicated fixtures.



Applicator Test Methods

Mascara brushes, dispenser pumps and aerosol sprays are just a few of the applicators tested to determine their performance and integrity. The wide variety of applicators, often involving a complex multi-part construction, means that test methods are usually developed in-house according to the particular requirements of the brand. The way in which a product is applied is key to overall customer experience and impacts the way in which the end user judges its quality. If the expectation is for a pump to dispense the product from its container smoothly and easily, this is what needs to be delivered.

Brushes & Containers

Brush manufacture is a highly specialised process utilising various rubber or synthetic fibre materials of differing lengths and density. For products such as mascaras and lip glosses the applicator is crucial to how the product is delivered. Applicators come in many design variations with innovations such as 'soft' flocking tips, 'flexible' wipers, 'soft' bristles with 'shed-resistant' properties … all features characterised by their mechanical strength.

Tensile testing is a key method of quality control to ensure that both the raw material and the finished applicator meet the specifications to withstand being extracted from the packaging and being used time and time again to apply the formula. Whether this be testing the force of individual bristles or their strength as a collective, or even the assembly strength of jointed applicator components

Eye Liner & Lip Pencils

Pencil cosmetic products are used as applicators. The main packaging element for this type of product is the lid that protects the tip from getting damaged/contaminated. A pull-off test is used to best determine the force required to remove the lid easily when in use, yet remain secure when not. A bend test may also be adopted to check for brittleness, ensuring the pencil can withstand the force applied during product application.

Dip Tubes

Dip tubes are an essential component of many multi-part applicators used to deliver liquids and sprays. A pull-off test is used to check the integrity of the joint between the dip tube and the spray head/dispenser.

Aerosols & Pump Dispensers

The delivery of mousse, fragrances and body sprays relies on the performance of the classic aerosol. By compression testing aerosols and pumps to a pre-determined displacement, it is possible to accurately determine the actuation force of spring-operated dispensers.

Texture

Customer acceptance is largely based on the physical characteristics of a product and how it delivers the expected performance based on the manufacturer's claim. With most cosmetic products designed for the skin, their texture characteristics at application are as important as the subsequent feel.

The sensory experience of a cosmetic product is based on its appearance, texture, and odour. As a measure of its quality, testing processes are put in place to ensure products physical texture and consistency are met.

Semi-Solid Cosmetics

Viscous semi-solid cosmetics include products that contain hydrocolloids, lipids, polyols, emulsions and emollients. Although a certain degree of firmness is expected in these products, they should also be easy to spread and capable of flowing easily. Products include:

- sun-protection/tanning lotions
- shampoos
- moisturisers
- lotions
- gels
- creams
- shaving creams
- liquid soaps
- bath/shower gels
- waxes

Skin creams are expected to have a smooth, creamy and rich texture, and be light but not slippery or greasy. To achieve this balance they need to be formulated so they moisturise and hydrate, but do not produce oiliness on the skin despite the presence of oils.

Solid Cosmetics

Solid cosmetics are often manufactured in the form of cohesive blocks. For example:

- bar soaps
- lip balms
- solid block deodorants /antiperspirants
- eye/lip liners in the form of pencils and lipsticks

Whilst expected to deform and wear off over their use, during application they are expected to remain hard and maintain their structure without flaking, breaking or crumbling.

Powder Cosmetics

Powder cosmetic products (compacted or loose) are dry in consistency and require the use of sponges, brushes and similar applicators, such as:

- eye shadows
- foundation powders
- blushes

With the product formulation and the force applied during application, these in particular need to be tested for flow in a consistent and controlled manner, without caking or clumping.

Test Methods for the Cosmetics Sector

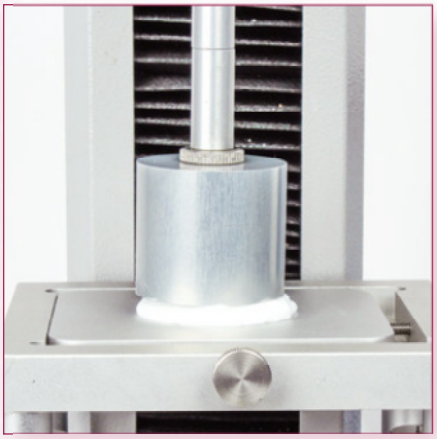
The movement of fingers during the handling and application of cosmetic products is replicated using a suitably shaped probe. Multiple test methods may be required to evaluate the physical characteristics.

Compression

Textural properties such as cohesiveness, fracturability and firmness are evaluated through compression testing. This is performed using spherical or cylindrical probe fixtures.

Product applications include:

- runniness or firmness of moisturisers
- crush resistance of sculpted soap bars.



Shear, Snap, Bend and Break

Evaluating the performance of cosmetic products that are subjected to stress during usage can be useful in assessing their formulation and the resulting texture.

Product applications include:

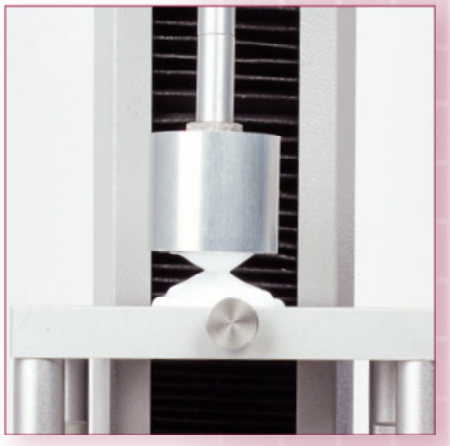
- Shear strength

Tension

The stickiness of a product is indicated by the adhesive force, which is measured by the tension encountered during the return stroke of the test.

Product applications include:

- stickiness of moisturisers.



Extrusion

Extrusion testing is specifically used for testing semi-solids in isolation, with the help of extrusion fixtures. The interaction of semi-solid cosmetics with the dispenser and packaging can also be evaluated using forward or back extrusion methods.

Product applications include:

- flow characteristics of bath creams
- spreadability and ease of applying moisturisers, masks, pastes and hair waxes (back extrusion)
- dispensability of shampoos and creams (forward extrusion).

Penetration and Puncture

The strength of solid samples are tested by penetrating them with needles, cones and small cylinders; while a ball probe can be used for evaluating the thickness and firmness of a semi-solid.

The cake strength and compaction of talc, and powder cosmetics can be also be evaluated by penetration and puncture testing. Some other characteristics that can be evaluated by this method include:

- fracture strength and hardness of lipstick, soap and solid deodorants
- crumbling resistance of liner pencils, and firmness of moisturisers.

Gel Testing

Gelling agents have found their way into most cosmetic product formulations. There are a set of standard tests prescribed by the gel industry for raw ingredients or final products that take the form of a gel.

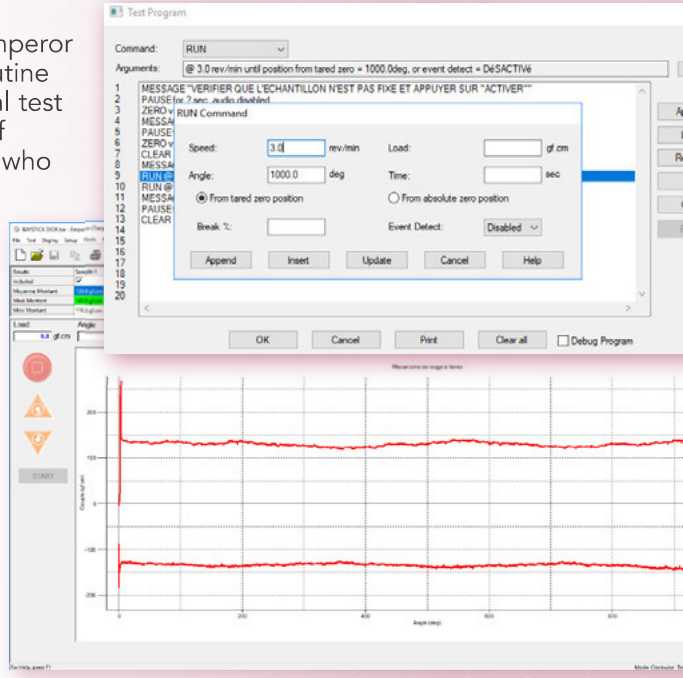
Product applications include:

- bloom strength
- hold strength of hair gels.

Test Standards

Within the cosmetics and personal-care product industry there are a variety of test methods adopted. These may be in-house standards created by a company within the industry, which are very tightly focussed on the testing of a specific kind of cosmetic product (eg.lipstick) and implement test parameters developed by the company itself. Alternatively test methods adopted may be more generic international standards relating to a broad range of products (eg. plastic containers), which are deemed to be pertinent to the cosmetics sector and therefore relevant for use.

The flexible programming capabilities of Mecmesin's powerful Emperor software really comes to the fore to create a step-by-step test routine to meet the exact requirements of both in-house and international test methods for the testing of force and torque. Storage and recall of test methods is extremely simple and ideally suited for operators who may have to test a variety of different products in small batches throughout the working day.



Special Grips and Fixtures

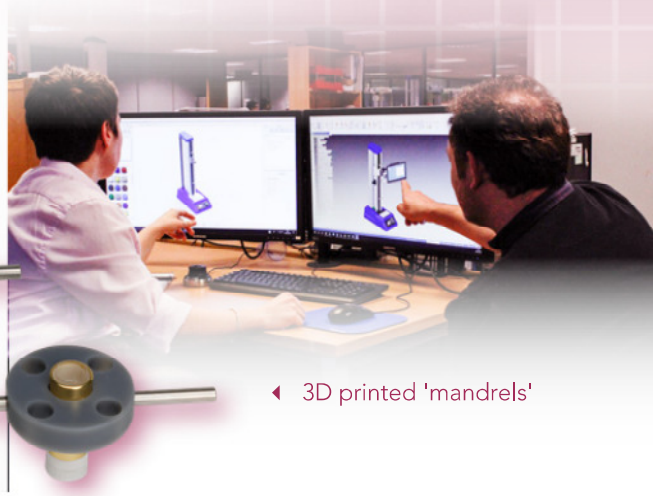
With innovation continually driving the cosmetics and personal care industry to deliver cutting-edge designs there is a plethora of varying sizes and shapes of packaging and applicators to be tested. This means that a standard range of grips cannot always hold all possible combinations so it is necessary to use special dedicated fixtures.

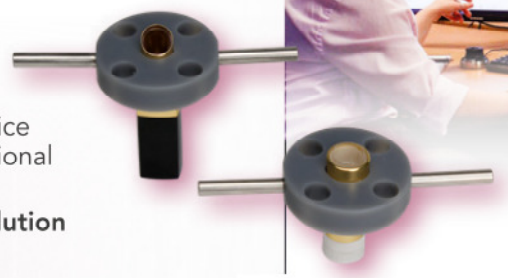
This is where Mecmesin's 40 years of experience in providing solutions for force and torque measurement really comes to the fore. Our team of Special Application Engineers are on-hand to consult with you to design and manufacture the best gripping solution for your product, whether it be to hold a single item or a more 'universal' approach to hold various items.

To meet the challenges of accurately testing at low forces needs the grips to be light-weight yet robust. Mecmesin has extensive experience in producing fixtures using the latest in 3D printer technology utilising nylon with embedded carbon micro-fibres for added strength… just perfect for testing the mini torque involved in lipsticks and other precision applicators.

Used extensively in QC laboratories, R&D facilities and Production areas Mecmesin is known for offering excellent value for money and backed up with technical advice and support by a network of trained international distributors.

If in any doubt about the best gripping solution for your application, just give us a call.





3D printed 'mandrels'

Testing the extraction force of the threaded plug of mascara

Shear fixture for lipstick bullet

Testing retention force of the mascara brush to its wand

Torque testing lids of face powder pots

Mecmesin

testing to perfection

Over 40 years experience in force & torque technology

Since 1977, Mecmesin has assisted thousands of companies achieve enhanced quality control in design and production. The Mecmesin brand represents excellence in accuracy, build, service, and value. In production centres and research labs worldwide, designers, engineers, operators, and quality managers endorse Mecmesin force and torque testing systems for their high performance across countless applications.

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