PLASTIFORM

DIMENSIONNAL NON-DESTRUCTIVE EVALUATIONS

By Plastiformization

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FOREWORD

Plastiform, a registered trademark of Rivelec, is a non-destructive quality control solution for the industry.
As the quality control of mechanical parts becomes more and more demanding, certifying the accuracy of the dimensions of a machined part can sometimes be laborious and costly with the usual inspection techniques.

Plastiform has developed unique polymer products that allow **non-destructive dimensional testing** of parts with an unbeatable price/quality ratio.

Today, Plastiform is the **worldwide leader** in the marketing of 3D impression products for metrology.

SUMMARY

QUALITY CONTROL

The Sector's Challenges

Non-Destructive Dimensional Testing

NDDT Using Plastiformization

Perform Dimensional Measurements

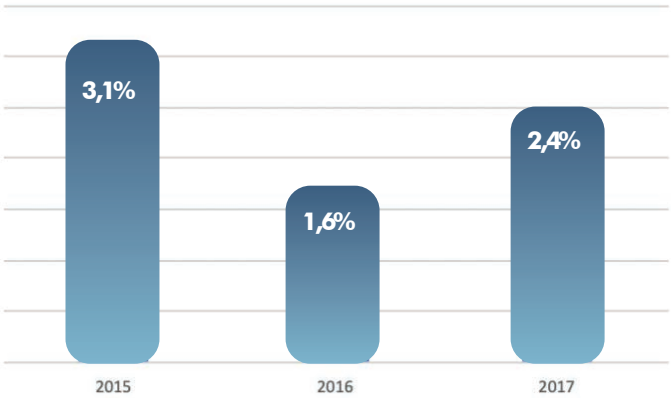
1

THE SECTOR CHALLENGES

While the popularity of compliance standards and growing customer requirements are driving companies to improve and optimize their Quality Assurance systems, there is a growth in industrial specialization around the world.

Indeed, production lines are becoming more specialized and each production site is assigned to a task for which it is optimized. These production strategies combined with the growth of standards and customer requirements create difficulties in product quality management and budgets.

Checking conformity throughout production is sometimes laborious and complex, which generates significant costs, especially with the use of destructive testing.



number of standards in force as a % of annual variations (Xerfi)

Market developments are leading to an increase in quality assurance budgets in companies.
Improving industrial performance and reliability is a competitive and costly challenge.

Non-Destructive Testing is in full evolution and techniques are multiplying, particularly for metrology. New measuring instruments have emerged in recent years, but alternatives remain more cost-effective.

NON DESTRUCTIVE DIMENSIONAL TESTING

Non-destructive Dimensional Testing, or NDDT, is a group of techniques for inspecting the conformity of the dimensions of parts or components that do not involve their degradation.

NDDT techniques have been growing rapidly in recent years. They make it possible to meet growing requirements in terms of quality, safety and risk management, but also to optimize production costs associated with parts inspection.

All industries producing **low-volume, high-cost parts** have an essential need to use non-destructive dimensional controls. This is also the case for companies that produce parts whose reliability **requires systematic verification**.

Non-Destructive Dimensional Testing often uses digital or laser technologies. This type of device is often expensive, cumbersome and complex to use for operators.

New technologies try to improve existing devices, but substitutions remain rare. **Plastiforms are innovative products in this field**: they offer a more cost-effective, easy-to-use and equally effective alternative: **Dimensional impressions**.

Plastiforms are ultra-accurate impressions. These two-component products, injected inside a part, polymerize and capture its dimensions (and every other informations). The impression after curing becomes solid and resistant, which makes it easy to remove from the part.

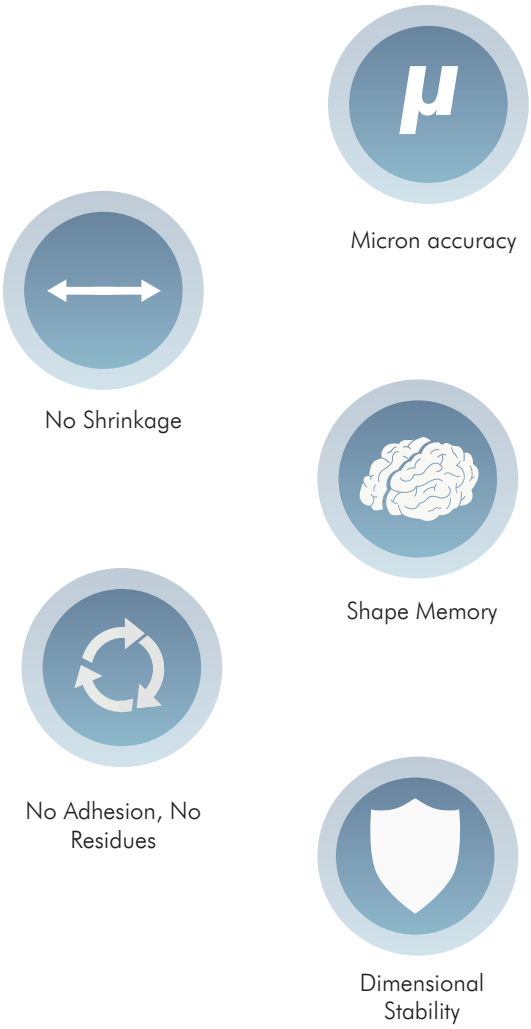
THE NDDT USING PLASTIFORMIZATION

Plastiforms are polymers that are originally divided into two components: the base and the catalyst. When they are brought into contact, they polymerize and are adopting physical properties perfectly adapted to NDDT techniques.

Injecting a non-rigid product into a part to be inspected is easy and much more convenient than handling dimensional inspection machines.

Plastiforms have technical properties perfectly adapted to quality control:

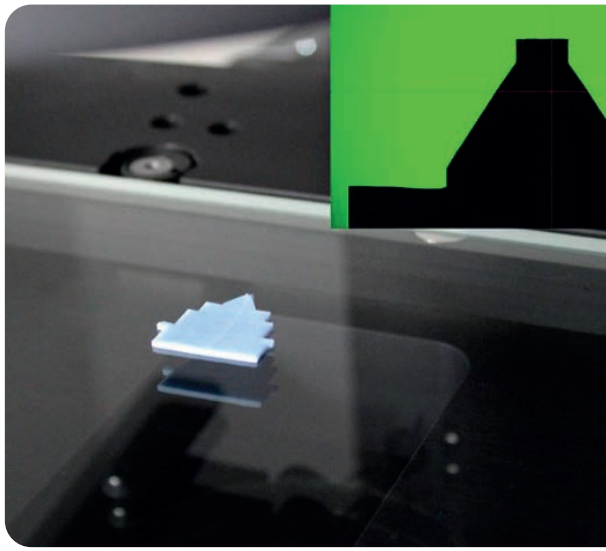
- Their reproduction accuracy is close to 0.001mm. (= 1μm)
- Polymerization does not cause any loss of volume.
- Pull and deform the impression after polymerization will not cause any alteration, it memorizes its final shape.
- Plastiform leaves no trace of its presence: no residues on any surface. It also works under water.
- The replica is stable over time: it does not degrade and can be stored for several years.



HOW TO PERFORM A DIMENSIONAL MEASUREMENT

Measuring the dimensions captured by a plastiform is relatively simple as they are compatible with measuring instruments traditionally used in metrology.

In general, it is **much easier and more accurate to study the dimensions of an impression using non-contact control machines**, such as profile projectors or digital scanners.
The shape memory property of plastiforms allows to cut cross sections of an impression in order to study its profile in 2 dimensions.



It is also possible to measure them with **contact measuring tools**. However, it must be taken into account that the pressure exerted on the impression may distort it, and thus alter the measurement.
There are several types of plastiform, choosing one that is rather rigid after curing will improve your results if you are performing a contact measurement.

THE PLASTIFORMS

The Company

How it Works

2

THE COMPANY

Rivelec innovated and created the plastiforms under the Plastiform brand that gave them their name. We are experts in quality control by impression taking.

Plastiforms are silicone products of fluid, pasty or malleable consistency developed to meet quality control requirements in very demanding sectors: Aeronautics, Oil, Energy, Medical, Watchmaking, etc.

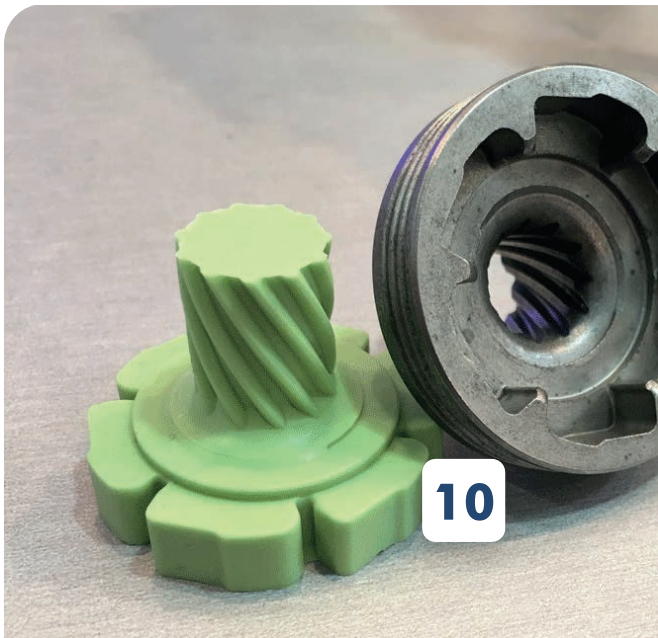
With more than 35 years of experience, Plastiform is present in more than 80 countries and in the most advanced companies in the world. **We are still leader in the marketing of impression-taking products for quality control.**

Today, plastiforms are often the most cost-effective solution to quality control problems for industries, especially for **dimensional inspection, roughness control and surface finishing inspection.**

Micron accuracy

Fast and Easy

Cheap and Effective

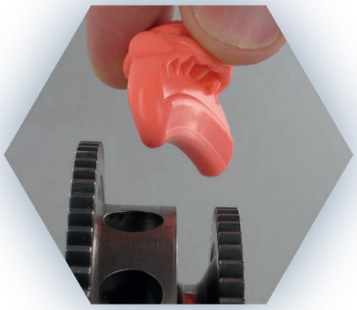


HOW IT WORKS

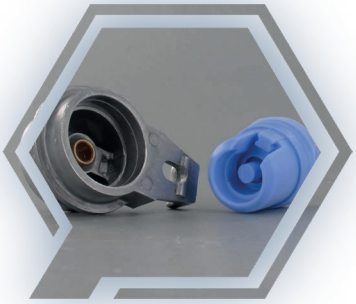
Plastiform offers 3 types of product viscosities: Fluids, Pasty and Manual Putty. These 3 ranges allow to make impressions on all types of parts, regardless of their geometric orientation.

Plastiforms are two-component products that solidify when mixed (with a 1:1 ratio). While curing, **they reproduce very precisely all the details of the surface** on which they have been applied: dimensions, shapes, aspects, surface conditions.

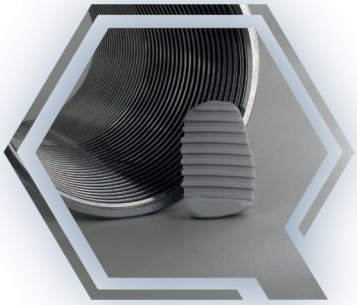
The properties of each product are unique. Each of them has been created to respond to a particular application or case.
Each product has its **own Removal Constraint** which indicate if the product can be extracted once solidified in a part.



Pasty



Fluid



Manual Putty

TECHNICAL INFORMATIONS

3

- The Removal Constraint
- The Impression Taking
- How To Exploit the Impressions
- Dimensional Measurements

THE REMOVAL CONSTRAINT

Before making the impression of a shape, whether internal or external to the part, it is necessary to determine the difficulty of extracting the replica. The extraction constraint is a value determined by a simple mathematical formula, it allows to define which plastiform to use.

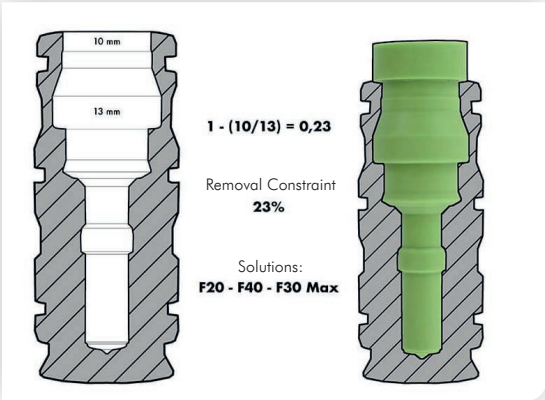
The extraction constraint is a percentage that indicates the constraint to which the impression will be exposed. In accordance with this principle, each plastiform has a maximum extraction stress to which it can be exposed

Calculating the extraction constraint therefore makes it possible to direct your choice towards a product, and to ensure that extraction will be possible.
The evaluation of the extraction stress is an essential step before any dimensional testing.

Here is the mathematical formula:

$$1 - \left[\frac{\text{Minimum Dimension of the extraction hole}}{\text{Maximum Internal Dimension}} \right] = \text{Removal Constraint (\%)}$$

Example:



THE IMPRESSION TAKING

a. Application Equipment

Taking an impression requires the use of accessories, especially for cartridge products. By using the plastiform case, you are ready to carry out your high-accuracy moldings.

The Plastiform case contains all the necessary accessories and products for taking impressions. It is a customizable product: you can fill it with products and tools specific to your applications.

Tips for Accuracy

Mixing Nozzles

Plastiform in cartridges

Dispensing Gun

To apply the **plastiforms in cartridges**, a **dispensing gun and mixing nozzle** must be used. This set ensures a homogeneous mixing of the two components, and therefore, an optimal polymerization of the product.

The Tip allows the flow rate at the injector outlet to be controlled. It is sometimes convenient to be able to slowly pour the product.

This set is essential to use the cartridge products. The Manual Putties, on the other hand, do not require any accessories to be used except for the degreaser.

THE IMPRESSION TAKING

a. Application Equipment

Plastin

DN1 Degreaser

Double Blade Cutter

RE-FORM

Removal Rings

The other accessories of the case are made to optimize the impression taking :

The DN1 Degreaser is essential before any try to mould an impression. The part must be degreased with this specially validated degreaser.

Plastin makes it possible to plug holes, position the part, block unwanted spills: it is an industrial modelling clay that does not dry out and leaves no traces.

The Removal Rings allow you to create a better grip to extract the impression.

The Double Blade Cutter allows you to cut a cross section of the impression for an easier measuring with a profile projector.

The Re-Form is used to hold or reinforce a part.

THE IMPRESSION TAKING

b. The application

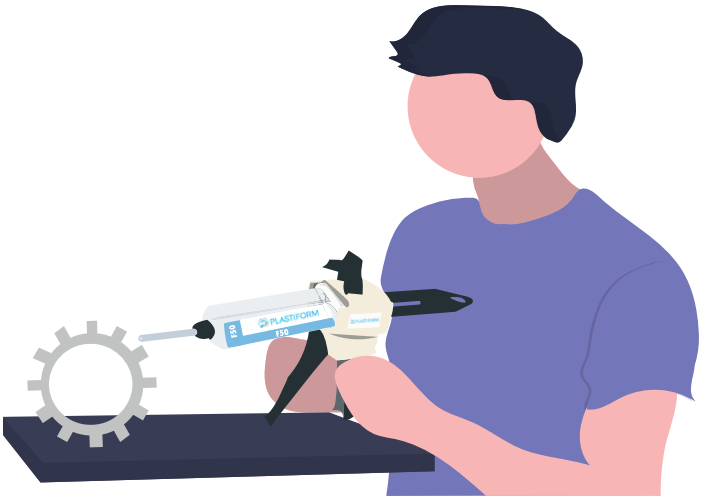
When your dispensing gun is mounted with a cartridge and an injector, simply use the trigger to mix the two components in the injector and apply the plastiform to the surface to be tested.

As soon as they leave the injector, the plastiforms begin to polymerize, a process which lasts from 2min. for the fastest to 40min. for the slowest.
As soon as you have finished injecting the products into (or on) your parts, let them rest for a few minutes to allow them to copy the part properties correctly.

The different types of injectors and nozzles will allow you to access all possible areas, including the smallest ones. (Minimum injection diameter: 0.90mm)
Plastiforms can also be applied to large volume areas. In this case, a long polymerization range (25 to 40 min.) exists.

Rivelec has also developed a range specially designed to be applied manually.

The manual putty products are applied by hand, they can be very practical to control assembled parts without having to disassemble and move them. It is also used for simple repetitive applications.



THE IMPRESSION TAKING

c. Application with 50mL Cartridges

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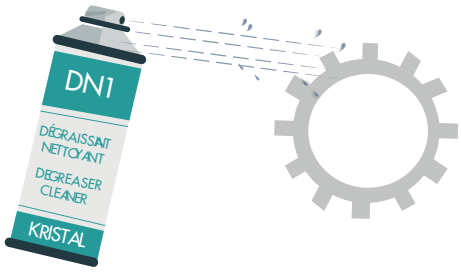
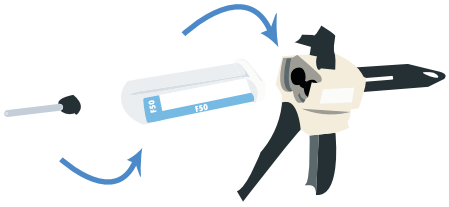


Degreasing, Cleaning, Drying

2



Cartridge Mounting

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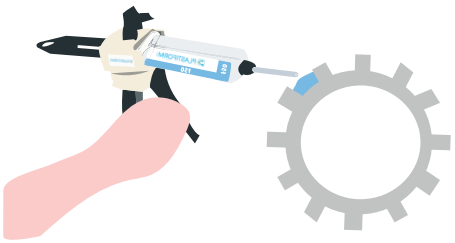

Plastiform application

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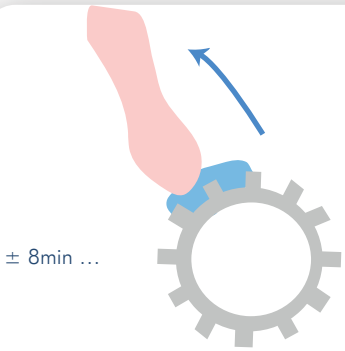

Impression Demoulding

THE IMPRESSION TAKING

d. Application with Manual Putty Plastiforms

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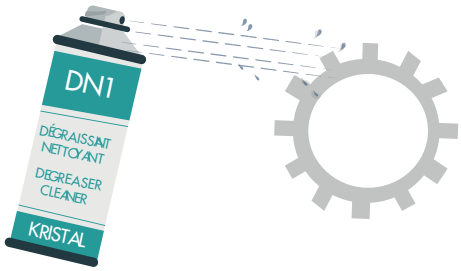

Degreasing, Cleaning, Drying

2

Mixing the bi-components

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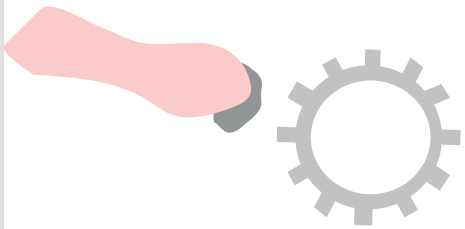

Plastiform application

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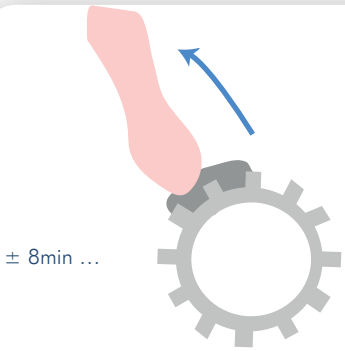


Impression Demoulding

HOW TO EXPLOIT THE IMPRESSIONS

After taking the impression you will obtain the negative of your part in 3 dimensions, replicated to the nearest micrometer.
Depending on your measuring instrument, it will be more or less easy for you to control this impression.

We recommend the use of non-contact measurement procedures, as optical inspection is more suitable for plastiforming techniques.

If your equipment allows you to inspect the entire negative replica, you only need to position it properly to analyze it.

If you use profile projectors or dimensional inspection tools that measure profiles in 2 dimensions, Plastiform has developed a **Double Blade Cutter** specially dedicated to this mission.

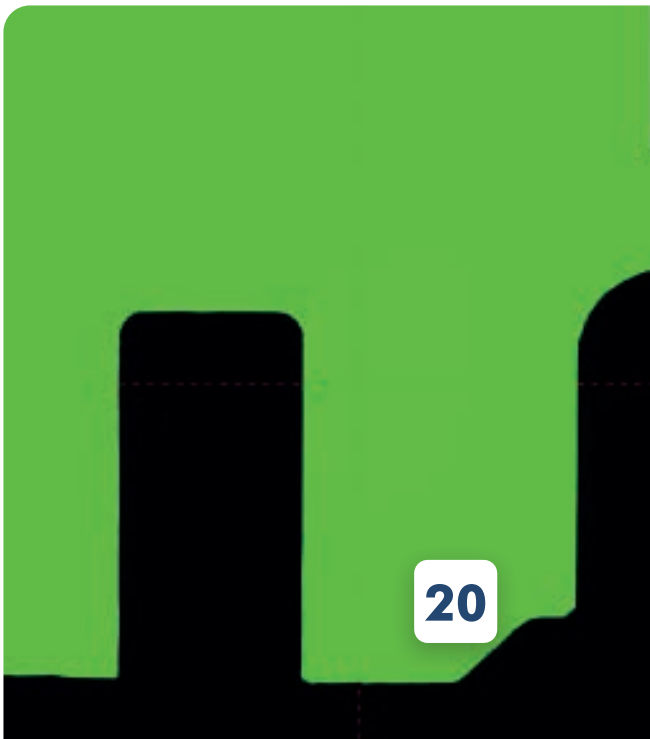
Forgeable to measure, it allows, with its two parallel blades, to create a cross section in the plastiforms in order to create a 2-dimensional profile.

DIMENSIONAL MEASUREMENTS

Replicas give excellent results on profile projectors and more generally on all non-contact dimensional inspection machines.

By using the **Double Blade Cutter** and its cutting guide, your impression profiles will be very easy to use on this type of instrument. This allows measurements to be taken without focusing on positioning the impression, which may not be easy with full impressions.

It is possible to use contact measuring tools. However, this measuring procedure is reserved for products with a final hardness > 70 Shore A, otherwise you may alter the results during the measurement.



THE PLASTIFORM MARKET

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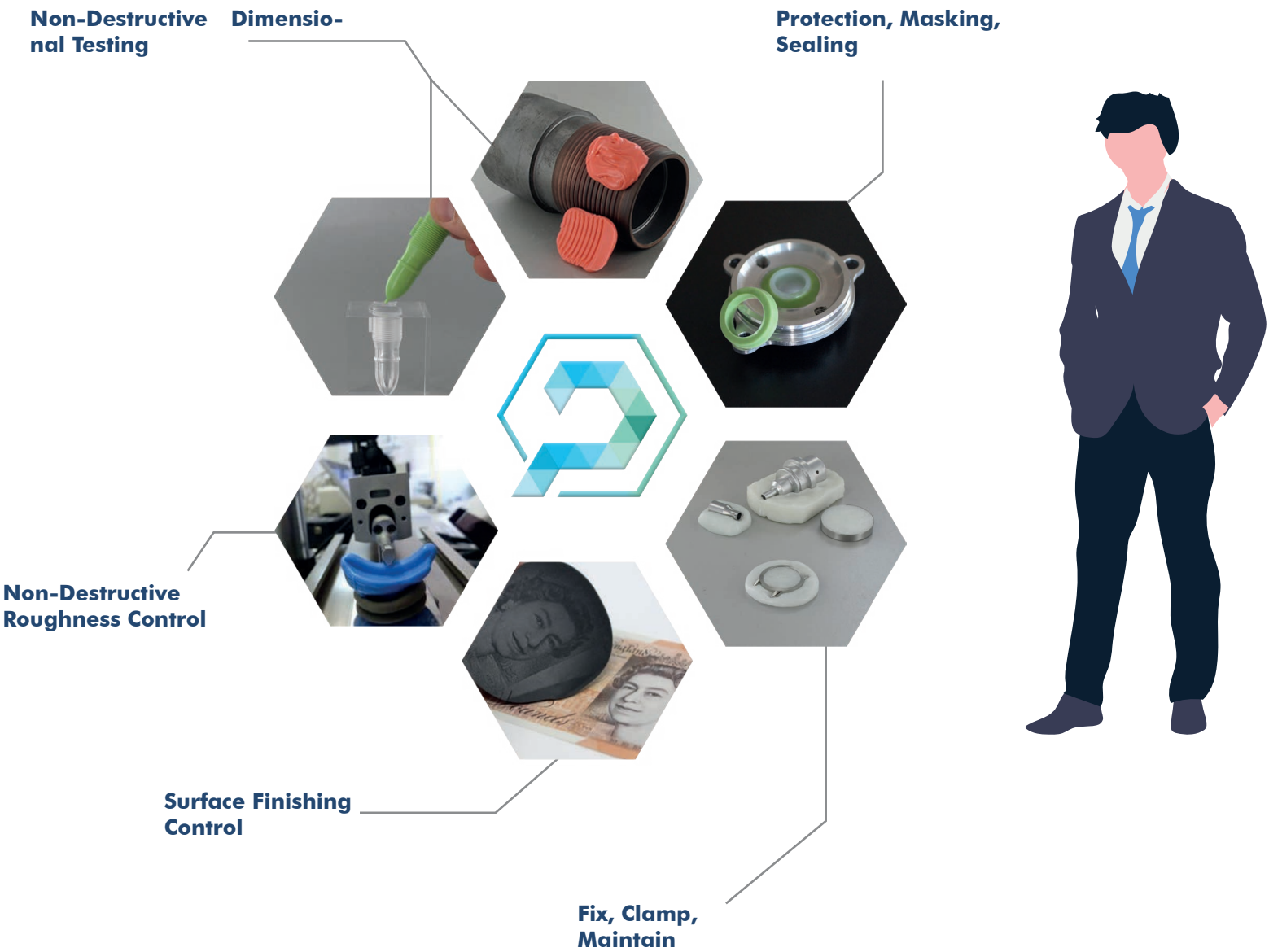
The Scope of Plastiform Action

Value Characteristics

Plastiformization Controls

THE SCOPE OF PLASTIFORM ACTION



VALUE CHARACTERISTICS

Plastiform is an innovative company that constantly seeks to simplify inspection techniques by making them cheaper and more efficient for Quality Control.

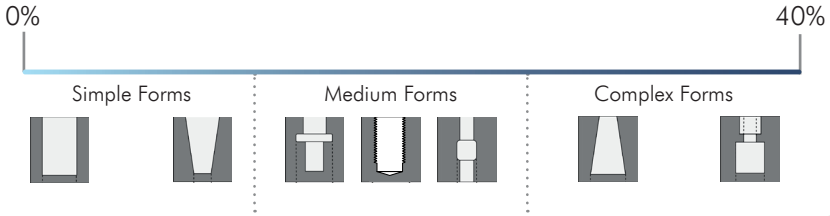
Product Range

More than 20 unique products

Custom-Made products available

More than 20 Accessories to help you during the application

Possible Removal Constraint



Products Consistencies

Before the polymerization

Fluid
7 products

Pasty
4 products

Manual Putty
5 products

After the polymerization

Very Flexible :
0 - 50 Shore A
7 products

Semi-Flexible :
50 - 75 Shore A
4 products

Rigid :
75 - 100 Shore A
5 products

Important Datas

Micron Accuracy

Fast and Easy

Cheap and Effective

Non Toxic, Non Dangerous

Measure with and without contact

Plastiform meets **98% of Non-Destructive Testings** needs through impression taking.

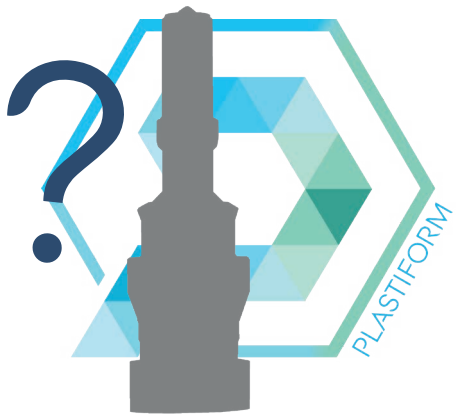
PLASTIFORMIZATION CONTROLS

CONCLUSION

Our team is at your disposal for any further information. You can use the services provided by Plastiform by visiting our website.

Find us on social networks!

Customize my case



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